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1.3 antlr 2.7.7

1.3.1 Available under license :

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Partially supported by University of San Francisco & jGuru.com

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The primary ANTLR guy:

Terence Parr
parrt@cs.usfca.edu
parrt@antlr.org

1.4 libjpeg 6b

1.4.1 Notifications :

This software is based in part on the work of the Independent JPEG Group.

1.4.2 Available under license :

The Independent JPEG Group's JPEG software
==========

README for release 6b of 27-Mar-1998
==========

This distribution contains the sixth public release of the Independent JPEG
Group's free JPEG software. You are welcome to redistribute this software and
to use it for any purpose, subject to the conditions under LEGAL ISSUES, below.

Serious users of this software (particularly those incorporating it into
larger programs) should contact IJG at jpeg-info@uunet.uu.net to be added to
our electronic mailing list. Mailing list members are notified of updates
and have a chance to participate in technical discussions, etc.

This software is the work of Tom Lane, Philip Gladstone, Jim Boucher,
Lee Crocker, Julian Minguillon, Luis Ortiz, George Phillips, Davide Rossi,
Guido Vollbeding, Ge' Weijers, and other members of the Independent JPEG
Group.

IJG is not affiliated with the official ISO JPEG standards committee.

DOCUMENTATION
ROADMAP
==========

This file contains the following sections:

OVERVIEW General description of JPEG and the IJG software.
LEGAL ISSUES Copyright, lack of warranty, terms of distribution.
REFERENCES Where to learn more about JPEG.
ARCHIVE LOCATIONS Where to find newer versions of this software.
RELATED SOFTWARE Other stuff you should get.
FILE FORMAT WARS Software *not* to get.
TO DO Plans for future IJG releases.

Other documentation files in the distribution are:

User documentation:
install.doc How to configure and install the IJG software.
usage.doc Usage instructions for cjpeg, djpeg, jpegtran,
rdjpgcom, and wrjpgcom.
*.1 Unix-style man pages for programs (same info as usage.doc).
wizard.doc Advanced usage instructions for JPEG wizards only.
change.log Version-to-version change highlights.
Programmer and internal
documentation:
libjpeg.doc How to use the JPEG library in your own programs.
example.c Sample code for calling the JPEG library.
structure.doc Overview of the JPEG library's internal structure.
filelist.doc Road map of IJG files.
coderules.doc Coding style rules --- please read if you contribute code.

Please read at least the files install.doc and usage.doc. Useful information
can also be found in the JPEG FAQ (Frequently Asked Questions) article. See
ARCHIVE LOCATIONS below to find out where to obtain the FAQ article.

If you want to understand how the JPEG code works, we suggest reading one or
more of the REFERENCES, then looking at the documentation files (in roughly
the order listed) before diving into the code.

OVERVIEW
========

This package contains C software to implement JPEG image compression and

decompression. JPEG (pronounced "jay-peg") is a standardized compression method for full-color and gray-scale images.
JPEG is intended for compressing "real-world" scenes; line drawings, cartoons and other non-realistic images are not its strong suit. JPEG is lossy, meaning that the output image is not exactly identical to the input image. Hence you must not use JPEG if you have to have identical output bits. However, on typical photographic images, very good compression levels can be obtained with no visible change, and remarkably high compression levels are possible if you can tolerate a low-quality image. For more details, see the references, or just experiment with various compression settings.

This software implements JPEG baseline, extended-sequential, and progressive compression processes. Provision is made for supporting all variants of these processes, although some uncommon parameter settings aren't implemented yet. For legal reasons, we are not distributing code for the arithmetic-coding variants of JPEG; see LEGAL ISSUES. We have made no provision for supporting the hierarchical or lossless processes defined in the standard.

We provide a set of library routines for reading and writing JPEG image files, plus two sample applications "cjpeg" and "djpeg", which use the library to perform conversion between JPEG and some other popular image file formats. The library is intended to be reused in other applications.

In order to support file conversion and viewing software, we have included considerable functionality beyond the bare JPEG coding/decoding capability; for example, the color quantization modules are not strictly part of JPEG decoding, but they are essential for output to colormapped file formats or colormapped displays. These extra functions can be compiled out of the library if not required for a particular application. We have also included "jpegtran", a utility for lossless transcoding between different JPEG processes, and "rdjpgcom" and "wrjpgcom", two simple applications for inserting and extracting textual comments in JFIF files.

The emphasis in designing this software has been on achieving portability and flexibility, while also making it fast enough to be useful. In particular, the software is not intended to be read as a tutorial on JPEG. (See the REFERENCES section for introductory material.) Rather, it is intended to be reliable, portable, industrial-strength code. We do not claim to have achieved that goal in every aspect of the software, but we strive for it.

We welcome the use of this software as a component of commercial products. No royalty is required, but we do ask for an acknowledgement in product documentation, as described under LEGAL ISSUES.

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==========

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must acknowledge somewhere in your documentation that
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that you must include source code if you redistribute it. (See the file
ansi2knr.c for full details.) However, since ansi2knr.c is not needed as part
of any program generated from the IJG code, this does not limit you more than
the foregoing paragraphs do.

The Unix configuration script "configure" was produced with GNU Autoconf.
It is copyright by the Free Software Foundation but is freely distributable.
The same holds for its supporting scripts (config.guess, config.sub,
ltconfig, ltmain.sh). Another support script, install-sh, is copyright
by M.I.T. but is also freely distributable.

It appears that the arithmetic coding option of the JPEG spec is covered by
patents owned by IBM, AT&T, and Mitsubishi. Hence arithmetic
coding cannot
legally be used without obtaining one or more licenses. For this reason,
support for arithmetic coding has been removed from the free JPEG software.
(Since arithmetic coding provides only a marginal gain over the unpatented
Huffman mode, it is unlikely that very many implementations will support it.)
So far as we are aware, there are no patent restrictions on the remaining
code.

The IJG distribution formerly included code to read and write GIF files.
To avoid entanglement with the Unisys LZW patent, GIF reading support has
been removed altogether, and the GIF writer has been simplified to produce
"uncompressed GIFs". This technique does not use the LZW algorithm; the
resulting GIF files are larger than usual, but are readable by all standard
GIF decoders.

We are required to state that
"The Graphics Interchange Format(c) is the Copyright property of
CompuServe Incorporated. GIF(sm) is a Service Mark property of
CompuServe Incorporated."

REFERENCES
==========

We

highly recommend reading one or more of these references before trying to understand the innards of the JPEG software.

The best short technical introduction to the JPEG compression algorithm is Wallace, Gregory K. "The JPEG Still Picture Compression Standard", Communications of the ACM, April 1991 (vol. 34 no. 4), pp. 30-44. (Adjacent articles in that issue discuss MPEG motion picture compression, applications of JPEG, and related topics.) If you don't have the CACM issue handy, a PostScript file containing a revised version of Wallace's article is available at ftp://ftp.uu.net/graphics/jpeg/wallace.ps.gz. The file (actually a preprint for an article that appeared in IEEE Trans. Consumer Electronics) omits the sample images that appeared in CACM, but it includes corrections and some added material. Note: the Wallace article is copyright ACM and IEEE, and it may not be used for commercial purposes.

A somewhat less technical, more leisurely introduction to JPEG can be found in "The Data Compression Book" by Mark Nelson and Jean-loup Gailly, published by M&T Books (New York), 2nd ed. 1996, ISBN 1-55851-434-1. This book provides good explanations and example C code for a multitude of compression methods including JPEG. It is an excellent source if you are comfortable reading C code but don't know much about data compression in general. The book's JPEG sample code is far from industrial-strength, but when you are ready to look at a full implementation, you've got one here...

The best full description of JPEG is the textbook "JPEG Still Image Data Compression Standard" by William B. Pennebaker and Joan L. Mitchell, published by Van Nostrand Reinhold, 1993, ISBN 0-442-01272-1. Price US$59.95, 638 pp. The book includes the complete text of the ISO JPEG standards (DIS 10918-1 and draft DIS 10918-2). This is by far the most complete exposition of JPEG in existence, and we highly recommend it.

The JPEG standard itself is not available electronically; you must order a paper copy through ISO or ITU. (Unless you feel a need to own a certified official copy, we recommend buying the Pennebaker and Mitchell book instead; it's much cheaper and includes a great deal of useful explanatory material.) In the USA, copies of the standard may be ordered from ANSI Sales at (212) 642-4900, or from Global Engineering Documents at (800) 854-7179. (ANSI doesn't take credit card orders, but Global does.) It's not cheap: as of 1992, ANSI was charging $95 for Part 1 and $47 for Part 2, plus 7% shipping/handling. The standard is divided into two parts, Part 1 being the actual specification, while Part 2 covers compliance testing methods. Part 1 is titled "Digital Compression and Coding of Continuous-tone Still Images, Part 1: Requirements and guidelines" and has document numbers ISO/IEC IS 10918-1, ITU-T T.81. Part 2 is titled "Digital Compression and Coding of Continuous-tone Still

Images, Part 2: Compliance testing" and has document
numbers ISO/IEC IS 10918-2, ITU-T T.83.

Some extensions to the original JPEG standard are defined in JPEG Part 3,
a newer ISO standard numbered ISO/IEC IS 10918-3 and ITU-T T.84. IJG
currently does not support any Part 3 extensions.

The JPEG standard does not specify all details of an interchangeable file
format. For the omitted details we follow the "JFIF" conventions, revision
1.02. A copy of the JFIF spec is available from:
Literature Department
C-Cube Microsystems, Inc.
1778 McCarthy Blvd.
Milpitas, CA 95035
phone (408) 944-6300, fax (408) 944-6314
A PostScript version of this document is available by FTP at
ftp://ftp.uu.net/graphics/jpeg/jfif.ps.gz. There is also a plain text
version at ftp://ftp.uu.net/graphics/jpeg/jfif.txt.gz, but it is missing
the figures.

The TIFF 6.0 file format specification can be obtained by FTP from
ftp://ftp.sgi.com/graphics/tiff/TIFF6.ps.gz. The JPEG incorporation
scheme
found in the TIFF 6.0 spec of 3-June-92 has a number of serious problems.
IJG does not recommend use of the TIFF 6.0 design (TIFF Compression tag 6).
Instead, we recommend the JPEG design proposed by TIFF Technical Note #2
(Compression tag 7). Copies of this Note can be obtained from ftp.sgi.com or
from ftp://ftp.uu.net/graphics/jpeg/. It is expected that the next revision
of the TIFF spec will replace the 6.0 JPEG design with the Note's design.
Although IJG's own code does not support TIFF/JPEG, the free libtiff library
uses our library to implement TIFF/JPEG per the Note. libtiff is available
from ftp://ftp.sgi.com/graphics/tiff/.

ARCHIVE LOCATIONS
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The "official" archive site for this software is ftp.uu.net (Internet
address 192.48.96.9). The most recent released version can always be found
there in directory graphics/jpeg. This particular version will be archived
as ftp://ftp.uu.net/graphics/jpeg/jpegsrc.v6b.tar.gz. If you don't
have
direct Internet access, UUNET's archives are also available via UUCP; contact
help@uunet.uu.net for information on retrieving files that way.

Numerous Internet sites maintain copies of the UUNET files. However, only
ftp.uu.net is guaranteed to have the latest official version.

You can also obtain this software in DOS-compatible "zip" archive format from the SimTel archives (ftp://ftp.simtel.net/pub/simtelnet/msdos/graphics/), or on CompuServe in the Graphics Support forum (GO CIS:GRAPHSUP), library 12 "JPEG Tools". Again, these versions may sometimes lag behind the ftp.uu.net release.

The JPEG FAQ (Frequently Asked Questions) article is a useful source of general information about JPEG. It is updated constantly and therefore is not included in this distribution. The FAQ is posted every two weeks to Usenet newsgroups comp.graphics.misc, news.answers, and other groups. It is available on the World Wide Web at http://www.faqs.org/faqs/jpeg-faq/ and other news.answers
archive sites, including the official news.answers archive at rtfm.mit.edu: ftp://rtfm.mit.edu/pub/usenet/news.answers/jpeg-faq/. If you don't have Web or FTP access, send e-mail to mail-server@rtfm.mit.edu with body
send usenet/news.answers/jpeg-faq/part1
send usenet/news.answers/jpeg-faq/part2

RELATED SOFTWARE
==========

Numerous viewing and image manipulation programs now support JPEG. (Quite a few of them use this library to do so.) The JPEG FAQ described above lists some of the more popular free and shareware viewers, and tells where to obtain them on Internet.

If you are on a Unix machine, we highly recommend Jef Poskanzer's free PBMPLUS software, which provides many useful operations on PPM-format image files. In particular, it can convert PPM images to and from a wide range of other formats, thus making cjpeg/djpeg considerably more useful. The latest version is distributed by the NetPBM group, and is available from numerous sites,
notably ftp://wuarchive.wustl.edu/graphics/graphics/packages/NetPBM/. Unfortunately PBMPLUS/NETPBM is not nearly as portable as the IJG software is; you are likely to have difficulty making it work on any non-Unix machine.

A different free JPEG implementation, written by the PVRG group at Stanford, is available from ftp://havefun.stanford.edu/pub/jpeg/. This program is designed for research and experimentation rather than production use; it is slower, harder to use, and less portable than the IJG code, but it is easier to read and modify. Also, the PVRG code supports lossless JPEG, which we do not. (On the other hand, it doesn't do progressive JPEG.)

FILE FORMAT WARS
==========

Some JPEG programs produce files that are not compatible with our library.
The root of the problem is that the ISO JPEG committee failed to specify a
concrete file format. Some vendors "filled in the blanks" on their own,
creating proprietary formats that no one else could read.
(For example, none
of the early commercial JPEG implementations for the Macintosh were able to
exchange compressed files.)

The file format we have adopted is called JFIF (see REFERENCES). This format
has been agreed to by a number of major commercial JPEG vendors, and it has
become the de facto standard. JFIF is a minimal or "low end" representation.
We recommend the use of TIFF/JPEG (TIFF revision 6.0 as modified by TIFF
Technical Note #2) for "high end" applications that need to record a lot of
additional data about an image. TIFF/JPEG is fairly new and not yet widely
supported, unfortunately.

The upcoming JPEG Part 3 standard defines a file format called SPIFF.
SPIFF is interoperable with JFIF, in the sense that most JFIF decoders should
be able to read the most common variant of SPIFF. SPIFF has some technical
advantages over JFIF, but its major claim to fame is simply that it is an
official standard rather than an informal one. At this point it is unclear
whether
SPIFF will supersede JFIF or whether JFIF will remain the de-facto
standard. IJG intends to support SPIFF once the standard is frozen, but we
have not decided whether it should become our default output format or not.
(In any case, our decoder will remain capable of reading JFIF indefinitely.)

Various proprietary file formats incorporating JPEG compression also exist.
We have little or no sympathy for the existence of these formats. Indeed,
one of the original reasons for developing this free software was to help
force convergence on common, open format standards for JPEG files. Don't
use a proprietary file format!

TO DO
=====

The major thrust for v7 will probably be improvement of visual quality.
The current method for scaling the quantization tables is known not to be
very good at low Q values. We also intend to investigate block boundary
smoothing, "poor man's variable quantization", and other means of improving
quality-vs-file-size performance without
sacrificing compatibility.

In future versions, we are considering supporting some of the upcoming JPEG
Part 3 extensions --- principally, variable quantization and the SPIFF file
format.

As always, speeding things up is of great interest.

Please send bug reports, offers of help, etc. to jpeg-info@uunet.uu.net.

1.5 libiconv 1.14

1.5.1 Available under license :

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Version 2, June 1991

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[This is the first released version of the library GPL. It is
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a textual and legal sense, the
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derivative of the original library, and the ordinary General Public License
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concluded that weaker conditions might promote sharing better.

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is invoked, then you must make a good faith effort to ensure that,
in the event an application does not supply such function or
table, the facility
still operates, and performs whatever part of
its purpose remains meaningful.

(For example, a function in a library to compute square roots has
a purpose that is entirely well-defined independent of the
application. Therefore, Subsection 2d requires that any
application-supplied function or table used by this function must
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This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

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GNU LIBICONV - character set conversion library

This library provides an iconv() implementation, for use on systems which
don't have one, or whose implementation cannot convert from/to Unicode.

It provides support for the encodings:

European languages
ASCII, ISO-8859-{1,2,3,4,5,7,9,10,13,14,15,16},
KOI8-R, KOI8-U, KOI8-RU,
CP{1250,1251,1252,1253,1254,1257}, CP{850,866,1131},
Mac{Roman,CentralEurope,Iceland,Croatian,Romania},
Mac{Cyrillic,Ukraine,Greek,Turkish},
Macintosh
Semitic languages
ISO-8859-{6,8}, CP{1255,1256}, CP862, Mac{Hebrew,Arabic}
Japanese
EUC-JP, SHIFT_JIS, CP932, ISO-2022-JP, ISO-2022-JP-2, ISO-2022-JP-1
Chinese
EUC-CN, HZ, GBK, CP936, GB18030, EUC-TW, BIG5, CP950, BIG5-HKSCS,
BIG5-HKSCS:2004, BIG5-HKSCS:2001, BIG5-HKSCS:1999, ISO-2022-CN,
ISO-2022-CN-EXT

Korean
EUC-KR, CP949, ISO-2022-KR, JOHAB
Armenian

ARMSCII-8
Georgian
Georgian-Academy, Georgian-PS
Tajik
KOI8-T
Kazakh
PT154, RK1048
Thai
ISO-8859-11, TIS-620, CP874, MacThai
Laotian
MuleLao-1, CP1133
Vietnamese
VISCII, TCVN, CP1258
Platform specifics
HP-ROMAN8, NEXTSTEP
Full Unicode
UTF-8
UCS-2, UCS-2BE, UCS-2LE
UCS-4, UCS-4BE, UCS-4LE
UTF-16, UTF-16BE, UTF-16LE
UTF-32, UTF-32BE, UTF-32LE
UTF-7
C99, JAVA
Full Unicode, in terms of 'uint16_t' or 'uint32_t'
(with machine dependent endianness and alignment)
UCS-2-INTERNAL, UCS-4-INTERNAL
Locale dependent, in terms of 'char' or 'wchar_t'
(with machine dependent endianness and alignment, and with OS and
locale dependent semantics)
char, wchar_t
The empty encoding name "" is equivalent to "char": it denotes the
locale
dependent character encoding.

When configured with the option --enable-extra-encodings, it also provides
support for a few extra encodings:

European languages
CP{437,737,775,852,853,855,857,858,860,861,863,865,869,1125}
Semitic languages
CP864
Japanese
EUC-JISX0213, Shift_JISX0213, ISO-2022-JP-3
Chinese

BIG5-2003 (experimental)
Turkmen
TDS565
Platform specifics
ATARIST, RISCOS-LATIN1

It can convert from any of these encodings to any other, through Unicode conversion.

It has also some limited support for transliteration, i.e. when a character cannot be represented in the target character set, it can be approximated through one or several similarly looking characters. Transliteration is activated when "//TRANSLIT" is appended to the target encoding name.

libiconv is for you if your application needs to support multiple character encodings, but that support
lacks from your system.

Installation

As usual for GNU packages:

```
$ ./configure --prefix=/usr/local
$ make
$ make install
```

After installing GNU libiconv for the first time, it is recommended to recompile and reinstall GNU gettext, so that it can take advantage of libiconv.

On systems other than GNU/Linux, the iconv program will be internationalized only if GNU gettext has been built and installed before GNU libiconv. This means that the first time GNU libiconv is installed, we have a circular dependency between the GNU libiconv and GNU gettext packages, which can be resolved by building and installing either
- first libiconv, then gettext, then libiconv again,
or (on systems supporting shared libraries, excluding AIX)
- first gettext, then libiconv, then gettext again.
Recall that before building a package for the second time, you need to erase the traces of the first build by running "make distclean".

This library can be built and installed in two variants:

- The library mode. This works on all systems, and uses a library 'libiconv.so' and a header file '<iconv.h>'. (Both are installed

through "make install".)

To use it, simply #include <iconv.h> and use the functions.

To use it in an autoconfiguring package:
- If you don't use automake, append m4/iconv.m4 to your aclocal.m4
  file.
- If you do use automake, add m4/iconv.m4 to your m4 macro repository.
- Add to the link command line of libraries and executables that use
  the functions the placeholder @LIBICONV@ (or, if using libtool for
  the link, @LTLIBICONV@). If you use automake, the right place for
  these additions are the *_LDADD variables.
Note that 'iconv.m4' is also part of the GNU gettext package, which
installs it in /usr/local/share/aclocal/iconv.m4.

- The libc plug/override mode. This works on GNU/Linux, Solaris and
OSF/1
systems only. It is a way to get good iconv support without having
glibc-2.1.
It installs a library 'preloadable_libiconv.so'. This library can be used
with LD_PRELOAD, to override the iconv* functions present in the C library.

On GNU/Linux and Solaris:
    $ export LD_PRELOAD=/usr/local/lib/preloadable_libiconv.so

On OSF/1:
    $ export _RLD_LIST=/usr/local/lib/preloadable_libiconv.so:DEFAULT

A program's source need not be modified, the program need not even be
recompiled. Just set the LD_PRELOAD environment variable, that's it!

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Download
----

http://ftp.gnu.org/gnu/libiconv/libiconv-1.14.tar.gz

Homepage
----

http://www.gnu.org/software/libiconv/

Bug
reports to

<bug-gnu-libiconv@gnu.org>

Bruno Haible <bruno@clisp.org>

1.6 lua 5.1.5

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1.7 libpcap 1.2.1

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1.8 freefont-ttf 20100919

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1.13 lua 5.1.4

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--- end of FTL.TXT ---

1.18 dhcp 4.1-ESV-R9

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1.23 glib 2.48.1

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```

1.26 kmod 23

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(For example, a function in a library to compute square roots has

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Otherwise, if the work is a derivative of the Library, you may
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Any executables
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system utilities (e2fsck, mke2fs, etc.). The EXT2 utilities were
written by Theodore Ts'o <tytso@mit.edu> and Remy Card <card@masi.ibp.fr>.

Sources were obtained from http://sourceforge.net/projects/e2fsprogs

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This package was added to the e2fsprogs debian source package by
Theodore Ts'o <tytso@mit.edu> on Sat Mar 15 15:33:37 EST 2003

It is part of the main e2fsprogs distribution, which can be found at:

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Upstream Author: Theodore Ts'o <tytso@mit.edu>

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#
This is a Makefile stub which handles the creation of BSD shared
libraries.
#
In order to use this stub, the following makefile variables must be defined.
#
BSDLIB_VERSION = 1.0
BSDLIB_IMAGE = libce
BSDLIB_MYDIR = et
BSDLIB_INSTALL_DIR = $(SHLIBDIR)
#

all:: image

real-subdirs:: Makefile
 @echo " MKDIR pic"
 @mkdir -p pic

```
BSD_LIB = $(BSDLIB_IMAGE).so.$(BSDLIB_VERSION)
BSDLIB_PIC_FLAG = -fpic

image:  $(BSD_LIB)

$(BSD_LIB): $(OBJS)
 (cd pic; ld -Bshareable -o $(BSD_LIB) $(LDFLAGS_SHLIB) $(OBJS))
 $(MV) pic/$(BSD_LIB) .
 $(RM) -f ../$(BSD_LIB)
 (cd ..; $(LN) $(LINK_BUILD_FLAGS) \
  `echo $(my_dir) | sed -e 's;lib/;;'`/$(BSD_LIB) $(BSD_LIB))

install-shlibs install:: $(BSD_LIB)
 @echo " INSTALL_PROGRAM $(BSDLIB_INSTALL_DIR)/$(BSD_LIB)"
 @$(INSTALL_PROGRAM) $(BSD_LIB) \
  $(DESTDIR)$(BSDLIB_INSTALL_DIR)/$(BSD_LIB)
 @-$(LDCONFIG)

install-strip: install

install-shlibs-strip: install-shlibs

uninstall-shlibs uninstall::
 $(RM) -f $(DESTDIR)$(BSDLIB_INSTALL_DIR)/$(BSD_LIB)

clean::
 $(RM)
 -rf pic
 $(RM) -f $(BSD_LIB)
 $(RM) -f ../$(BSD_LIB)
```

This is the Debian GNU/Linux prepackaged version of the ss
command-line interface parsing library. It is currently
distributed together with the EXT2 file system utilities, which are
otherwise packaged as "e2fsprogs".

This package was put together by Yann Dirson <dirson@debian.org>,
from sources obtained from a mirror of:
tsx-11.mit.edu:/pub/linux/packages/ext2fs/

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a more recent version that is still in ALPHA testing (i.e., either
using the "WIP" test distributions or one from the hg or git
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    Theodore Ts'o
    23-June-2007

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That's all there is to it!
This is the Debian GNU/Linux prepackaged version of the Common Error
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system utilities, which are otherwise packaged as "e2fsprogs".

This package was put together by Yann Dirson <dirson@debian.org>,
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tsx-11.mit.edu:/pub/linux/packages/ext2fs/

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1.28 apr-util 1.6.1

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1.29 pcre 8.42

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1.32 curl 7.62.0

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==========

libcurl can be built to use a fair amount of various third party libraries,

libraries that are written and provided by other parties that are distributed using their own licenses. Even libcurl itself contains code that may cause problems to some. This document attempts to describe what licenses libcurl and the other libraries use and what possible dilemmas linking and mixing them all can lead to for end users.

I am not a lawyer and this is not legal advice!

One common dilemma is that [GPL](https://www.gnu.org/licenses/gpl.html) licensed code is not allowed to be linked with code licensed under the [Original BSD license](https://spdx.org/licenses/BSD-4-Clause.html) (with the announcement clause). You may still build your own copies that use them all, but distributing them as binaries would be to violate the GPL license - unless you accompany your license with an [exception](https://www.gnu.org/licenses/gpl-faq.html#GPLIncompatibleLibs). This particular problem
was addressed when the [Modified BSD license](https://opensource.org/licenses/BSD-3-Clause) was created, which does not have the announcement clause that collides with GPL.

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Uses an [MIT style license](https://curl.haxx.se/docs/copyright.html) that is very liberal.

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libssh2

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1.33 latencyutils 2.0.3

1.34 python 3.7.3

1.34.1 Available under license :

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==========

Python was created in the early 1990s by Guido van Rossum at Stichting
Mathematisch Centrum (CWI, see http://www.cwi.nl) in the Netherlands
as a successor of a language called ABC. Guido remains Python's
principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for National Research Initiatives (CNRI, see http://www.cnri.reston.va.us) in Reston, Virginia where he released several versions of the software.

In May 2000, Guido and the Python core development team moved to BeOpen.com to form the BeOpen PythonLabs team. In October of the same year, the PythonLabs team moved to Digital Creations, which became Zope Corporation. In 2001, the Python Software Foundation (PSF, see https://www.python.org/psf/) was formed, a non-profit organization created specifically to own Python-related Intellectual Property. Zope Corporation was a sponsoring member of the PSF.

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1.3 thru 1.5.2	1.2	1995-1999	CNRI	yes
1.6	1.5.2	2000	CNRI	no
2.0	1.6	2000	BeOpen.com	no
1.6.1	1.6	2001	CNRI	yes (2)
2.1	2.0+1.6.1	2001	PSF	no
2.0.1	2.0+1.6.1	2001	PSF	yes
2.1.1	2.1+2.0.1	2001	PSF	yes
2.1.2	2.1.1	2002	PSF	yes
2.1.3	2.1.2	2002	PSF	yes
2.2 and above	2.1.1	2001-now	PSF	yes

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==========

Python was created in the early 1990s by Guido van Rossum at Stichting

Mathematisch Centrum (CWI, see https://www.cwi.nl/) in the Netherlands as a successor of a language called ABC. Guido remains Python's principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for National Research Initiatives (CNRI, see https://www.cnri.reston.va.us/) in Reston, Virginia where he released several versions of the software.

In May 2000, Guido and the Python core development team moved to BeOpen.com to form the BeOpen PythonLabs team. In October of the same year, the PythonLabs team moved to Digital Creations (now Zope Corporation; see http://www.zope.com/). In 2001, the Python Software Foundation (PSF, see https://www.python.org/psf/) was formed, a non-profit organization created
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1.6.1	1.6	2001	CNRI	no
2.1	2.0+1.6.1	2001	PSF	no
2.0.1	2.0+1.6.1	2001	PSF	yes
2.1.1	2.1+2.0.1	2001	PSF	yes
2.1.2	2.1.1	2002	PSF	yes
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Mersenne Twister

The :mod:`_random` module includes code based on a download from http://www.math.sci.hiroshima-u.ac.jp/~m-mat/MT/MT2002/emt19937ar.html. The following are the verbatim comments from the
original code::

A C-program for MT19937, with initialization improved 2002/1/26.
Coded by Takuji Nishimura and Makoto Matsumoto.

Before using, initialize the state by using init_genrand(seed)
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Sockets

The :mod:`socket`
 module uses the functions, :func:`getaddrinfo`, and
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Asynchronous socket services

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Modified by Jack Jansen, CWI, July 1995:
- Use binascii module to do the actual line-by-line conversion
between ascii and binary. This results in a 1000-fold speedup. The C
version is still 5 times faster, though.
- Arguments more compliant with Python standard

XML Remote Procedure Calls

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The file :file:`Python/pyhash.c` contains Marek
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Original location:
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Solution inspired by code from:
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  Jean-Philippe Aumasson
(https://131002.net/siphash/siphash24.c)

strtod and dtoa

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cfuhash

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1.35 freerdp 2.0.0-rc4

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```
/*
* FILE: sha2.c
* AUTHOR: Aaron D. Gifford - http://www.aarongifford.com/
*
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*
* Modified by Jelte Jansen to fit in ldns, and not clash with any
* system-defined SHA code.
* Changes:
* - Renamed (external) functions and constants to fit ldns style
* - Removed _End and _Data functions
* - Added ldns_shaX(data, len, digest) convenience functions
* - Removed prototypes of _Transform functions and made those static
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* $Id:
sha2.c,v 1.1 2001/11/08 00:01:51 adg Exp adg $
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1.39 zlib 1.2.8

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/* zlib.h -- interface of the 'zlib' general purpose compression library
version 1.2.11, January 15th, 2017

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1.42 pcre 8.39

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1.43 ethtool 4.6

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1.44 json-c 0.12.1

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General Public License therefore permits such linking only if the entire combination fits its criteria of freedom. The Lesser General Public License permits more lax criteria for linking other code with the library.

We call this license the @dfn{Lesser} General Public License because it does @emph{Less} to protect the user's freedom than the ordinary General Public License. It also provides other free software developers Less of an advantage over competing non-free programs. These disadvantages are the reason we use the ordinary General Public License for many libraries. However, the Lesser license provides advantages in certain special circumstances.

For example, on rare occasions, there may be a special need to encourage the widest possible use of a certain library, so that it becomes a de-facto standard. To achieve this, non-free programs must be allowed to use the library. A more frequent case is that a free library does the
same job as widely used non-free libraries. In this
case, there is little to gain by limiting the free library to free software only, so we use the Lesser General Public License.

In other cases, permission to use a particular library in non-free programs enables a greater number of people to use a large body of free software. For example, permission to use the GNU C Library in non-free programs enables many more people to use the whole GNU operating system, as well as its variant, the GNU/Linux operating system.

Although the Lesser General Public License is Less protective of the users' freedom, it does ensure that the user of a program that is

linked with the Library has the freedom and the wherewithal to run
that program using a modified version of the Library.

The precise terms and conditions for copying, distribution and
modification follow. Pay close attention to the difference between a
``work based on the library'' and a ``work that uses the library''. The
former
contains code derived from the library, whereas the latter must
be combined with the library in order to run.

@subheading TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

@enumerate 0
@item
This License Agreement applies to any software library or other program
which contains a notice placed by the copyright holder or other
authorized party saying it may be distributed under the terms of this
Lesser General Public License (also called ``this License''). Each
licensee is addressed as ``you''.

A ``library'' means a collection of software functions and/or data
prepared so as to be conveniently linked with application programs
(which use some of those functions and data) to form executables.

The ``Library'', below, refers to any such software library or work
which has been distributed under these terms. A ``work based on the
Library'' means either the Library or any derivative work under
copyright law: that is to say, a work containing the Library or a
portion of it,
either verbatim or with modifications and/or translated
straightforwardly into another language. (Hereinafter, translation is
included without limitation in the term ``modification''.)

``Source code'' for a work means the preferred form of the work for
making modifications to it. For a library, complete source code means
all the source code for all modules it contains, plus any associated
interface definition files, plus the scripts used to control compilation
and installation of the library.

Activities other than copying, distribution and modification are not
covered by this License; they are outside its scope. The act of
running a program using the Library is not restricted, and output from
such a program is covered only if its contents constitute a work based
on the Library (independent of the use of the Library in a tool for
writing it). Whether that is true depends on what the Library does
and what the program that uses the Library does.

@item

You may copy and distribute
 verbatim copies of the Library's
complete source code as you receive it, in any medium, provided that
you conspicuously and appropriately publish on each copy an
appropriate copyright notice and disclaimer of warranty; keep intact
all the notices that refer to this License and to the absence of any
warranty; and distribute a copy of this License along with the
Library.

 You may charge a fee for the physical act of transferring a copy,
and you may at your option offer warranty protection in exchange for a
fee.

@item
You may modify your copy or copies of the Library or any portion
of it, thus forming a work based on the Library, and copy and
distribute such modifications or work under the terms of Section 1
above, provided that you also meet all of these conditions:

@enumerate a
@item
The modified work must itself be a software library.

@item
You must cause the files modified to carry prominent notices
stating that you changed the files and the date of any change.

@item
You must
 cause the whole of the work to be licensed at no
charge to all third parties under the terms of this License.

@item
If a facility in the modified Library refers to a function or a
table of data to be supplied by an application program that uses
the facility, other than as an argument passed when the facility
is invoked, then you must make a good faith effort to ensure that,
in the event an application does not supply such function or
table, the facility still operates, and performs whatever part of
its purpose remains meaningful.

(For example, a function in a library to compute square roots has
a purpose that is entirely well-defined independent of the
application. Therefore, Subsection 2d requires that any
application-supplied function or table used by this function must
be optional: if the application does not supply it, the square
root function must still compute square roots.)
@end enumerate

These requirements apply to the modified work as a whole. If identifiable sections
 of that work are not derived from the Library,
and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

In addition, mere aggregation of another work not based on the Library with the Library (or with a work based on the Library) on a volume of a storage or distribution medium does not bring the other work under the scope of this
 License.

@item
You may opt to apply the terms of the ordinary GNU General Public License instead of this License to a given copy of the Library. To do this, you must alter all the notices that refer to this License, so that they refer to the ordinary GNU General Public License, version 2, instead of to this License. (If a newer version than version 2 of the ordinary GNU General Public License has appeared, then you can specify that version instead if you wish.) Do not make any other change in these notices.

 Once this change is made in a given copy, it is irreversible for that copy, so the ordinary GNU General Public License applies to all subsequent copies and derivative works made from that copy.

 This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

@item
You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and
 2 above provided that you accompany
it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a

medium customarily used for software interchange.

If distribution of object code is made by offering access to copy
from a designated place, then offering equivalent access to copy the
source code from the same place satisfies the requirement to
distribute the source code, even though third parties are not
compelled to copy the source along with the object code.

@item
A program that contains no derivative of any portion of the
Library, but is designed to work with the Library by being compiled or
linked with it, is called a ``work that uses the Library''. Such a
work, in isolation, is not a derivative work of the Library, and
therefore falls outside the scope of this License.

However, linking a ``work that uses the Library'' with the Library
creates an executable that is a derivative of the Library (because
it
contains portions of the Library), rather than a ``work that uses the
library''. The executable is therefore covered by this License.
Section 6 states terms for distribution of such executables.

When a ``work that uses the Library'' uses material from a header file
that is part of the Library, the object code for the work may be a
derivative work of the Library even though the source code is not.
Whether this is true is especially significant if the work can be
linked without the Library, or if the work is itself a library. The
threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data
structure layouts and accessors, and small macros and small inline
functions (ten lines or less in length), then the use of the object
file is unrestricted, regardless of whether it is legally a derivative
work. (Executables containing this object code plus portions of the
Library will still fall under Section 6.)

Otherwise,
if the work is a derivative of the Library, you may
distribute the object code for the work under the terms of Section 6.
Any executables containing that work also fall under Section 6,
whether or not they are linked directly with the Library itself.

@item
As an exception to the Sections above, you may also combine or
link a ``work that uses the Library'' with the Library to produce a
work containing portions of the Library, and distribute that work
under terms of your choice, provided that the terms permit
modification of the work for the customer's own use and reverse

engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

@enumerate a
@item
Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable ``work that uses the Library'', as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)

@item
Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2) will operate properly with a modified version of the library, if the user installs one, as long as the modified version is interface-compatible with the version that the work was made with.

@item
Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.

@item
If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

@item
Verify that the user has already received a copy of these

materials or that you have already sent this user a copy.
@end enumerate

For an executable, the required form of the ``work that uses the
Library'' must include any data and utility programs needed for
reproducing the executable from it. However, as a special exception,
the materials to be distributed need not include anything that
is
normally distributed (in either source or binary form) with the major
components (compiler, kernel, and so on) of the operating system on
which the executable runs, unless that component itself accompanies the
executable.

It may happen that this requirement contradicts the license
restrictions of other proprietary libraries that do not normally
accompany the operating system. Such a contradiction means you cannot
use both them and the Library together in an executable that you
distribute.

@item
You may place library facilities that are a work based on the
Library side-by-side in a single library together with other library
facilities not covered by this License, and distribute such a combined
library, provided that the separate distribution of the work based on
the Library and of the other library facilities is otherwise
permitted, and provided that you do these two things:

@enumerate a
@item
Accompany the combined library with a copy of the same work
based on the Library,
uncombined with any other library
facilities. This must be distributed under the terms of the
Sections above.

@item
Give prominent notice with the combined library of the fact
that part of it is a work based on the Library, and explaining
where to find the accompanying uncombined form of the same work.
@end enumerate

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@end enumerate

@subheading END OF TERMS AND CONDITIONS

@page
@subheading How to Apply These Terms to Your New Libraries

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 To apply these terms, attach the following notices to the library. It is safest to attach them to the start of each source
 file to most effectively
convey the exclusion of warranty; and each file should have at least the ``copyright'' line and a pointer to where the full notice is found.

@smallexample
@var{one line to give the library's name and an idea of what it does.}
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Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1301,
USA.
@end
 smallexample

Also add information on how to contact you by electronic and paper mail.

You should also get your employer (if you work as a programmer) or your
school, if any, to sign a ``copyright disclaimer'' for the library, if
necessary. Here is a sample; alter the names:

@smallexample
Yoyodyne, Inc., hereby disclaims all copyright interest in the library
`Frob' (a library for tweaking knobs) written by James Random Hacker.

@var{signature of Ty Coon}, 1 April 1990
Ty Coon, President of Vice
@end smallexample

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Version 2.1, February 1999

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Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public Licenses are intended to guarantee your freedom to share and change free software--to make sure the software is free for all its users.

This license, the Lesser General Public License, applies to some specially designated software packages--typically libraries--of the Free Software Foundation and other authors who decide to use it. You can use it too, but we suggest you first think carefully about whether this license or the ordinary General Public License is the better strategy to use in any particular case, based on the explanations below.

When we speak of free software, we are referring to freedom of use, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish); that you receive source code or can get it if you want it; that you can change the software and use pieces of it in new free programs; and that you are informed that you can do these things.

To protect your rights, we need to make restrictions that forbid distributors to deny you these rights or to ask you to surrender these rights. These restrictions translate to certain responsibilities for you if you distribute copies of the library or if you modify it.

For example, if you distribute copies of the library, whether gratis or for a fee, you must give the recipients all the rights that we gave you. You must make sure that they, too, receive or can get the source code. If you link other code with the library, you must provide complete object files to the recipients, so that they can relink them with the library after making changes to the library and recompiling it. And you must show them these terms so they know their rights.

We protect your rights with a two-step method: (1) we copyright the library, and (2) we offer you this license, which gives you legal permission to copy, distribute and/or modify the library.

To protect each distributor, we want to make it very clear that there is no warranty for the free library. Also, if the library is modified by someone else and passed on, the recipients should know that what they have is not the original version, so that the original author's reputation will not be affected by problems that might be introduced by others.

Finally, software
patents pose a constant threat to the existence of
any free program. We wish to make sure that a company cannot effectively restrict the users of a free program by obtaining a restrictive license from a patent holder. Therefore, we insist that any patent license obtained for a version of the library must be consistent with the full freedom of use specified in this license.

Most GNU software, including some libraries, is covered by the ordinary GNU General Public License. This license, the GNU Lesser General Public License, applies to certain designated libraries, and is quite different from the ordinary General Public License. We use this license for certain libraries in order to permit linking those libraries into non-free programs.

When a program is linked with a library, whether statically or using a shared library, the combination of the two is legally speaking a combined work, a derivative of the original library. The ordinary General Public License therefore permits
such linking only if the
entire combination fits its criteria of freedom. The Lesser General Public License permits more lax criteria for linking other code with the library.

We call this license the "Lesser" General Public License because it does Less to protect the user's freedom than the ordinary General Public License. It also provides other free software developers Less of an advantage over competing non-free programs. These disadvantages are the reason we use the ordinary General Public License for many libraries. However, the Lesser license provides advantages in certain special circumstances.

For example, on rare occasions, there may be a special need to encourage the widest possible use of a certain library, so that it becomes a de-facto standard. To achieve this, non-free programs must be allowed to use the library. A more frequent case is that a free

library does the same job as widely used non-free libraries. In this case, there is little to gain by limiting the free library to free software only, so we use the Lesser General Public License.

In other cases, permission to use a particular library in non-free programs enables a greater number of people to use a large body of free software. For example, permission to use the GNU C Library in non-free programs enables many more people to use the whole GNU operating system, as well as its variant, the GNU/Linux operating system.

Although the Lesser General Public License is Less protective of the users' freedom, it does ensure that the user of a program that is linked with the Library has the freedom and the wherewithal to run that program using a modified version of the Library.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a "work based on the library" and a "work that uses the library". The former contains code derived from the library, whereas the latter must be combined with the library in order to run.

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0. This License Agreement applies to any software library or other program which contains a notice placed by the copyright holder or other authorized party saying it may be distributed under the terms of this Lesser General Public License (also called "this License"). Each licensee is addressed as "you".

A "library" means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

The "Library", below, refers to any such software library or work which has been distributed under these terms. A "work based on the Library" means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term "modification".)

"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means

all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

1. You may copy and distribute verbatim copies of the Library's complete source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and distribute a copy of this License along with the Library.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Library or any portion of it, thus forming a work based on the Library, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

a) The modified work must itself be a software library.

b) You must cause the files modified to carry prominent notices stating that you changed the files and the date of any change.

c) You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.

d) If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has

a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be
reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

In addition, mere aggregation of another work not based on the Library with the Library (or with a work based on the Library) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may opt to apply the terms of the ordinary
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License instead of this License to a given copy of the Library. To do this, you must alter all the notices that refer to this License, so that they refer to the ordinary GNU General Public License, version 2, instead of to this License. (If a newer version than version 2 of the ordinary GNU General Public License has appeared, then you can specify that version instead if you wish.) Do not make any other change in these notices.

Once this change is made in a given copy, it is irreversible for that copy, so the ordinary GNU General Public License applies to all subsequent copies and derivative works made from that copy.

This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany

it with the complete corresponding
machine-readable source code, which
must be distributed under the terms of Sections 1 and 2 above on a
medium customarily used for software interchange.

If distribution of object code is made by offering access to copy
from a designated place, then offering equivalent access to copy the
source code from the same place satisfies the requirement to
distribute the source code, even though third parties are not
compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the
Library, but is designed to work with the Library by being compiled or
linked with it, is called a "work that uses the Library". Such a
work, in isolation, is not a derivative work of the Library, and
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However, linking a "work that uses the Library" with the Library
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structure layouts and accessors, and small macros and small inline
functions (ten lines or less in length), then the use of the object
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/*
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From network_io/unix/inet_ntop.c, network_io/unix/inet_pton.c:

```
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```

From dso/aix/dso.c:

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From strings/apr_strnatcmp.c,
include/apr_strings.h:

strnatcmp.c -- Perform 'natural order' comparisons of strings in C.
Copyright (C) 2000 by Martin Pool <mbp@humbug.org.au>

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From
strings/apr_snprintf.c:

*
* cvt - IEEE floating point formatting routines.
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b) Convey the object code in, or embodied in, a physical product (including a physical distribution medium), accompanied by a written offer, valid for at least three years and valid for as long as you offer spare parts or customer support for that product model, to give anyone who possesses the object code either (1) a copy of the Corresponding Source for all the software in the product that is covered by this License, on a durable physical medium customarily used for software interchange, for a price no more than your reasonable cost of physically performing this conveying of source, or (2) access to copy the Corresponding Source from a network server at no charge.

c) Convey individual copies of the object code with a copy of the written offer to provide the Corresponding Source. This alternative is allowed only occasionally and noncommercially, and only if you received the object code with such an offer, in accord with subsection 6b.

d) Convey the object code by offering access from a designated place (gratis or for a charge), and offer equivalent access to the Corresponding Source in the same way through the same place at no further charge. You need not require recipients to copy the Corresponding Source along with the object code. If the place to copy the object code is a network server, the Corresponding Source may be on a different server (operated by you or a third party) that supports equivalent copying facilities, provided you maintain clear directions next to the object code saying where to find the Corresponding Source. Regardless of what server hosts the Corresponding Source, you remain obligated to ensure that it is available for as long as needed to satisfy these requirements.

e) Convey the object code using peer-to-peer transmission, provided

you inform other peers where the object code and Corresponding Source of the work are being offered to the general public at no charge under subsection 6d.

A separable portion of the object code, whose source code is excluded from the Corresponding Source as a System Library, need not be included in conveying the object code work.

A "User Product" is either (1) a "consumer product", which means any tangible personal property which is normally used for personal, family, or household purposes, or (2) anything designed or sold for incorporation into a dwelling. In determining whether a product is a consumer product, doubtful cases shall be resolved in favor of coverage. For a particular product received by a particular user, "normally used" refers to a typical or common use of that class of product, regardless of the status of the particular user or of the way in which the particular user actually uses, or expects or is expected to use, the product. A product is a consumer product regardless of whether the product has substantial commercial, industrial or non-consumer uses, unless such uses represent the only significant mode of use of the product.

"Installation Information" for a User Product means any methods, procedures, authorization keys, or other information required to install and execute modified versions of a covered work in that User Product from a modified version of its Corresponding Source. The information must suffice to ensure that the continued functioning of the modified object code is in no case prevented or interfered with solely because modification has been made.

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1.58 pcre 8.39-12

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1.59 coreutils 8.30-3

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1.60 lua 5.2.3

1.61 libvmtools 9.4.0.25793

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```

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```
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1.63 swagger-annotations 1.5.22

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import java.lang.annotation.ElementType;
import java.lang.annotation.Retention;
import java.lang.annotation.RetentionPolicy;
import java.lang.annotation.Target;

/**
* License metadata available within the info section of a Swagger definition, see
* https://github.com/OAI/OpenAPI-Specification/blob/master/versions/2.0.md#licenseObject
*
* @since 1.5.0
 */

@Target(ElementType.ANNOTATION_TYPE)
@Retention(RetentionPolicy.RUNTIME)
public @interface License {

   /**
```

```
     * The name of the license.
     *
     * @return the name of the license
     */
    String name();

    /**
     * An optional URL for the license.
     *
     * @return an optional URL for the license.
     */
    String url() default "";
}
```

1.64 opus 1.1.2

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1.65 libvpx 1.4.0

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1.66 e2fsprogs 1.43.1

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Upstream Author: Theodore Ts'o <tytso@mit.edu>

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This is the Debian GNU/Linux prepackaged version of the translation
files of the EXT2 file system utilities. The EXT2 utilities were
written by Theodore Ts'o <tytso@mit.edu> and Remy Card
<card@masi.ibp.fr>.

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*/
Index: tdbsa/tdb.c
===
--- tdbsa.orig/tdb.c
+++ tdbsa/tdb.c
@@ -4,11 +4,11 @@ Rev: 23371
Last Changed Date: 2007-06-06 20:14:06 -0400 (Wed, 06 Jun 2007)
*/
/*

- Unix SMB/CIFS implementation.
+ trivial database library - standalone version

- trivial database library - private includes
-
- Copyright (C) Andrew Tridgell 2005
+ Copyright (C) Andrew Tridgell 1999-2005
+ Copyright (C) Jeremy Allison 2000-2006
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Gadi Oxman, August 1995

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This package was added to the e2fsprogs debian source package by
Theodore Ts'o <tytso@mit.edu> on Sat Mar 15 15:33:37 EST 2003

It is part of the main e2fsprogs distribution, which can be found at:

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#
This is a Makefile stub which handles the creation of BSD shared
libraries.
#
In order to use this stub, the following makefile variables must be defined.
#
BSDLIB_VERSION = 1.0
BSDLIB_IMAGE = libce

```
# BSDLIB_MYDIR = et
# BSDLIB_INSTALL_DIR = $(SHLIBDIR)
#

all:: image

real-subdirs:: Makefile
 @echo " MKDIR pic"
 @mkdir -p pic

BSD_LIB = $(BSDLIB_IMAGE).so.$(BSDLIB_VERSION)
BSDLIB_PIC_FLAG = -fpic

image:  $(BSD_LIB)

$(BSD_LIB): $(OBJS)
 (cd pic; ld -Bshareable -o $(BSD_LIB) $(LDFLAGS_SHLIB) $(OBJS))
 $(MV) pic/$(BSD_LIB) .
 $(RM) -f ../$(BSD_LIB)
 (cd ..; $(LN) $(LINK_BUILD_FLAGS) \
  `echo $(my_dir) | sed -e 's;lib/;;'`/$(BSD_LIB) $(BSD_LIB))

install-shlibs install:: $(BSD_LIB)
 @echo " INSTALL_PROGRAM $(BSDLIB_INSTALL_DIR)/$(BSD_LIB)"
 @$(INSTALL_PROGRAM) $(BSD_LIB) \
  $(DESTDIR)$(BSDLIB_INSTALL_DIR)/$(BSD_LIB)
 @-$(LDCONFIG)

install-strip: install

install-shlibs-strip: install-shlibs

uninstall-shlibs uninstall::
 $(RM) -f $(DESTDIR)$(BSDLIB_INSTALL_DIR)/$(BSD_LIB)

clean::
 $(RM)
 -rf pic
 $(RM) -f $(BSD_LIB)
 $(RM) -f ../$(BSD_LIB)
This is the Debian GNU/Linux prepackaged version of the ss
command-line interface parsing library. It is currently
distributed together with the EXT2 file system utilities, which are
otherwise packaged as "e2fsprogs".

This package was put together by Yann Dirson <dirson@debian.org>,
from sources obtained from a mirror of:
tsx-11.mit.edu:/pub/linux/packages/ext2fs/
```

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This is the Debian GNU/Linux prepackaged version of the Common Error
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system utilities, which are otherwise packaged as "e2fsprogs".

This package was put together by Yann Dirson <dirson@debian.org>,
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1.67 jline 3.11.0

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1.68 cache-api 1.1.1

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John R. Hauser
2017 February 10

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PNG

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This package was debianized by Christopher L Cheney <ccheney@debian.org> on
Fri, 22 Aug 2003 01:33:34 -0500.

The current maintainer is Roland Stigge <stigge@antcom.de>

It was downloaded from http://www.ece.uvic.ca/~mdadams/jasper/

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1.72 cryptsetup 1.7.2

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1.75 nio-multipart-parser 1.1.0

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1.76 busybox 1.30.1

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bzip2/libbzip2 version 1.0.4 of 20 December 2006
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1.78 glibc 2.27

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`Frob' (a library for tweaking knobs) written by James Random Hacker.

@var{signature of Ty Coon}, 1 April 1990
Ty Coon, President of Vice
@end smallexample

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1.82 coreutils 8.30-3ubuntu2

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1.83 libidn 2.2.0-2

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1.96 e2fsprogs 1.44.5-1+deb10u3

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Theodore Ts'o <tytso@mit.edu> on Sat Mar 15 15:33:37 EST 2003

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#
This is a Makefile stub which handles the creation of BSD shared
libraries.
#
In order to use this stub, the following makefile variables must be defined.
#
BSDLIB_VERSION = 1.0
BSDLIB_IMAGE = libce
BSDLIB_MYDIR = et
BSDLIB_INSTALL_DIR = $(SHLIBDIR)
#

all:: image

real-subdirs:: Makefile
 @echo " MKDIR pic"
 @mkdir -p pic

BSD_LIB = $(BSDLIB_IMAGE).so.$(BSDLIB_VERSION)
BSDLIB_PIC_FLAG = -fpic

image: $(BSD_LIB)

$(BSD_LIB): $(OBJS)
 (cd pic; ld -Bshareable -o $(BSD_LIB) $(LDFLAGS_SHLIB) $(OBJS))
 $(MV) pic/$(BSD_LIB) .

```
 $(RM) -f ../$(BSD_LIB)
 (cd ..; $(LN) $(LINK_BUILD_FLAGS) \
  `echo $(my_dir) | sed -e 's;lib/;;'`/$(BSD_LIB) $(BSD_LIB))

install-shlibs install:: $(BSD_LIB)
 @echo " INSTALL_PROGRAM $(BSDLIB_INSTALL_DIR)/$(BSD_LIB)"
 @$(INSTALL_PROGRAM) $(BSD_LIB) \
  $(DESTDIR)$(BSDLIB_INSTALL_DIR)/$(BSD_LIB)
 @-$(LDCONFIG)

install-strip: install

install-shlibs-strip: install-shlibs

uninstall-shlibs uninstall::
 $(RM) -f $(DESTDIR)$(BSDLIB_INSTALL_DIR)/$(BSD_LIB)

clean::
 $(RM)
 -rf pic
 $(RM) -f $(BSD_LIB)
 $(RM) -f ../$(BSD_LIB)
```

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1.97 acpid 2.0.11

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1.100 slf4j-log4j 1.7.30

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1.102 ipmi-tool 1.8.16

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1.103 lsof 4.89

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1.105 libusrsctp 1.0

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1.106 iproute 3.14.0

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1.107 lsof 4.85

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1.108 lm-sensors 3.3.1

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1.110 fontconfig 2.6.0

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1.111 gvfs 1.28.2-1ubuntu1~16.04.2

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1.113 open-vm-tools 9.4.0

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4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data

structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also combine or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

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b) Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2) will operate properly with a modified version of the library, if the user installs one, as long as the modified version is interface-compatible with the version that the work was made with.

c) Accompany the work with a written offer, valid for at
least three years, to give the same user the materials
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d) If distribution of the work is made by offering access to copy
from a designated place, offer equivalent access to copy the above
specified materials from the same place.

e) Verify that the user has already received a copy of these
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For an executable, the required form of the "work that uses the
Library" must include any data and utility
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the materials to be distributed need not include anything that is
normally distributed (in either source or binary form) with the major
components (compiler, kernel, and so on) of the operating system on
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1.116 tftp-hpa 5.2

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1.117 tzdata 2016h

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1.118 slf4j 1.7.30

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1.119 libcap-ng 0.7.9-2.1build1

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4. You may copy and distribute the Library (or a portion or
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If distribution of object code is made by offering access to copy
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b) Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2)

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1.121 zlib 1.2.11.dfsg-2ubuntu1

1.121.1 Available under license :

/* zlib.h -- interface of the 'zlib' general purpose compression library
version 1.2.11, January 15th, 2017

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Jean-loup Gailly Mark Adler
jloup@gzip.org madler@alumni.caltech.edu

The data format used by the zlib library is described by RFCs (Request for
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*/

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1.122 e2fsprogs 1.45.5-2ubuntu1

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Theodore Ts'o <tytso@mit.edu> on Sat Mar 15 15:33:37 EST 2003

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```
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Public License can be found in `/usr/share/common-licenses/GPL-2'.
#
# This is a Makefile stub which handles the creation of BSD shared
# libraries.
#
# In order to use this stub, the following makefile variables must be defined.
#
# BSDLIB_VERSION = 1.0
# BSDLIB_IMAGE = libce
# BSDLIB_MYDIR = et
# BSDLIB_INSTALL_DIR = $(SHLIBDIR)
#

all:: image

real-subdirs:: Makefile
 @echo " MKDIR pic"
 @mkdir -p pic

BSD_LIB = $(BSDLIB_IMAGE).so.$(BSDLIB_VERSION)
BSDLIB_PIC_FLAG = -fpic

image:  $(BSD_LIB)

$(BSD_LIB): $(OBJS)
 (cd pic; ld -Bshareable -o $(BSD_LIB) $(LDFLAGS_SHLIB) $(OBJS))
 $(MV) pic/$(BSD_LIB) .
 $(RM) -f ../$(BSD_LIB)
 (cd ..; $(LN) $(LINK_BUILD_FLAGS) \
  `echo $(my_dir) | sed -e 's;lib/;;'`/$(BSD_LIB) $(BSD_LIB))

install-shlibs install:: $(BSD_LIB)
 @echo " INSTALL_PROGRAM $(BSDLIB_INSTALL_DIR)/$(BSD_LIB)"
 @$(INSTALL_PROGRAM) $(BSD_LIB) \
  $(DESTDIR)$(BSDLIB_INSTALL_DIR)/$(BSD_LIB)
 @-$(LDCONFIG)

install-strip: install

install-shlibs-strip:: install-shlibs

uninstall-shlibs uninstall::
 $(RM) -f $(DESTDIR)$(BSDLIB_INSTALL_DIR)/$(BSD_LIB)

clean::
 $(RM)
```

-rf pic
$(RM) -f $(BSD_LIB)
$(RM) -f ../$(BSD_LIB)
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files of the EXT2 file system utilities. The EXT2 utilities were
written by Theodore Ts'o <tytso@mit.edu> and Remy Card
<card@masi.ibp.fr>.

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Index: tdbsa/tdb.c
==========

--- tdbsa.orig/tdb.c
+++ tdbsa/tdb.c
@@ -4,11 +4,11 @@ Rev: 23371
Last Changed Date: 2007-06-06 20:14:06 -0400 (Wed, 06 Jun 2007)
*/
 /*
-   Unix SMB/CIFS implementation.
+   trivial database library - standalone version

-   trivial database library - private includes
-
-   Copyright (C) Andrew Tridgell   2005
+   Copyright (C) Andrew Tridgell   1999-2005
+   Copyright (C) Jeremy Allison   2000-2006
+   Copyright (C) Paul `Rusty' Russell   2000

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    ** library. This does NOT imply that all of Samba is released
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Gadi Oxman, August 1995

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This package was added to the e2fsprogs debian source package by
Theodore Ts'o <tytso@mit.edu> on Sat Mar 15 15:33:37 EST 2003

It is part of the main e2fsprogs distribution, which can be found at:

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1.123 gzip 1.10-0ubuntu4

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1.125 keyutils 1.6-6ubuntu1

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AES in libhcrypto

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rijndael-alg-fst.c

@version 3.0 (December 2000)

Optimised ANSI C code for the Rijndael cipher (now AES)

@author Vincent Rijmen <vincent.rijmen@esat.kuleuven.ac.be>
@author Antoon Bosselaers <antoon.bosselaers@esat.kuleuven.ac.be>
@author Paulo Barreto <paulo.barreto@terra.com.br>

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DES core in libhcrypto

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1.130 stunnel 5.56

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1.131 icu 65

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Commands to generate dependency files
GEN_DEPS.c= $(CC) -E -MM $(DEFS) $(CPPFLAGS)
GEN_DEPS.cc= $(CXX) -E -MM $(DEFS) $(CPPFLAGS)

Flags for position independent code
SHAREDLIBCFLAGS = -fPIC
SHAREDLIBCXXFLAGS = -fPIC
SHAREDLIBCPPFLAGS = -DPIC

```
## Additional flags when building libraries and with threads
THREADSCPPFLAGS = -D_REENTRANT
LIBCPPFLAGS =

## Compiler switch to embed a runtime search path
LD_RPATH=
LD_RPATH_PRE= -Wl,-rpath,

## Compiler switch to embed a library name
LD_SONAME = -Wl,-soname -Wl,$(notdir $(MIDDLE_SO_TARGET))

## Shared library options
LD_SOOPTIONS= -Wl,-Bsymbolic

## Shared object suffix
SO = so
## Non-shared intermediate object suffix
STATIC_O = ao

## Compilation
 rules
%.$(STATIC_O): $(srcdir)/%.c
 $(COMPILE.c) $(STATICCPPFLAGS) $(STATICCFLAGS) -o $@ $<
%.o: $(srcdir)/%.c
 $(COMPILE.c) $(DYNAMICCPPFLAGS) $(DYNAMICCFLAGS) -o $@ $<

%.$(STATIC_O): $(srcdir)/%.cpp
 $(COMPILE.cc) $(STATICCPPFLAGS) $(STATICCXXFLAGS) -o $@ $<
%.o: $(srcdir)/%.cpp
 $(COMPILE.cc) $(DYNAMICCPPFLAGS) $(DYNAMICCXXFLAGS) -o $@ $<


## Dependency rules
%.d: $(srcdir)/%.c
 @echo "generating dependency information for $<"
 @$(SHELL) -ec '$(GEN_DEPS.c) $< \
  | sed '\"s/\($*\)\.o[ :]*/\1.o $@ : /g'\" > $@; \
  [ -s $@ ] || rm -f $@'

%.d: $(srcdir)/%.cpp
 @echo "generating dependency information for $<"
 @$(SHELL) -ec '$(GEN_DEPS.cc) $< \
  | sed '\"s/\($*\)\.o[ :]*/\1.o $@ : /g'\" > $@; \
  [ -s $@ ] || rm -f $@'

## Versioned libraries rules
```

```
%.$(SO).$(SO_TARGET_VERSION_MAJOR): %.$(SO).$(SO_TARGET_VERSION)
 $(RM) $@ && ln -s ${<F} $@
%.$(SO): %.$(SO).$(SO_TARGET_VERSION_MAJOR)
 $(RM) $@ && ln -s ${*F}.$(SO).$(SO_TARGET_VERSION) $@

##  Bind internal references

# LDflags that pkgdata will use
BIR_LDFLAGS= -Wl,-Bsymbolic

# Dependencies [i.e. map files] for the final library
BIR_DEPS=

## Remove shared library 's'
STATIC_PREFIX_WHEN_USED =
STATIC_PREFIX =

## End BSD-specific setup
```

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 /dom4j-2-1-3-sources-jar/org/dom4j/rule/Pattern.java
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* /dom4j-2-1-3-sources-jar/org/dom4j/tree/NamespaceStack.java
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* /dom4j-2-1-3-sources-jar/org/dom4j/dom/DOMEntityReference.java
* /dom4j-2-1-3-sources-jar/org/dom4j/tree/FlyweightAttribute.java
* /dom4j-2-1-3-sources-jar/org/dom4j/DocumentFactory.java
* /dom4j-2-1-3-sources-jar/org/dom4j/tree/DefaultDocument.java
* /dom4j-2-1-3-sources-jar/org/dom4j/io/DocumentResult.java
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* /dom4j-2-1-3-sources-jar/org/dom4j/util/NodeComparator.java
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* /dom4j-2-1-3-sources-jar/org/dom4j/tree/DefaultDocumentType.java
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* /dom4j-2-1-3-sources-jar/org/dom4j/io/XPPReader.java
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* /dom4j-2-1-3-sources-jar/org/dom4j/datatype/NamedTypeResolver.java
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* /dom4j-2-1-3-sources-jar/org/dom4j/dom/DOMAttribute.java
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* /dom4j-2-1-3-sources-jar/org/dom4j/tree/DefaultText.java
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1.135 glibc 2.31-0ubuntu9

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This code is derived from section 17.1 of Applied Cryptography,

second edition, which describes a stream cipher allegedly
compatible with RSA Labs "RC4" cipher (the actual description of
which is a trade secret). The same algorithm is used as a stream
cipher called "arcfour" in Tatu Ylonen's
ssh package.

Here the stream cipher has been modified always to include the time
when initializing the state. That makes it impossible to
regenerate the same random sequence twice, so this can't be used
for encryption, but will generate good random numbers.

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This code implements the MD5 message-digest algorithm.
The algorithm is due to Ron Rivest. This code was
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Equivalent code is available from RSA Data Security, Inc.
This code has been tested against that, and is equivalent,
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with every copy.

To compute the message digest of a chunk of bytes, declare an
MD5Context structure, pass it to MD5Init, call MD5Update as
needed on buffers full of bytes, and then call MD5Final, which

will fill a supplied 16-byte array with the digest.

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* /jandex-2-1-3-final-sources-jar/org/jboss/jandex/EmptyTypeTarget.java
* /jandex-2-1-3-final-sources-jar/org/jboss/jandex/PositionBasedTypeTarget.java
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* /jandex-2-1-3-final-sources-jar/org/jboss/jandex/IndexReaderV2.java

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1.145 docker 19.03.5-r1

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1.148 nghttp2 1.40.0-1build1

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set terminal pngcairo font 'Sans, 8' lw 1 size 1400,1024
set xtics rotate by -45
set style histogram errorbars gap 2 lw 1
set style fill solid border -1
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1.149 tomcat 9.0.37

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- javaee_6.xsd
- javaee_web_services_1_3.xsd
- javaee_web_services_client_1_3.xsd
- jsp_2_2.xsd
- web-app_3_0.xsd
- web-common_3_0.xsd
- web-fragment_3_0.xsd
- javaee_7.xsd
- javaee_web_services_1_4.xsd
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- web-app_3_0.xsd
- web-common_3_0.xsd
- web-fragment_3_0.xsd

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Schemas for Java EE Deployment Descriptors:
- javaee_5.xsd
- javaee_web_services_1_2.xsd
- javaee_web_services_client_1_2.xsd
- javaee_6.xsd
- javaee_web_services_1_3.xsd
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- jsp_2_2.xsd
- web-app_3_0.xsd
- web-common_3_0.xsd
- web-fragment_3_0.xsd
- javaee_7.xsd
- javaee_web_services_1_4.xsd
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- jsp_2_3.xsd
- web-app_3_1.xsd
- web-common_3_1.xsd
- web-fragment_3_1.xsd
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The original XML Schemas for Java EE Deployment Descriptors:
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- javaee_web_services_1_3.xsd
- javaee_web_services_client_1_3.xsd
- jsp_2_2.xsd
- web-app_3_0.xsd
- web-common_3_0.xsd
- web-fragment_3_0.xsd
- javaee_7.xsd
- javaee_web_services_1_4.xsd
- javaee_web_services_client_1_4.xsd
- jsp_2_3.xsd
- web-app_3_1.xsd
- web-common_3_1.xsd
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may be obtained from:
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* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketServerProtocolConfig.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketServerHandshaker07.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketCloseStatus.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/CloseWebSocketFrame.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/extensions/WebSocketExtensionFilter.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketClientProtocolConfig.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocket00FrameDecoder.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketServerHandshakerFactory.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketServerHandshaker13.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketServerProtocolHandshakeHandler.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/CorruptedWebSocketFrameException.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketServerHandshaker00.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketServerProtocolHandler.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/extensions/WebSocketExtensionFilterProvider.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketServerHandshaker.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketDecoderConfig.java
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* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/cookie/ServerCookieEncoder.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/cookie/CookieDecoder.java
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 /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/cookie/CookieEncoder.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/cookie/Cookie.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/cookie/CookieHeaderNames.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/CombinedHttpHeaders.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/cookie/ClientCookieDecoder.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/HttpExpectationFailedEvent.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/rtsp/RtspEncoder.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/cookie/ServerCookieDecoder.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/HttpScheme.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/cookie/package-info.java
*
 /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/CookieUtil.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/EmptyHttpHeaders.java
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* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/cookie/ClientCookieEncoder.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/cookie/CookieUtil.java
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jar/io/netty/handler/codec/http/websocketx/WebSocket08FrameEncoder.java
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* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/DefaultSpdySettingsFrame.java
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* /netty-codec-http-4-1-51-final-sources-
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* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/multipart/CaseIgnoringComparator.java
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* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/PongWebSocketFrame.java
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* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/QueryStringDecoder.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/DefaultHttpMessage.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/PingWebSocketFrame.java
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* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketClientHandshaker13.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/rtsp/RtspObjectEncoder.java
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 /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/WebSocketFrame.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/HttpHeaderDateFormat.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/CookieDecoder.java
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* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/extensions/WebSocketExtensionEncoder.java
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* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/ServerCookieEncoder.java

* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/HttpChunkedInput.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/HttpStatusClass.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/HttpHeadersEncoder.java
* /netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/compression/PerFrameDeflateDecoder.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyHeaderBlockZlibDecoder.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyFrameDecoderDelegate.java
* /netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/WebSocketClientExtension.java
*
/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/HttpHeaderValues.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/HttpHeaderNames.java
* /netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/WebSocketServerExtensionHandshaker.java
* /netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/WebSocketServerExtension.java
* /netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/compression/DeflateEncoder.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyHeaderBlockRawDecoder.java
* /netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/compression/PerMessageDeflateClientExtensionHandshaker.j
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* /netty-codec-http-4-1-51-final-sources-
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jar/io/netty/handler/codec/http/websocketx/extensions/compression/WebSocketServerCompressionHandler.java
* /netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/compression/PerMessageDeflateServerExtensionHandshaker.
java
* /netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/WebSocketExtension.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyProtocolException.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/rtsp/RtspHeaderNames.java
* /netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/compression/package-info.java
* /netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/compression/DeflateFrameServerExtensionHandshaker.java
* /netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/WebSocketServerExtensionHandler.java
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/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyFrameEncoder.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/websocketx/Utf8FrameValidator.java
* /netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/compression/PerFrameDeflateEncoder.java
* /netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/compression/DeflateFrameClientExtensionHandshaker.java
* /netty-codec-http-4-1-51-final-sources-

jar/io/netty/handler/codec/http/websocketx/extensions/WebSocketExtensionDecoder.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/rtsp/RtspHeaderValues.java
* /netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/compression/WebSocketClientCompressionHandler.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyFrameDecoder.java
*
/netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/HttpMessageUtil.java
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jar/io/netty/handler/codec/http/websocketx/extensions/WebSocketExtensionData.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/ClientCookieEncoder.java
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* /netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/WebSocketClientExtensionHandler.java
* /netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/WebSocketExtensionUtil.java
* /netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/extensions/compression/PerMessageDeflateDecoder.java
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jar/io/netty/handler/codec/http/websocketx/WebSocket13FrameDecoder.java
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jar/io/netty/handler/codec/http/websocketx/WebSocket07FrameDecoder.java
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* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdySessionStatus.java
*
 /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/DefaultSpdyWindowUpdateFrame.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyDataFrame.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdySynReplyFrame.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyStreamFrame.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyRstStreamFrame.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/FullHttpResponse.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdySynStreamFrame.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyPingFrame.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/FullHttpMessage.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/DefaultSpdyDataFrame.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyVersion.java
*
 /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/DefaultFullHttpResponse.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdySettingsFrame.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyGoAwayFrame.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/cors/package-info.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyHeaderBlockRawEncoder.java

* /netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/WebSocketClientProtocolHandler.java
* /netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/WebSocketFrameAggregator.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyHttpDecoder.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyHttpCodec.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyHeaders.java
*
 /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/DefaultFullHttpRequest.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/DefaultSpdyStreamFrame.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/DefaultSpdyPingFrame.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/DefaultSpdySynStreamFrame.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/DefaultSpdySynReplyFrame.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/DefaultSpdyRstStreamFrame.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyFrame.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/ComposedLastHttpContent.java
* /netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/WebSocketClientProtocolHandshakeHandler.java
*
 /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/DefaultSpdyGoAwayFrame.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdySessionHandler.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/DefaultSpdyHeaders.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/http/FullHttpRequest.java
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* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyCodecUtil.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyHeaderBlockEncoder.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/DefaultSpdyHeadersFrame.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyHeaderBlockZlibEncoder.java
* /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyHeaderBlockJZlibEncoder.java
*
 /netty-codec-http-4-1-51-final-sources-jar/io/netty/handler/codec/spdy/SpdyStreamStatus.java
* /netty-codec-http-4-1-51-final-sources-
jar/io/netty/handler/codec/http/websocketx/WebSocketProtocolHandler.java
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1.151 netty-handler 4.1.51.Final

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* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ReferenceCountedOpenSslClientContext.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ReferenceCountedOpenSslEngine.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/PemEncoded.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/PemValue.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/util/X509TrustManagerWrapper.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/flush/package-info.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/Java8SslUtils.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslCertificateException.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ReferenceCountedOpenSslContext.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/flush/FlushConsolidationHandler.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/DelegatingSslContext.java
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/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslKeyMaterialManager.java
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* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/package-info.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/timeout/IdleStateHandler.java
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/netty-handler-4-1-51-final-sources-jar/io/netty/handler/logging/LoggingHandler.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/NotSslRecordException.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SslHandler.java
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* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/stream/ChunkedInput.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/timeout/ReadTimeoutException.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/timeout/TimeoutException.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/timeout/IdleStateEvent.java
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/netty-handler-4-1-51-final-sources-jar/io/netty/handler/timeout/WriteTimeoutException.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/stream/package-info.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/timeout/IdleState.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/timeout/WriteTimeoutHandler.java
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* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/logging/package-info.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/timeout/ReadTimeoutHandler.java
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* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ExtendedOpenSslSession.java
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 /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/DefaultOpenSslKeyMaterial.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslCachingKeyMaterialProvider.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslX509KeyManagerFactory.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslX509TrustManagerWrapper.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslPrivateKey.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslKeyMaterial.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslCachingX509KeyManagerFactory.java
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* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkBaseApplicationProtocolNegotiator.java
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 /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SniHandler.java
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* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/Java7SslParametersUtils.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslSessionStats.java

* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkApplicationProtocolNegotiator.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslServerContext.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SupportedCipherSuiteFilter.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ipfilter/package-info.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JettyNpnSslEngine.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslEngineMap.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslContext.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/util/SimpleTrustManagerFactory.java
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 /netty-handler-4-1-51-final-sources-jar/io/netty/handler/traffic/GlobalChannelTrafficCounter.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/util/BouncyCastleSelfSignedCertGenerator.java
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* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/CipherSuiteConverter.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslSessionContext.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/CipherSuiteFilter.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslEngine.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SslContext.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslDefaultApplicationProtocolNegotiator.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ApplicationProtocolNegotiator.java
*
 /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkSslEngine.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ipfilter/RuleBasedIpFilter.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkAlpnApplicationProtocolNegotiator.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkSslServerContext.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkDefaultApplicationProtocolNegotiator.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SslProvider.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/IdentityCipherSuiteFilter.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/util/OpenJdkSelfSignedCertGenerator.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkSslContext.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/util/ThreadLocalInsecureRandom.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ApplicationProtocolConfig.java
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 /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ipfilter/UniqueIpFilter.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslApplicationProtocolNegotiator.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslServerSessionContext.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkNpnApplicationProtocolNegotiator.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ApplicationProtocolUtil.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ipfilter/IpSubnetFilterRule.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ipfilter/IpFilterRule.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslNpnApplicationProtocolNegotiator.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SslUtils.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ipfilter/IpFilterRuleType.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ipfilter/AbstractRemoteAddressFilter.java
*
 /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkSslClientContext.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/util/FingerprintTrustManagerFactory.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSsl.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JettyAlpnSslEngine.java

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* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/traffic/ChannelTrafficShapingHandler.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/traffic/TrafficCounter.java
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* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/util/SimpleKeyManagerFactory.java
*
 /netty-handler-4-1-51-final-sources-jar/io/netty/handler/address/DynamicAddressConnectHandler.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/KeyManagerFactoryWrapper.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslPrivateKeyMethod.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/address/package-info.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/PseudoRandomFunction.java
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* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SslCompletionEvent.java
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/netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SslCloseCompletionEvent.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/Conscrypt.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SniCompletionEvent.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OptionalSslHandler.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkAlpnSslUtils.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/JdkAlpnSslEngine.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SslClientHelloHandler.java

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* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslSessionTicketKey.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ApplicationProtocolNames.java
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 /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/OpenSslJavaxX509Certificate.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/SslContextBuilder.java
* /netty-handler-4-1-51-final-sources-jar/io/netty/handler/ssl/ClientAuth.java
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1.152 netty-resolver 4.1.51.Final

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* /netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/AbstractAddressResolver.java
* /netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/HostsFileEntriesResolver.java
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* /netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/NoopAddressResolver.java
* /netty-resolver-4-1-51-final-sources-jar/io/netty/resolver/NameResolver.java
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1.153 netty-transport 4.1.51.Final

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* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/WriteBufferWaterMark.java
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 /netty-transport-4-1-51-final-sources-jar/io/netty/channel/DefaultSelectStrategyFactory.java
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* /netty-transport-4-1-51-final-sources-jar/io/netty/bootstrap/ServerBootstrapConfig.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/bootstrap/AbstractBootstrapConfig.java
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* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/MultithreadEventLoopGroup.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelInboundHandlerAdapter.java
*
 /netty-transport-4-1-51-final-sources-jar/io/netty/channel/local/LocalAddress.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelConfig.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/DefaultSocketChannelConfig.java

* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/nio/AbstractNioMessageChannel.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/oio/package-info.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelDuplexHandler.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/DefaultServerSocketChannelConfig.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/nio/NioDatagramChannelConfig.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/DatagramPacket.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/DefaultEventLoopGroup.java
*
 /netty-transport-4-1-51-final-sources-jar/io/netty/channel/Channel.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/oio/AbstractOioChannel.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/bootstrap/AbstractBootstrap.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/SingleThreadEventLoop.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/EventLoopGroup.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/nio/NioEventLoop.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelFuture.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/local/LocalChannelRegistry.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/nio/package-info.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/AdaptiveRecvByteBufAllocator.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/oio/package-info.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/RecvByteBufAllocator.java
*
 /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelFlushPromiseNotifier.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelPromiseAggregator.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/DatagramChannel.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/oio/OioServerSocketChannel.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelPromiseNotifier.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/oio/AbstractOioByteChannel.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/oio/OioSocketChannel.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/local/package-info.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelPipelineException.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/local/LocalChannel.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/InternetProtocolFamily.java
*
 /netty-transport-4-1-51-final-sources-jar/io/netty/channel/local/LocalServerChannel.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/VoidChannelPromise.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/AbstractChannel.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/bootstrap/ServerBootstrap.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/FailedChannelFuture.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/embedded/EmbeddedEventLoop.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/AbstractServerChannel.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelOutboundHandler.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelException.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/nio/NioDatagramChannel.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/DefaultChannelPipeline.java
*
 /netty-transport-4-1-51-final-sources-jar/io/netty/channel/package-info.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/AbstractChannelHandlerContext.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/CompleteChannelFuture.java

* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ThreadPerChannelEventLoopGroup.java
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* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelInboundHandler.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/SocketChannelConfig.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelOption.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/nio/package-info.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/nio/NioServerSocketChannel.java
*
 /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ServerChannel.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelMetadata.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/ServerSocketChannel.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/CombinedChannelDuplexHandler.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/nio/NioSocketChannel.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelPipeline.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/nio/ProtocolFamilyConverter.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/nio/AbstractNioChannel.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/group/CombinedIterator.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/oio/OioEventLoopGroup.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/nio/AbstractNioByteChannel.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/ChannelInputShutdownEvent.java
*
 /netty-transport-4-1-51-final-sources-jar/io/netty/channel/nio/NioTask.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/group/DefaultChannelGroupFuture.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelHandlerContext.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelInitializer.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/EventLoopException.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/group/package-info.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/embedded/EmbeddedSocketAddress.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/DefaultEventLoop.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/FixedRecvByteBufAllocator.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/package-info.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/SocketChannel.java
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* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/embedded/EmbeddedChannel.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/oio/OioDatagramChannel.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/FileRegion.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/DefaultFileRegion.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/nio/NioEventLoopGroup.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/group/ChannelGroupFutureListener.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/EventLoop.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/group/ChannelGroupFuture.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/SucceededChannelFuture.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelFutureListener.java
*
 /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelPromise.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelOutboundHandlerAdapter.java

* /netty-transport-4-1-51-final-sources-jar/io/netty/bootstrap/package-info.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/DefaultChannelConfig.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/DefaultChannelPromise.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/ServerSocketChannelConfig.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/local/LocalEventLoopGroup.java
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/**
```

```
* Handles an I/O event or intercepts an I/O operation, and forwards it to its next handler in
* its {@link ChannelPipeline}.
*
* <h3>Sub-types</h3>
* <p>
* {@link ChannelHandler} itself does not provide many methods, but you usually have to implement one of its
subtypes:
* <ul>
* <li>{@link
 ChannelInboundHandler} to handle inbound I/O events, and</li>
* <li>{@link ChannelOutboundHandler} to handle outbound I/O operations.</li>
* </ul>
* </p>
* <p>
* Alternatively, the following adapter classes are provided for your convenience:
* <ul>
* <li>{@link ChannelInboundHandlerAdapter} to handle inbound I/O events,</li>
* <li>{@link ChannelOutboundHandlerAdapter} to handle outbound I/O operations, and</li>
* <li>{@link ChannelDuplexHandler} to handle both inbound and outbound events</li>
* </ul>
* </p>
* <p>
* For more information, please refer to the documentation of each subtype.
* </p>
*
* <h3>The context object</h3>
* <p>
* A {@link ChannelHandler} is provided with a {@link ChannelHandlerContext}
* object.  A {@link ChannelHandler} is supposed to interact with the
* {@link ChannelPipeline} it belongs to via a context object.  Using the
* context object, the {@link ChannelHandler} can pass events upstream or
* downstream, modify the pipeline dynamically,
 or store the information
* (using {@link AttributeKey}s) which is specific to the handler.
*
* <h3>State management</h3>
*
* A {@link ChannelHandler} often needs to store some stateful information.
* The simplest and recommended approach is to use member variables:
* <pre>
* public interface Message {
*     // your methods here
* }
*
* public class DataServerHandler extends {@link SimpleChannelInboundHandler}&lt;Message&gt; {
*
*     <b>private boolean loggedIn;</b>
*
```

```
*     {@code @Override}
*     public void channelRead0({@link ChannelHandlerContext} ctx, Message message) {
*         if (message instanceof LoginMessage) {
*             authenticate((LoginMessage) message);
*             <b>loggedIn = true;</b>
*         } else (message instanceof GetDataMessage) {
*             if (<b>loggedIn</b>) {
*                 ctx.writeAndFlush(fetchSecret((GetDataMessage) message));
*             } else {
*                 fail();
*             }
*         }
 *     }
*     ...
* }
* </pre>
* Because the handler instance has a state variable which is dedicated to
* one connection, you have to create a new handler instance for each new
* channel to avoid a race condition where a unauthenticated client can get
* the confidential information:
* <pre>
* // Create a new handler instance per channel.
* // See {@link ChannelInitializer#initChannel(Channel)}.
* public class DataServerInitializer extends {@link ChannelInitializer}&lt;{@link Channel}&gt; {
*     {@code @Override}
*     public void initChannel({@link Channel} channel) {
*         channel.pipeline().addLast("handler", <b>new DataServerHandler()</b>);
*     }
* }
*
* </pre>
*
* <h4>Using {@link AttributeKey}s</h4>
*
* Although it's recommended to use member variables to store the state of a
* handler, for some reason you might not want to create many handler instances.
* In such a case, you can use {@link AttributeKey}s which is provided by
* {@link ChannelHandlerContext}:
 * <pre>
* public interface Message {
*     // your methods here
* }
*
* {@code @Sharable}
* public class DataServerHandler extends {@link SimpleChannelInboundHandler}&lt;Message&gt; {
*     private final {@link AttributeKey}&lt;{@link Boolean}&gt; auth =
*           {@link AttributeKey#valueOf(String) AttributeKey.valueOf("auth")};
*
```

```
*     {@code @Override}
*     public void channelRead({@link ChannelHandlerContext} ctx, Message message) {
*         {@link Attribute}&lt;{@link Boolean}&gt; attr = ctx.attr(auth);
*         if (message instanceof LoginMessage) {
*             authenticate((LoginMessage) o);
*             <b>attr.set(true)</b>;
*         } else (message instanceof GetDataMessage) {
*             if (<b>Boolean.TRUE.equals(attr.get())</b>) {
*                 ctx.writeAndFlush(fetchSecret((GetDataMessage) o));
*             } else {
*                 fail();
*             }
*         }
*     }
*     ...
* }
* </pre>
* Now that the state
 of the handler is attached to the {@link ChannelHandlerContext}, you can add the
* same handler instance to different pipelines:
* <pre>
* public class DataServerInitializer extends {@link ChannelInitializer}&lt;{@link Channel}&gt; {
*
*     private static final DataServerHandler <b>SHARED</b> = new DataServerHandler();
*
*     {@code @Override}
*     public void initChannel({@link Channel} channel) {
*         channel.pipeline().addLast("handler", <b>SHARED</b>);
*     }
* }
* </pre>
*
*
* <h4>The {@code @Sharable} annotation</h4>
* <p>
* In the example above which used an {@link AttributeKey},
* you might have noticed the {@code @Sharable} annotation.
* <p>
* If a {@link ChannelHandler} is annotated with the {@code @Sharable}
* annotation, it means you can create an instance of the handler just once and
* add it to one or more {@link ChannelPipeline}s multiple times without
* a race condition.
* <p>
* If this annotation is not specified, you have to create
 a new handler
* instance every time you add it to a pipeline because it has unshared state
* such as member variables.
* <p>
```

```
* This annotation is provided for documentation purpose, just like
* <a href="http://www.javaconcurrencyinpractice.com/annotations/doc/">the JCIP annotations</a>.
*
* <h3>Additional resources worth reading</h3>
* <p>
* Please refer to the {@link ChannelHandler}, and
* {@link ChannelPipeline} to find out more about inbound and outbound operations,
* what fundamental differences they have, how they flow in a  pipeline,  and how to handle
* the operation in your application.
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```

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* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/AbstractEventLoop.java
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* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/pool/AbstractChannelPoolHandler.java
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* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelHandlerAdapter.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/group/DefaultChannelGroup.java
*
 /netty-transport-4-1-51-final-sources-jar/io/netty/channel/DefaultAddressedEnvelope.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelProgressivePromise.java

* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/group/ChannelGroupException.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelOutboundBuffer.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelId.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/MessageSizeEstimator.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/AbstractEventLoopGroup.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/group/ChannelGroup.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/DefaultChannelId.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/group/ChannelMatcher.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/oio/DefaultOioSocketChannelConfig.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/group/ChannelMatchers.java
*
/netty-transport-4-1-51-final-sources-jar/io/netty/channel/ConnectTimeoutException.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/bootstrap/ChannelFactory.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/oio/OioServerSocketChannelConfig.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/AddressedEnvelope.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelProgressiveFutureListener.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/oio/OioSocketChannelConfig.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/ChannelProgressiveFuture.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/SimpleChannelInboundHandler.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/DefaultChannelProgressivePromise.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/oio/DefaultOioServerSocketChannelConfig.java
*
/netty-transport-4-1-51-final-sources-jar/io/netty/channel/nio/SelectedSelectionKeySet.java
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* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/oio/DefaultOioDatagramChannelConfig.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/DelegatingChannelPromiseNotifier.java
*
 /netty-transport-4-1-51-final-sources-jar/io/netty/bootstrap/FailedChannel.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/ChannelOutputShutdownEvent.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/internal/package-info.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/nio/SelectedSelectionKeySetSelector.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/oio/OioDatagramChannelConfig.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/ChannelInputShutdownReadComplete.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/internal/ChannelUtils.java
* /netty-transport-4-1-51-final-sources-jar/io/netty/channel/socket/ChannelOutputShutdownException.java

1.154 netty-codec 4.1.51.Final

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*/
/**
* A decoder that splits the received {@link ByteBuf}s dynamically by the
* value of the length field in the message. It is particularly useful when you
* decode a binary message which has an integer header field that represents the
* length of the message body or the whole message.
*
 <p>
* {@link LengthFieldBasedFrameDecoder} has many configuration parameters so
* that it can decode any message with a length field, which is often seen in

```
* proprietary client-server protocols. Here are some example that will give
* you the basic idea on which option does what.
*
* <h3>2 bytes length field at offset 0, do not strip header</h3>
*
* The value of the length field in this example is <tt>12 (0x0C)</tt> which
* represents the length of "HELLO, WORLD".  By default, the decoder assumes
* that the length field represents the number of the bytes that follows the
* length field.  Therefore, it can be decoded with the simplistic parameter
* combination.
* <pre>
* <b>lengthFieldOffset</b>   = <b>0</b>
* <b>lengthFieldLength</b>   = <b>2</b>
* lengthAdjustment    = 0
* initialBytesToStrip = 0 (= do not strip header)
*
* BEFORE DECODE (14 bytes)         AFTER DECODE (14 bytes)
* +--------+----------------+      +--------+----------------+
* | Length | Actual Content
 |----->| Length | Actual Content |
* | 0x000C | "HELLO, WORLD" |      | 0x000C | "HELLO, WORLD" |
* +--------+----------------+      +--------+----------------+
* </pre>
*
* <h3>2 bytes length field at offset 0, strip header</h3>
*
* Because we can get the length of the content by calling
* {@link ByteBuf#readableBytes()}, you might want to strip the length
* field by specifying <tt>initialBytesToStrip</tt>.  In this example, we
* specified <tt>2</tt>, that is same with the length of the length field, to
* strip the first two bytes.
* <pre>
* lengthFieldOffset   = 0
* lengthFieldLength   = 2
* lengthAdjustment    = 0
* <b>initialBytesToStrip</b> = <b>2</b> (= the length of the Length field)
*
* BEFORE DECODE (14 bytes)         AFTER DECODE (12 bytes)
* +--------+----------------+      +----------------+
* | Length | Actual Content |----->| Actual Content |
* | 0x000C | "HELLO, WORLD" |      | "HELLO, WORLD" |
* +--------+----------------+      +----------------+
 * </pre>
*
* <h3>2 bytes length field at offset 0, do not strip header, the length field
*     represents the length of the whole message</h3>
*
* In most cases, the length field represents the length of the message body
```

```
* only, as shown in the previous examples.  However, in some protocols, the
* length field represents the length of the whole message, including the
* message header.  In such a case, we specify a non-zero
* <tt>lengthAdjustment</tt>.  Because the length value in this example message
* is always greater than the body length by <tt>2</tt>, we specify <tt>-2</tt>
* as <tt>lengthAdjustment</tt> for compensation.
* <pre>
* lengthFieldOffset   =  0
* lengthFieldLength   =  2
* <b>lengthAdjustment</b>    = <b>-2</b> (= the length of the Length field)
* initialBytesToStrip =  0
*
* BEFORE DECODE (14 bytes)         AFTER DECODE (14 bytes)
* +--------+----------------+      +--------+----------------+
* | Length | Actual Content |----->| Length | Actual
 Content |
* | 0x000E | "HELLO, WORLD" |      | 0x000E | "HELLO, WORLD" |
* +--------+----------------+      +--------+----------------+
* </pre>
*
* <h3>3 bytes length field at the end of 5 bytes header, do not strip header</h3>
*
* The following message is a simple variation of the first example.  An extra
* header value is prepended to the message.  <tt>lengthAdjustment</tt> is zero
* again because the decoder always takes the length of the prepended data into
* account during frame length calculation.
* <pre>
* <b>lengthFieldOffset</b>   = <b>2</b> (= the length of Header 1)
* <b>lengthFieldLength</b>   = <b>3</b>
* lengthAdjustment    = 0
* initialBytesToStrip = 0
*
* BEFORE DECODE (17 bytes)                      AFTER DECODE (17 bytes)
* +----------+----------+----------------+      +----------+----------+----------------+
* | Header 1 |  Length  | Actual Content |----->| Header 1 |  Length  | Actual Content |
* |  0xCAFE  | 0x00000C | "HELLO, WORLD" |      |
  0xCAFE  | 0x00000C | "HELLO, WORLD" |
* +----------+----------+----------------+      +----------+----------+----------------+
* </pre>
*
* <h3>3 bytes length field at the beginning of 5 bytes header, do not strip header</h3>
*
* This is an advanced example that shows the case where there is an extra
* header between the length field and the message body.  You have to specify a
* positive <tt>lengthAdjustment</tt> so that the decoder counts the extra
* header into the frame length calculation.
* <pre>
* lengthFieldOffset   = 0
```

```
* lengthFieldLength   = 3
* <b>lengthAdjustment</b>    = <b>2</b> (= the length of Header 1)
* initialBytesToStrip = 0
*
* BEFORE DECODE (17 bytes)                  AFTER DECODE (17 bytes)
* +----------+----------+----------------+      +----------+----------+----------------+
* |  Length  | Header 1 | Actual Content |----->|  Length  | Header 1 | Actual Content |
* | 0x00000C |  0xCAFE  | "HELLO, WORLD" |      | 0x00000C |  0xCAFE  | "HELLO,
 WORLD" |
* +----------+----------+----------------+      +----------+----------+----------------+
* </pre>
*
* <h3>2 bytes length field at offset 1 in the middle of 4 bytes header,
*     strip the first header field and the length field</h3>
*
* This is a combination of all the examples above.  There are the prepended
* header before the length field and the extra header after the length field.
* The prepended header affects the <tt>lengthFieldOffset</tt> and the extra
* header affects the <tt>lengthAdjustment</tt>.  We also specified a non-zero
* <tt>initialBytesToStrip</tt> to strip the length field and the prepended
* header from the frame.  If you don't want to strip the prepended header, you
* could specify <tt>0</tt> for <tt>initialBytesToSkip</tt>.
* <pre>
* lengthFieldOffset   = 1 (= the length of HDR1)
* lengthFieldLength   = 2
* <b>lengthAdjustment</b>    = <b>1</b> (= the length of HDR2)
* <b>initialBytesToStrip</b> = <b>3</b> (= the length of HDR1 + LEN)
 *
* BEFORE DECODE (16 bytes)                  AFTER DECODE (13 bytes)
* +------+--------+------+----------------+      +------+----------------+
* | HDR1 | Length | HDR2 | Actual Content |----->| HDR2 | Actual Content |
* | 0xCA | 0x000C | 0xFE | "HELLO, WORLD" |      | 0xFE | "HELLO, WORLD" |
* +------+--------+------+----------------+      +------+----------------+
* </pre>
*
* <h3>2 bytes length field at offset 1 in the middle of 4 bytes header,
*     strip the first header field and the length field, the length field
*     represents the length of the whole message</h3>
*
* Let's give another twist to the previous example.  The only difference from
* the previous example is that the length field represents the length of the
* whole message instead of the message body, just like the third example.
* We have to count the length of HDR1 and Length into <tt>lengthAdjustment</tt>.
* Please note that we don't need to take the length of HDR2 into account
* because
 the length field already includes the whole header length.
* <pre>
* lengthFieldOffset   =  1
```

* lengthFieldLength   = 2
* lengthAdjustment   = -3 (= the length of HDR1 + LEN, negative)
* initialBytesToStrip = 3
*
* BEFORE DECODE (16 bytes)   AFTER DECODE (13 bytes)
* +------+--------+------+----------------+   +------+----------------+
* | HDR1 | Length | HDR2 | Actual Content |----->| HDR2 | Actual Content |
* | 0xCA | 0x0010 | 0xFE | "HELLO, WORLD" | | 0xFE | "HELLO, WORLD" |
* +------+--------+------+----------------+   +------+----------------+
* </pre>
* @see LengthFieldPrepender
*/

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* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/EmptyHeaders.java
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* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/compression/ByteBufChecksum.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/DatagramPacketDecoder.java
*
 /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/string/LineEncoder.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/CodecOutputList.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/compression/CompressionUtil.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/DateFormatter.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/DatagramPacketEncoder.java
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* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/CharSequenceValueConverter.java
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* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/compression/JdkZlibDecoder.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/xml/XmlFrameDecoder.java
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* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/ProtocolDetectionResult.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/protobuf/ProtobufDecoder.java
*
 /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/protobuf/ProtobufVarint32LengthFieldPrepender.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/protobuf/ProtobufEncoderNano.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/protobuf/ProtobufDecoderNano.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/UnsupportedValueConverter.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/ProtocolDetectionState.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/HeadersUtils.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/protobuf/ProtobufEncoder.java
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* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/serialization/ObjectDecoder.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/serialization/ReferenceMap.java
*
 /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/marshalling/MarshallerProvider.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/marshalling/CompatibleMarshallingDecoder.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/base64/package-info.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/serialization/CompactObjectInputStream.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/TooLongFrameException.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/marshalling/MarshallingDecoder.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/PrematureChannelClosureException.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/compression/JdkZlibEncoder.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/marshalling/LimitingByteInput.java
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* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/marshalling/MarshallingEncoder.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/serialization/ObjectEncoderOutputStream.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/serialization/ObjectEncoder.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/marshalling/ChannelBufferByteOutput.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/CodecException.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/ReplayingDecoder.java
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* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/EncoderException.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/bytes/ByteArrayDecoder.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/serialization/ClassLoaderClassResolver.java
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* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/compression/ZlibUtil.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/compression/ZlibWrapper.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/compression/ZlibCodecFactory.java
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* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/ByteToMessageCodec.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/CorruptedFrameException.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/string/StringEncoder.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/serialization/ClassResolvers.java

* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/marshalling/package-info.java
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* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/bytes/ByteArrayEncoder.java
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 /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/protobuf/package-info.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/marshalling/DefaultUnmarshallerProvider.java
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* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/compression/ZlibDecoder.java
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* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/compression/Bzip2BlockCompressor.java
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* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/json/package-info.java
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* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/compression/LzfEncoder.java
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* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/compression/Bzip2BlockDecompressor.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/compression/Lz4Constants.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/DecoderResultProvider.java
* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/compression/Lz4FrameDecoder.java
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* /netty-codec-4-1-51-final-sources-jar/io/netty/handler/codec/compression/Bzip2BitReader.java
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*/
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1.155 coturn 4.5.1.3

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1.160 bzip2 1.0.8-2

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    * Allowing them being read would mean anyone with access to the channel could get them.

  */
/**
```

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* /netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/LinuxSocket.java
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* /netty-transport-native-epoll-4-1-51-final-sources-jar/io/netty/channel/epoll/TcpMd5Util.java
* /netty-transport-native-epoll-4-1-51-final-sources-
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* /netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/DomainSocketChannel.java
* /netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/ServerDomainSocketChannel.java
* /netty-transport-native-unix-common-4-1-51-final-sources-jar/netty_unix_socket.c
*
/netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/DomainSocketAddress.java
* /netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/DatagramSocketAddress.java
* /netty-transport-native-unix-common-4-1-51-final-sources-jar/netty_unix_filedescriptor.h
* /netty-transport-native-unix-common-4-1-51-final-sources-jar/netty_unix_filedescriptor.c
* /netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/NativeInetAddress.java
* /netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/DomainSocketChannelConfig.java
* /netty-transport-native-unix-common-4-1-51-final-sources-jar/netty_unix_socket.h
* /netty-transport-native-unix-common-4-1-51-final-sources-jar/netty_unix_errors.h
* /netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/Socket.java
* /netty-transport-native-unix-common-4-1-51-final-sources-jar/netty_unix_errors.c
*
/netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/FileDescriptor.java
* /netty-transport-native-unix-common-4-1-51-final-sources-

jar/io/netty/channel/unix/DomainSocketReadMode.java
* /netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/Errors.java
* /netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/UnixChannel.java
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Found in path(s):
* /netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/IovArray.java
* /netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/UnixChannelOption.java
* /netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/package-info.java
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Found in path(s):
* /netty-transport-native-unix-common-4-1-51-final-sources-jar/META-INF/maven/io.netty/netty-transport-native-unix-common/pom.xml
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Found in path(s):
* /netty-transport-native-unix-common-4-1-51-final-sources-jar/netty_unix_jni.h
* /netty-transport-native-unix-common-4-1-51-final-sources-jar/io/netty/channel/unix/UnixChannelUtil.java

1.163 jackson-annotations 2.11.2

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1.164 ffmpeg 4.3.1

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Specifically, the GPL parts of FFmpeg are:

- libpostproc
- optional x86 optimization in the files
  - `libavcodec/x86/flac_dsp_gpl.asm`
  - `libavcodec/x86/idct_mmx.c`
  - `libavfilter/x86/vf_removegrain.asm`
- the following building and testing tools
  - `compat/solaris/make_sunver.pl`
  - `doc/t2h.pm`
  - `doc/texi2pod.pl`
  - `libswresample/tests/swresample.c`
  - `tests/checkasm/*`
  - `tests/tiny_ssim.c`
-
 the following filters in libavfilter:
  - `signature_lookup.c`
  - `vf_blackframe.c`
  - `vf_boxblur.c`
  - `vf_colormatrix.c`
  - `vf_cover_rect.c`
  - `vf_cropdetect.c`
  - `vf_delogo.c`
  - `vf_eq.c`
  - `vf_find_rect.c`
  - `vf_fspp.c`
  - `vf_histeq.c`
  - `vf_hqdn3d.c`
  - `vf_kerndeint.c`
  - `vf_lensfun.c` (GPL version 3 or later)
  - `vf_mcdeint.c`
  - `vf_mpdecimate.c`
  - `vf_nnedi.c`
  - `vf_owdenoise.c`
  - `vf_perspective.c`
  - `vf_phase.c`
  - `vf_pp.c`
  - `vf_pp7.c`
  - `vf_pullup.c`
  - `vf_repeatfields.c`
  - `vf_sab.c`
  - `vf_signature.c`
  - `vf_smartblur.c`
  - `vf_spp.c`
  - `vf_stereo3d.c`
  - `vf_super2xsai.c`
  - `vf_tinterlace.c`
  - `vf_uspp.c`

- `vf_vaguedenoiser.c`
- `vsrc_mptestsrc.c`

Should you, for whatever reason, prefer to use version 3 of the (L)GPL, then
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or, if you have enabled GPL parts,
`COPYING.GPLv3` to learn the exact legal terms that apply in this case.

There are a handful of files under other licensing terms, namely:

* The files `libavcodec/jfdctfst.c`, `libavcodec/jfdctint_template.c` and
`libavcodec/jrevdct.c` are taken from libjpeg, see the top of the files for
licensing details. Specifically note that you must credit the IJG in the
documentation accompanying your program if you only distribute executables.
You must also indicate any changes including additions and deletions to
those three files in the documentation.
* `tests/reference.pnm` is under the expat license.

External libraries

FFmpeg can be combined with a number of external libraries, which sometimes
affect the licensing of binaries resulting from the combination.

Compatible libraries

The following libraries are under GPL version 2:
- avisynth
- frei0r
- libcdio
- libdavs2
- librubberband
- libvidstab
- libx264
- libx265
- libxavs
-
libxavs2
- libxvid

When combining them with FFmpeg, FFmpeg needs to be licensed as GPL as well by
passing `--enable-gpl` to configure.

The following libraries are under LGPL version 3:
- gmp
- libaribb24
- liblensfun

When combining them with FFmpeg, use the configure option `--enable-version3` to
upgrade FFmpeg to the LGPL v3.

The VMAF, mbedTLS, RK MPI, OpenCORE and VisualOn libraries are under the Apache License
2.0. That license is incompatible with the LGPL v2.1 and the GPL v2, but not with
version 3 of those licenses. So to combine these libraries with FFmpeg, the
license version needs to be upgraded by passing `--enable-version3` to configure.

The smbclient library is under the GPL v3, to combine it with FFmpeg,
the options `--enable-gpl` and `--enable-version3` have to be passed to
configure to upgrade FFmpeg to the GPL v3.

Incompatible libraries

There are certain libraries you can combine with FFmpeg whose licenses are not
compatible with the GPL and/or the LGPL. If
you wish to enable these
libraries, even in circumstances that their license may be incompatible, pass
`--enable-nonfree` to configure. This will cause the resulting binary to be
unredistributable.

The Fraunhofer FDK AAC and OpenSSL libraries are under licenses which are
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Version 3, 29 June 2007

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* /netty-handler-proxy-4-1-51-final-sources-jar/io/netty/handler/proxy/ProxyHandler.java
* /netty-handler-proxy-4-1-51-final-sources-jar/io/netty/handler/proxy/package-info.java
* /netty-handler-proxy-4-1-51-final-sources-jar/io/netty/handler/proxy/Socks4ProxyHandler.java
*
 /netty-handler-proxy-4-1-51-final-sources-jar/io/netty/handler/proxy/ProxyConnectionEvent.java
* /netty-handler-proxy-4-1-51-final-sources-jar/io/netty/handler/proxy/Socks5ProxyHandler.java
* /netty-handler-proxy-4-1-51-final-sources-jar/io/netty/handler/proxy/ProxyConnectException.java

1.166 netty-codec-socks 4.1.51.Final

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* /netty-codec-socks-4-1-51-final-sources-
jar/io/netty/handler/codec/socksx/v5/DefaultSocks5PasswordAuthResponse.java
*
 /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/UnknownSocksRequest.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v5/DefaultSocks5InitialResponse.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v4/Socks4CommandRequest.java

* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v5/DefaultSocks5CommandResponse.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v4/Socks4CommandResponse.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksMessage.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v5/DefaultSocks5PasswordAuthRequest.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksInitResponseDecoder.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksCmdRequestDecoder.java
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 /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v5/Socks5InitialRequest.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v5/Socks5PasswordAuthResponse.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v4/Socks4ClientDecoder.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksAuthRequest.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v4/DefaultSocks4CommandResponse.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v5/DefaultSocks5CommandRequest.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksResponse.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/UnknownSocksResponse.java
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* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v5/Socks5CommandRequest.java
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 /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v4/Socks4CommandType.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksCmdResponse.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksAuthResponse.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v4/DefaultSocks4CommandRequest.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksInitResponse.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksInitRequest.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksCmdResponseDecoder.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v5/Socks5PasswordAuthRequest.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v5/Socks5CommandResponse.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v5/Socks5InitialResponse.java
*
 /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v5/package-info.java
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* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksAuthResponseDecoder.java
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* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksMessageEncoder.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v4/Socks4CommandStatus.java
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jar/io/netty/handler/codec/socksx/SocksPortUnificationServerHandler.java
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* /netty-codec-socks-4-1-51-final-sources-
jar/io/netty/handler/codec/socksx/v5/Socks5CommandResponseDecoder.java
*
 /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v4/Socks4Message.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v5/Socks5Message.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/AbstractSocksMessage.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v5/AbstractSocks5Message.java
* /netty-codec-socks-4-1-51-final-sources-

jar/io/netty/handler/codec/socksx/v5/Socks5PasswordAuthRequestDecoder.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/package-info.java
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* /netty-codec-socks-4-1-51-final-sources-
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/netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v4/Socks4ServerEncoder.java
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* /netty-codec-socks-4-1-51-final-sources-
jar/io/netty/handler/codec/socksx/v5/Socks5CommandRequestDecoder.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v5/Socks5ServerEncoder.java
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* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksAuthScheme.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksCmdStatus.java
*
/netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksRequestType.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksCmdType.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksResponseType.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksMessageType.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksAddressType.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socks/SocksAuthStatus.java
* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v5/Socks5AuthMethod.java
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* /netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v5/Socks5CommandType.java
*
/netty-codec-socks-4-1-51-final-sources-jar/io/netty/handler/codec/socksx/v5/Socks5AddressType.java
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* @version 3.0 (December 2000)
*
* Optimised ANSI C code for the Rijndael cipher (now AES)
*
* @author Vincent Rijmen <vincent.rijmen@esat.kuleuven.ac.be>
* @author Antoon Bosselaers <antoon.bosselaers@esat.kuleuven.ac.be>
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* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/server/authentication/RedirectServerAuthenticationFailureHandler.java
*
/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/server/ServerRedirectStrategy.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/server/ui/LogoutPageGeneratingWebFilter.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/server/authorization/DelegatingReactiveAuthorizationManager.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/server/header/ServerHttpHeadersWriter.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/server/authorization/ExceptionTranslationWebFilter.java
* /spring-security-web-5-3-4-release-sources-

jar/org/springframework/security/web/server/header/HttpHeaderWriterWebFilter.java
* /spring-security-web-5-3-4-release-sources-
jar/org/springframework/security/web/server/authentication/ServerAuthenticationEntryPointFailureHandler.java
*
/spring-security-web-5-3-4-release-sources-
jar/org/springframework/security/web/server/authorization/HttpStatusServerAccessDeniedHandler.java
* /spring-security-web-5-3-4-release-sources-
jar/org/springframework/security/web/server/authentication/RedirectServerAuthenticationSuccessHandler.java
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jar/org/springframework/security/web/server/savedrequest/NoOpServerRequestCache.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/server/WebFilterExchange.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/server/csrf/CsrfToken.java
* /spring-security-web-5-3-4-release-sources-
jar/org/springframework/security/web/server/context/SecurityContextServerWebExchangeWebFilter.java
* /spring-security-web-5-3-4-release-sources-
jar/org/springframework/security/web/server/authorization/ServerAccessDeniedHandler.java
* /spring-security-web-5-3-4-release-sources-
jar/org/springframework/security/web/server/savedrequest/ServerRequestCache.java
*
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jar/org/springframework/security/web/server/savedrequest/WebSessionServerRequestCache.java
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jar/org/springframework/security/web/server/authentication/logout/LogoutWebFilter.java
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jar/org/springframework/security/web/server/context/ReactorContextWebFilter.java
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jar/org/springframework/security/web/server/SecurityWebFilterChain.java
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jar/org/springframework/security/web/server/header/CompositeServerHttpHeadersWriter.java
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jar/org/springframework/security/web/server/authentication/logout/ServerLogoutSuccessHandler.java
* /spring-security-web-5-3-4-release-sources-
jar/org/springframework/security/web/server/context/NoOpServerSecurityContextRepository.java
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/spring-security-web-5-3-4-release-sources-
jar/org/springframework/security/web/authentication/rememberme/PersistentTokenBasedRememberMeServices.jav
a
* /spring-security-web-5-3-4-release-sources-
jar/org/springframework/security/web/server/header/CacheControlServerHttpHeadersWriter.java
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jar/org/springframework/security/web/server/context/ServerSecurityContextRepository.java
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* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/expression/EvaluationContextPostProcessor.java
*
 /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/expression/AbstractVariableEvaluationContextPostProcessor.java
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*
 /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/csrf/CsrfAuthenticationStrategy.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/util/matcher/AnyRequestMatcher.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/csrf/InvalidCsrfTokenException.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/csrf/DefaultCsrfToken.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/session/AbstractSessionFixationProtectionStrategy.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/session/ChangeSessionIdAuthenticationStrategy.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/csrf/CsrfException.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/csrf/MissingCsrfTokenException.java
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* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/csrf/CsrfFilter.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/context/AbstractSecurityWebApplicationInitializer.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/session/SessionFixationProtectionStrategy.java
* /spring-security-web-5-3-4-release-sources-

jar/org/springframework/security/web/authentication/session/CompositeSessionAuthenticationStrategy.java
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* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/method/annotation/AuthenticationPrincipalArgumentResolver.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/bind/annotation/AuthenticationPrincipal.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/csrf/CsrfToken.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/header/HeaderWriter.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/session/SessionFixationProtectionEvent.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/method/annotation/CsrfTokenArgumentResolver.java
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* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/util/matcher/ELRequestMatcher.java
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* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/server/DefaultServerRedirectStrategy.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/server/util/matcher/PathPatternParserServerWebExchangeMatcher.java
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jar/org/springframework/security/web/server/authentication/HttpStatusServerEntryPoint.java
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* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/server/context/WebSessionServerSecurityContextRepository.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/ui/DefaultLogoutPageGeneratingFilter.java
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/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/SimpleUrlAuthenticationFailureHandler.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/server/header/ContentSecurityPolicyServerHttpHeadersWriter.java
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* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/AccessDeniedHandlerImpl.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/savedrequest/SavedRequestAwareWrapper.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/channel/ChannelProcessingFilter.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/channel/RetryWithHttpEntryPoint.java
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* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/PortMapperImpl.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/www/DigestAuthenticationEntryPoint.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/PortResolver.java
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* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/session/SessionInformationExpiredStrategy.java
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* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/logout/SimpleUrlLogoutSuccessHandler.java
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* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/expression/package-info.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/preauth/x509/package-info.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/jaasapi/package-info.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/www/package-info.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/session/InvalidSessionStrategy.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/channel/AbstractRetryEntryPoint.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/authentication/rememberme/RememberMeAuthenticationException.java
*
/spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/context/package-info.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/access/expression/WebExpressionVoter.java
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* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/session/SessionInformationExpiredEvent.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/csrf/CookieCsrfTokenRepository.java
* /spring-security-web-5-3-4-release-sources-jar/org/springframework/security/web/csrf/LazyCsrfTokenRepository.java

1.173 spring-security-core 5.3.4.RELEASE

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*/
/**
* Base64 encoder which is a reduced version of Robert Harder's public domain
* implementation (version 2.3.7). See <a
* href="http://iharder.sourceforge.net/current/java/base64/">http://iharder.sourceforge.net/current/java/base64/ for more information.
* <p>
* For internal use only.
*
* @author
 Luke Taylor
* @since 3.0
* @deprecated Use java.util.Base64
*/

Found in path(s):
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/codec/Base64.java
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jar/org/springframework/security/core/parameters/AnnotationParameterNameDiscoverer.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/annotation/AuthenticationPrincipal.java
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```
* limitations under the License.
*/
/**
* Reviews the <code>Object</code> returned from a secure object invocation, being able to
* modify the <code>Object</code> or throw an {@link AccessDeniedException}.
* <p>
* Typically used to ensure the principal is permitted to access the domain object
* instance returned by a service layer bean.
 Can also be used to mutate the domain object
* instance so the principal is only able to access authorised bean properties or
* <code>Collection</code> elements.
* <p>
* Special consideration should be given to using an <code>AfterInvocationManager</code>
* on bean methods that modify a database. Typically an
* <code>AfterInvocationManager</code> is used with read-only methods, such as
* <code>public DomainObject getById(id)</code>. If used with methods that modify a
* database, a transaction manager should be used to ensure any
* <code>AccessDeniedException</code> will cause a rollback of the changes made by the
* transaction.
* </p>
*
* @author Ben Alex
*/
```

Found in path(s):
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/intercept/AfterInvocationManager.java
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*/
```

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* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/converter/RsaKeyConverters.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/userdetails/UserDetailsPasswordService.java
*
/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/crypto/argon2/Argon2PasswordEncoder.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/ReactiveAuthenticationManagerResolver.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/AbstractUserDetailsReactiveAuthenticationManager.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/crypto/argon2/Argon2EncodingUtils.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/token/SecureRandomFactoryBean.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/expression/method/ExpressionBasedPreInvocationAdvice.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/event/LogoutSuccessEvent.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/UserDetailsRepositoryReactiveAuthenticationManager.java
*
/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/annotation/CurrentSecurityContext.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/hierarchicalroles/RoleHierarchyImpl.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/ReactiveAuthenticationManagerAdapter.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/AuthenticationManagerResolver.java
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* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/keygen/SecureRandomBytesKeyGenerator.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/util/EncodingUtils.java
*
 /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/encrypt/HexEncodingTextEncryptor.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/encrypt/TextEncryptor.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/keygen/HexEncodingStringKeyGenerator.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/password/StandardPasswordEncoder.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/password/NoOpPasswordEncoder.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/encrypt/BouncyCastleAesCbcBytesEncryptor.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/encrypt/CipherUtils.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/keygen/SharedKeyGenerator.java
*
 /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/encrypt/BouncyCastleAesBytesEncryptor.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/keygen/StringKeyGenerator.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/keygen/KeyGenerators.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/encrypt/AesBytesEncryptor.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/encrypt/BytesEncryptor.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/encrypt/BouncyCastleAesGcmBytesEncryptor.java
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* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/method/AbstractFallbackMethodSecurityMetadataSource.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/authority/SimpleGrantedAuthority.java
*
 /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/jaas/event/package-info.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/expression/method/MethodSecurityExpressionRoot.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/method/P.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/expression/SecurityExpressionRoot.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/package-info.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/InternalAuthenticationServiceException.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/prepost/PostInvocationAttribute.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/prepost/PostFilter.java
*
 /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/intercept/package-info.java
* /spring-security-core-5-3-4-release-sources-

jar/org/springframework/security/access/prepost/PreInvocationAuthorizationAdviceVoter.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/authority/mapping/GrantedAuthoritiesMapper.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/jaas/package-info.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/intercept/aspectj/AspectJMethodSecurityInterceptor.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/annotation/AnnotationMetadataExtractor.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/AccountStatusException.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/provisioning/MutableUser.java
*
/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/session/SessionDestroyedEvent.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/concurrent/DelegatingSecurityContextScheduledExecutorService.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/intercept/aspectj/MethodInvocationAdapter.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/jackson2/package-info.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/authority/mapping/MappableAttributesRetriever.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/expression/method/MethodSecurityExpressionOperations.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/expression/method/AbstractExpressionBasedMethodConfigAttribute.java
*
/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/authority/mapping/MapBasedAttributes2GrantedAuthoritiesMapper.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/context/package-info.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/provisioning/UserDetailsManager.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/prepost/PostAuthorize.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/authority/GrantedAuthoritiesContainer.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/authority/package-info.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/authority/mapping/SimpleMappableAttributesRetriever.java
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jar/org/springframework/security/core/authority/mapping/NullAuthoritiesMapper.java
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/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/context/DelegatingApplicationListener.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/authority/AuthorityUtils.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/session/package-info.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/expression/ExpressionUtils.java
* /spring-security-core-5-3-4-release-sources-

jar/org/springframework/security/access/vote/RoleHierarchyVoter.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/prepost/PreFilter.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/userdetails/UserDetailsByNameServiceWrapper.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/prepost/PrePostInvocationAttributeFactory.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/concurrent/DelegatingSecurityContextExecutor.java
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/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/authority/mapping/SimpleAttributes2GrantedAuthoritiesMapper.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/userdetails/UserDetailsChecker.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/task/DelegatingSecurityContextAsyncTaskExecutor.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/codec/Utf8.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/event/package-info.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/userdetails/jdbc/package-
info.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/prepost/PrePostAnnotationSecurityMetadataSource.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/PermissionCacheOptimizer.java
*
/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/concurrent/AbstractDelegatingSecurityContextSupport.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/vote/package-info.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/package-info.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/provisioning/package-info.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/crypto/password/AbstractPasswordEncoder.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/prepost/PostInvocationAdviceProvider.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/prepost/PreInvocationAuthorizationAdvice.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/provisioning/GroupManager.java
*
/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/util/package-info.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/userdetails/cache/package-
info.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/userdetails/package-info.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/expression/SecurityExpressionHandler.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/core/userdetails/cache/SpringCacheBasedUserCache.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/task/DelegatingSecurityContextTaskExecutor.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/expression/method/package-

info.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/expression/DenyAllPermissionEvaluator.java
*
/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/method/DelegatingMethodSecurityMetadataSource.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/token/Sha512DigestUtils.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/session/SessionCreationEvent.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/annotation/package-info.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/rcp/package-info.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/hierarchicalroles/package-info.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/provisioning/InMemoryUserDetailsManager.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/userdetails/AuthenticationUserDetailsService.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/userdetails/memory/package-info.java
*
/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/hierarchicalroles/RoleHierarchyAuthoritiesMapper.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/authority/mapping/Attributes2GrantedAuthoritiesMapper.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/scheduling/DelegatingSecurityContextSchedulingTaskExecutor.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/expression/method/ExpressionBasedAnnotationAttributeFactory.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/codec/Hex.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/hierarchicalroles/CycleInRoleHierarchyException.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/CredentialsContainer.java
*
/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/AccountStatusUserDetailsChecker.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/token/DefaultToken.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/intercept/aspectj/package-info.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/method/package-info.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/package-info.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/prepost/PreAuthorize.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/jaas/memory/package-info.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/parameters/DefaultSecurityParameterNameDiscoverer.java
*
/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/expression/AbstractSecurityExpressionHandler.java

* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/dao/package-info.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/prepost/PostInvocationAuthorizationAdvice.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/AuthenticationEventPublisher.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/codec/package-info.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/authority/mapping/SimpleAuthorityMapper.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/expression/package-info.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/expression/method/PostInvocationExpressionAttribute.java
*
/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/annotation/Jsr250Voter.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/concurrent/DelegatingSecurityContextExecutorService.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/token/package-info.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/provisioning/MutableUserDetails.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/annotation/Jsr250SecurityConfig.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/intercept/aopalliance/package-info.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/hierarchicalroles/RoleHierarchy.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/hierarchicalroles/NullRoleHierarchy.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/authority/mapping/package-info.java
*
/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/expression/method/MethodSecurityExpressionHandler.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/event/package-info.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/prepost/package-info.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/prepost/PreInvocationAttribute.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/expression/method/ExpressionBasedPostInvocationAdvice.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/token/TokenService.java
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*/
/**
* A token issued by {@link TokenService}.
*
* <p>
* It is important that the keys assigned to tokens are sufficiently randomised and
* secured that they can serve as identifying a unique user session. Implementations of
* {@link TokenService} are free to use encryption or encoding strategies of their
 choice.
* It is strongly recommended that keys are of sufficient length to balance safety against
* persistence cost. In relation to persistence cost, it is strongly recommended that
* returned keys are small enough for encoding in a cookie.
* </p>
*
* @author Ben Alex
* @since 2.0.1
*/
```

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* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/util/FieldUtils.java
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 /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/session/SessionRegistry.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/AnonymousAuthenticationProvider.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/event/AuthenticationFailureServiceExceptionEvent.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/annotation/Secured.java

* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/event/AbstractAuthenticationFailureEvent.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/rcp/RemoteAuthenticationManager.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/AuthenticationTrustResolver.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/intercept/AfterInvocationProviderManager.java
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* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/event/PublicInvocationEvent.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/event/AbstractAuthorizationEvent.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/AuthenticationServiceException.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/vote/AuthenticatedVoter.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/intercept/aopalliance/MethodSecurityInterceptor.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/LockedException.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/userdetails/UserDetailsService.java
*
/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/event/AuthenticationFailureCredentialsExpiredEvent.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/event/AuthenticationFailureProviderNotFoundEvent.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/TestingAuthenticationToken.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/vote/UnanimousBased.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/RememberMeAuthenticationProvider.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/SpringSecurityMessageSource.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/SecurityConfig.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/vote/ConsensusBased.java
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* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/event/LoggerListener.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/context/InheritableThreadLocalSecurityContextHolderStrategy.java
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* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/event/InteractiveAuthenticationSuccessEvent.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/intercept/AbstractSecurityInterceptor.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/event/AuthenticationCredentialsNotFoundEvent.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/event/AuthorizedEvent.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/TestingAuthenticationProvider.java
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* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/intercept/RunAsManagerImpl.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/event/AuthenticationFailureExpiredEvent.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/jaas/DefaultLoginExceptionResolver.java
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* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/event/AuthenticationFailureBadCredentialsEvent.java

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* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/userdetails/UserCache.java
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* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/event/LoggerListener.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/intercept/aopalliance/MethodSecurityMetadataSourceAdvisor.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/AccessDeniedException.java
* /spring-security-core-5-3-4-release-sources-
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* /spring-security-core-5-3-4-release-sources-
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jar/org/springframework/security/authentication/DisabledException.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/userdetails/UserDetails.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/util/SimpleMethodInvocation.java
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* /spring-security-core-5-3-4-release-sources-
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* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/jaas/event/JaasAuthenticationSuccessEvent.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/jaas/JaasAuthenticationCallbackHandler.java
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jar/org/springframework/security/authentication/jaas/JaasAuthenticationToken.java
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/spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/ProviderNotFoundException.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/UsernamePasswordAuthenticationToken.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/authentication/AuthenticationTrustResolverImpl.java
* /spring-security-core-5-3-4-release-sources-
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* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/access/intercept/aspectj/AspectJCallback.java
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jar/org/springframework/security/authentication/BadCredentialsException.java
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* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/context/ThreadLocalSecurityContextHolderStrategy.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/AuthenticationDetailsSource.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/userdetails/cache/NullUserCache.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/vote/AffirmativeBased.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/method/AbstractMethodSecurityMetadataSource.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/AccessDecisionManager.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/SecurityMetadataSource.java
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/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/AbstractAuthenticationToken.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/vote/RoleVoter.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/dao/AbstractUserDetailsAuthenticationProvider.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/RememberMeAuthenticationToken.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/jaas/JaasPasswordCallbackHandler.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/intercept/RunAsManager.java
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jar/org/springframework/security/authorization/AuthorizationDecision.java
* /spring-security-core-5-3-4-release-sources-
jar/org/springframework/security/crypto/password/PasswordEncoderUtils.java
*

/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/ReactiveAuthenticationManager.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/userdetails/ReactiveUserDetailsService.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authorization/AuthenticatedReactiveAuthorizationManager.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/password/Md4.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/factory/PasswordEncoderFactories.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/SpringSecurityCoreVersion.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authorization/ReactiveAuthorizationManager.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/AuthenticatedPrincipal.java
*
/spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/parameters/P.java
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* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/jaas/AbstractJaasAuthenticationProvider.java
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* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/keygen/Base64StringKeyGenerator.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/DelegatingReactiveAuthenticationManager.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/Transient.java
*
 /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/userdetails/ReactiveUserDetailsPasswordService.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/password/MessageDigestPasswordEncoder.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/scheduling/DelegatingSecurityContextTaskScheduler.java

* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authorization/AuthorityReactiveAuthorizationManager.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/jackson2/UnmodifiableListDeserializer.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/provisioning/JdbcUserDetailsManager.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/expression/method/DefaultMethodSecurityExpressionHandler.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/core/token/KeyBasedPersistenceTokenService.java
*
 /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/password/LdapShaPasswordEncoder.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/jackson2/UnmodifiableListMixin.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/concurrent/DelegatingSecurityContextCallable.java
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* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/prepost/PrePostAdviceReactiveMethodInterceptor.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/authentication/CachingUserDetailsService.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/password/Md4PasswordEncoder.java
*
 /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/crypto/password/DelegatingPasswordEncoder.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/jackson2/BadCredentialsExceptionMixin.java
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/**
  * Determines if the {@link #getAuthentication()} has permission to access the target
  * given the permission
  * @param target the target domain object to check permission on
  * @param permission the permission to check on the domain object (i.e. "read",
  * "write", etc).
  * @return true if permission
 is granted to the {@link #getAuthentication()}, else
  * false
  */

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* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/jackson2/CoreJackson2Module.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/jackson2/UserMixin.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/jackson2/UnmodifiableSetDeserializer.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/jackson2/UnmodifiableSetMixin.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/jackson2/RememberMeAuthenticationTokenMixin.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/jackson2/SimpleGrantedAuthorityMixin.java
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/jackson2/UsernamePasswordAuthenticationTokenMixin.java
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*/
/**
  *
  * @param authentication represents the user in question. Should not be null.
  * @param targetDomainObject the domain object for which permissions should be
  * checked. May be null in which case implementations should return false, as the null
  * condition can be checked explicitly in the expression.

 * @param permission a representation of the permission object as supplied by the
  * expression system. Not null.
  * @return true if the permission is granted, false otherwise
  */
```

Found in path(s):
* /spring-security-core-5-3-4-release-sources-jar/org/springframework/security/access/PermissionEvaluator.java

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1.175 classgraph 4.8.69

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* /micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/distribution/NoopHistogram.java
* /micrometer-core-1-5-4-sources-jar/io/micrometer/core/instrument/MockClock.java
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1.182 lcms 2.11

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1.184 reactor-netty 0.9.11.RELEASE

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1.186 zlib 1.2.11.dfsg-2ubuntu1.1

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/* zlib.h -- interface of the 'zlib' general purpose compression library
version 1.2.11, January 15th, 2017

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The data format used by the zlib library is described by RFCs (Request for Comments) 1950 to 1952 in the files http://tools.ietf.org/html/rfc1950 (zlib format), rfc1951 (deflate format) and rfc1952 (gzip format).
*/

1.187 boost 1.71.0-6ubuntu6

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1.188 berkeley-db 5.3.28+dfsg1-0.6ubuntu2

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(including a physical distribution medium), accompanied by a
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and valid for as
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conveying of source, or (2) access to copy the

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1.190 flyway-core 6.4.4

1.190.1 Available under license :

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```
/*
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*/
```

Found in path(s):

* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/resource/filesystem/package-info.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/oracle/OracleDatabase.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/util/TimeFormat.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/resolver/CompositeMigrationResolver.java
*
/flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/firebird/FirebirdDatabase.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/mysql/MySQLParser.java
* /flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/jdbc/CockroachRetryingTransactionalExecutionTemplate.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/sqlite/SQLiteParser.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/oracle/OracleParser.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/base/Database.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/h2/package-info.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/util/FileCopyUtils.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/derby/DerbyDatabase.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/sqlscript/SqlScriptExecutor.java
*
/flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/clazz/ClassProvider.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/license/package-info.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/package-info.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/command/package-info.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/util/ExceptionUtils.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/cockroachdb/package-info.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/hsqldb/HSQLDBDatabase.java

* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/schemahistory/package-info.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/scanner/filesystem/FileSystemScanner.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/derby/DerbySchema.java
*
 /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/schemahistory/SchemaHistory.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/sqlscript/SqlStatement.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/sybasease/SybaseASEConnection.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/resource/android/package-info.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/hsqldb/package-info.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/scanner/classpath/UrlResolver.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/api/migration/BaseJavaMigration.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/redshift/RedshiftDatabase.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/logging/package-info.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/db2/DB2Table.java
*
 /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/saphana/SAPHANASchema.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/util/StopWatch.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/api/InfoOutputProvider.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/scanner/classpath/DefaultUrlResolver.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/jdbc/RowMapper.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/license/FlywayEditionUpgradeRequiredException.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/parser/PlaceholderReplacingReader.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/sqlscript/package-info.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/parser/ParsingContext.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/resource/LoadableResource.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/sqlserver/SQLServerTable.java
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 /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/command/DbSchemas.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/license/VersionPrinter.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/util/StringUtils.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/saphana/SAPHANADatabase.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/scanner/classpath/package-info.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/derby/package-info.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/scanner/classpath/ClassPathLocationScanner.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/sqlscript/SqlScript.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/sybasease/SybaseASETable.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/postgresql/PostgreSQLConnection.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/logging/LogCreatorFactory.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/h2/H2Table.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/parser/Recorder.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/api/migration/package-info.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/util/BomFilter.java

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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/util/CloseableIterator.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/oracle/package-info.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/jdbc/ExecutionTemplate.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/api/executor/Context.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/api/migration/JavaMigration.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/configuration/ConfigUtils.java
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* /flyway-core-6-4-4-sources-
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/parser/PeekingReader.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/scanner/ResourceNameCache.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/command/DbClean.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/firebird/package-info.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/parser/PositionTrackingReader.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/api/MigrationInfoService.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/snowflake/SnowflakeSchema.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/scanner/classpath/jboss/JBossVFSv2UrlResolver.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/h2/H2Database.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/parser/Statement.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/api/android/ContextHolder.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/postgresql/PostgreSQLSchema.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/cockroachdb/CockroachDBParser.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/base/Schema.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/api/configuration/ClassicConfiguration.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/oracle/OracleResults.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/info/MigrationInfoContext.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/scanner/LocationScannerCache.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/sqlserver/package-info.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/schemahistory/AppliedMigration.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/oracle/OracleSqlScriptExecutor.java

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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/resource/Resource.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/api/executor/package-info.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/db2/DB2Parser.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/sqlscript/SqlScriptMetadata.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/redshift/RedshiftSchema.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/sqlscript/DefaultSqlScriptExecutor.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/resource/ResourceNameValidator.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/sqlite/package-info.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/oracle/OracleTable.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/oracle/OracleConnection.java
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 /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/hsqldb/HSQLDBConnection.java
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* /flyway-core-6-4-4-sources-
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/api/callback/Statement.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/cockroachdb/CockroachDBDatabase.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/postgresql/PostgreSQLParser.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/sqlscript/SqlStatementIterator.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/logging/slf4j/Slf4jLog.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/api/callback/Error.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/cockroachdb/CockroachDBConnection.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/logging/slf4j/package-info.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/db2/DB2Database.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/package-info.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/firebird/FirebirdParser.java

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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/jdbc/PlainExecutionTemplate.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/info/MigrationInfoDumper.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/resource/ResourceName.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/mysql/MySQLDatabase.java
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 /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/base/Type.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/base/Table.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/api/configuration/FluentConfiguration.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/util/Locations.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/hsqldb/HSQLDBSchema.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/package-info.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/resolver/MigrationInfoHelper.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/informix/InformixSchema.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/api/logging/Log.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/jdbc/DatabaseType.java
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 /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/sqlscript/ParsedSqlStatement.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/logging/android/AndroidLog.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/sqlscript/SqlScriptFactory.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/scanner/android/package-info.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/api/resolver/ResolvedMigration.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/info/MigrationInfoServiceImpl.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/callback/NoopCallbackExecutor.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/resolver/sql/SqlMigrationExecutorFactory.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/jdbc/Results.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/db2/package-info.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/resolver/sql/SqlMigrationExecutor.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/callback/NoopCallback.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/util/BomStrippingReader.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/clazz/NoopClassProvider.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/redshift/RedshiftType.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/sqlserver/SQLServerConnection.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/redshift/RedshiftParser.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/resolver/ResolvedMigrationImpl.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/db2/DB2Type.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/sqlite/SQLiteSchema.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/jdbc/TableLockingExecutionTemplate.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/command/DbInfo.java
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 /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/resolver/ResolvedMigrationComparator.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/postgresql/PostgreSQLDatabase.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/jdbc/JdbcUtils.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/output/MigrationOutput.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/h2/H2Parser.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/api/callback/Callback.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/resource/android/AndroidResource.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/scanner/package-info.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/api/MigrationVersion.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/derby/DerbyTable.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/sqlite/SQLiteConnection.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/info/MigrationInfoImpl.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/util/AbbreviationUtils.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/exception/FlywayDbUpgradeRequiredException.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/snowflake/SnowflakeParser.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/api/package-info.java
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* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/scanner/classpath/ClassPathScanner.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/util/IOUtils.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/api/callback/Event.java

* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/sybasease/SybaseASESchema.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/resource/StringResource.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/resource/ResourceNameParser.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/output/InfoOutput.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/util/ClassUtils.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/hsqldb/HSQLDBTable.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/parser/PositionTracker.java
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/flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/logging/apachecommons/package-info.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/util/Pair.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/resource/filesystem/FileSystemResource.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/exception/FlywaySqlException.java
* /flyway-core-6-4-4-sources-
jar/org/flywaydb/core/internal/database/sqlserver/SQLServerApplicationLockTemplate.java
* /flyway-core-6-4-4-sources-jar/org/flywaydb/core/internal/database/sybasease/package-info.java
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Found in path(s):
* /flyway-core-6-4-4-sources-jar/META-INF/maven/org.flywaydb/flyway-core/pom.xml

1.191 brotli 1.0.7-6ubuntu0.1

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#
src/base/fthash.c
src/base/md5.c
src/base/md5.h
#
src/bdf/bdf.c
src/bdf/bdf.h
src/bdf/bdfdrivr.c
src/bdf/bdfdrivr.h
src/bdf/bdferror.h
src/bdf/bdflib.c
src/bdf/module.mk
src/bdf/README
src/bdf/rules.mk
#
src/pcf/module.mk
src/pcf/pcf.c
src/pcf/pcf.h
src/pcf/pcfdrivr.c
src/pcf/pcfdrivr.h
src/pcf/pcferror.h
src/pcf/pcfread.c
src/pcf/pcfread.h
src/pcf/pcfutil.c
src/pcf/pcfutil.h
src/pcf/README
src/pcf/rules.mk
#
src/gzip/adler32.c
src/gzip/infblock.c
src/gzip/infblock.h
src/gzip/infcodes.c
src/gzip/infcodes.h
```

src/gzip/inffixed.h
src/gzip/inflate.c
src/gzip/inftrees.c
src/gzip/inftrees.h
src/gzip/infutil.c
src/gzip/infutil.h
src/gzip/zconf.h
src/gzip/zlib.h
src/gzip/zutil.c
src/gzip/zutil.h
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src/tools/apinames.c
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printf("%s",png_get_copyright(NULL));
```

Also, the PNG logo (in PNG format, of course) is supplied in the files "pngbar.png" and "pngbar.jpg (88x31) and "pngnow.png" (98x31).

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Glenn Randers-Pehrson
glennrp at users.sourceforge.net
June 26, 2010
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1.195 syslinux 6.03

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```
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Glenn Randers-Pehrson
glennrp at users.sourceforge.net
June 26, 2010
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1.196 dav1d 0.6.0

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1.197 inja 3.1.0

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1.198 gnulib 2019-09-23

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Files:
tests/test-update-copyright.sh

Depends-on:

configure.ac:
abs_aux_dir=`cd "$ac_aux_dir"; pwd`
AC_SUBST([abs_aux_dir])

Makefile.am:
TESTS += test-update-copyright.sh
TESTS_ENVIRONMENT += abs_aux_dir='$(abs_aux_dir)'
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@center Version 2.1, February 1999

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creates an executable that is a derivative of the Library (because
it
contains portions of the Library), rather than a ``work that uses the
library''. The executable is therefore covered by this License.
Section 6 states terms for distribution of such executables.

When a ``work that uses the Library'' uses material from a header file
that is part of the Library, the object code for the work may be a
derivative work of the Library even though the source code is not.
Whether this is true is especially significant if the work can be
linked without the Library, or if the work is itself a library. The
threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data
structure layouts and accessors, and small macros and small inline
functions (ten lines or less in length), then the use of the object
file is unrestricted, regardless of whether it is legally a derivative
work. (Executables containing this object code plus portions of the
Library will still fall under Section 6.)

Otherwise,
if the work is a derivative of the Library, you may
distribute the object code for the work under the terms of Section 6.
Any executables containing that work also fall under Section 6,

whether or not they are linked directly with the Library itself.

@item
As an exception to the Sections above, you may also combine or
link a ``work that uses the Library'' with the Library to produce a
work containing portions of the Library, and distribute that work
under terms of your choice, provided that the terms permit
modification of the work for the customer's own use and reverse
engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the
Library is used in it and that the Library and its use are covered by
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during execution displays copyright notices, you must include the
copyright notice for the Library among them, as well as a reference
directing the user to the copy of
this License. Also, you must do one
of these things:

@enumerate a
@item
Accompany the work with the complete corresponding
machine-readable source code for the Library including whatever
changes were used in the work (which must be distributed under
Sections 1 and 2 above); and, if the work is an executable linked
with the Library, with the complete machine-readable ``work that
uses the Library'', as object code and/or source code, so that the
user can modify the Library and then relink to produce a modified
executable containing the modified Library. (It is understood
that the user who changes the contents of definitions files in the
Library will not necessarily be able to recompile the application
to use the modified definitions.)

@item
Use a suitable shared library mechanism for linking with the Library. A
suitable mechanism is one that (1) uses at run time a copy of the
library already present on the user's computer system, rather than
copying library functions into the executable,
and (2) will operate
properly with a modified version of the library, if the user installs
one, as long as the modified version is interface-compatible with the
version that the work was made with.

@item
Accompany the work with a written offer, valid for at
least three years, to give the same user the materials
specified in Subsection 6a, above, for a charge no more
than the cost of performing this distribution.

@item
If distribution of the work is made by offering access to copy
from a designated place, offer equivalent access to copy the above
specified materials from the same place.

@item
Verify that the user has already received a copy of these
materials or that you have already sent this user a copy.
@end enumerate

For an executable, the required form of the ``work that uses the
Library" must include any data and utility programs needed for
reproducing the executable from it. However, as a special exception,
the materials to be distributed need not include anything that
is
normally distributed (in either source or binary form) with the major
components (compiler, kernel, and so on) of the operating system on
which the executable runs, unless that component itself accompanies the
executable.

It may happen that this requirement contradicts the license
restrictions of other proprietary libraries that do not normally
accompany the operating system. Such a contradiction means you cannot
use both them and the Library together in an executable that you
distribute.

@item
You may place library facilities that are a work based on the
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library, provided that the separate distribution of the work based on
the Library and of the other library facilities is otherwise
permitted, and provided that you do these two things:

@enumerate a
@item
Accompany the combined library with a copy of the same work
based on the Library,
uncombined with any other library
facilities. This must be distributed under the terms of the
Sections above.

@item
Give prominent notice with the combined library of the fact
that part of it is a work based on the Library, and explaining
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@subheading END OF TERMS AND CONDITIONS

@page
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USA.
@end
 smallexample

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@var{signature of Ty Coon}, 1 April 1990
Ty Coon, President of Vice
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Version 3, 29 June 2007

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Description:
Concatenate two arbitrary file names.

Files:
lib/filenamecat.h
lib/filenamecat-lgpl.c
m4/filenamecat.m4

Depends-on:
dirname-lgpl

configure.ac:
gl_FILE_NAME_CONCAT_LGPL

Makefile.am:
lib_SOURCES += filenamecat-lgpl.c

Include:
"filenamecat.h"

License:
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Maintainer:
Jim Meyering
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If you develop a new program, and you want it to be of the greatest possible use to the public, the best way to achieve this is to make it free software which everyone can redistribute and change under these terms.

To do so, attach the following notices to the program. It is safest to attach them to the start of each source file to most effectively state the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

<one line to give the program's name and a brief idea of what it does.>
Copyright (C) <year> <name of author>

This program is free software: you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation, either version 3 of the License, or (at your option) any later version.

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Also add information on how to contact you by electronic and paper mail.

If the program does terminal interaction, make it output a short

notice like this when it starts in an interactive mode:

<program> Copyright (C) <year> <name of author>
This program comes with ABSOLUTELY NO WARRANTY; for details type `show w'.
This is free software, and you are welcome to redistribute it
under certain conditions; type `show c' for details.

The hypothetical commands `show w' and `show c' should show the appropriate
parts of the General Public License. Of course, your program's commands
might be different; for a GUI interface, you would use an "about box".

You should also get your employer (if you work as a programmer) or school,
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may consider it more useful to permit linking proprietary applications with
the library. If this is what you want
to do, use the GNU Lesser General
Public License instead of this License. But first, please read
<https://www.gnu.org/licenses/why-not-lgpl.html>.
Files:
tests/test-canonicalize-lgpl.c
tests/signature.h
tests/null-ptr.h
tests/macros.h

Depends-on:
ignore-value
same-inode
symlink

configure.ac:

Makefile.am:
TESTS += test-canonicalize-lgpl
check_PROGRAMS += test-canonicalize-lgpl
Description:
Provide the GNU Free Documentation License in Texinfo format.

Files:
doc/fdl.texi

Depends-on:

configure.ac:

Makefile.am:

Include:

License:
unmodifiable license text

Maintainer:
all
Legal Issues about Contributing Code to GNU last updated 14 July 2015

Project GNU has to be careful to obey copyright laws, even though these laws are wrong when they stop people from sharing generally useful published information such as software, because we are in the public eye. We also use copyright to defend users' freedom, by means of copyleft (though this does not excuse copyright law for helping to make software proprietary).

This means that if you want to contribute software to GNU, you have to do something to give us legal permission to use it. There are three ways this can be done:

* Assign the copyright to the Free Software Foundation.
This allows the FSF to act to stop violations of the GPL.

* Keep the copyright and release the program yourself under the GNU GPL. (This alternative is too impractical for contributions to a preexisting FSF-copyrighted GNU program.)

* Put the code in the public domain. Then there is nothing to stop hoarding of modified versions, but we
can still use the program in GNU.

Most of these alternatives require a signed piece of paper, or in some cases a digital signature, to make it happen.

* Assigning copyright.

Assigning the copyright means signing a contract that makes the Free Software Foundation the "owner" of the program according to the law. As the copyright holder, the Foundation can sue anyone who tries to distribute the program as a proprietary product. We are willing to keep your name on the program as the author for as long as the program remains recognizably distinct. ("Owner" is in quotes to show that we don't really believe in this kind of ownership.)

The assignment contract commits the foundation to setting distribution

terms that permit free redistribution.

Often we don't want to do the work of starting to distribute a program right away. There are many things which we will need in order to have a complete system but which aren't really useful until the rest of the system is done. But signing the
assignment does not stop you from
distributing the program yourself--as long as you do so under the GNU terms. You don't have to wait for us to start distributing. You can start distributing as soon as you attach our standard copyleft to the files. (Ask for our advice on how to do this.)

The assignment contract we normally use has a clause that permits you to use your code in proprietary programs, on 30 days' notice. (The 30 days' notice is there because, through a legal technicality, it would improve our position in a suit against a hoarder.) Although we believe that proprietary software is wrong, we include this clause because it would serve no purpose to ask you to promise not to do it. You're giving us a gift in the first place.

You don't need to invoke this clause in order to distribute copies as free software under the GNU GPL, since everyone is allowed to do that.

* Releasing it yourself.

You can release a program yourself under copyleft distribution terms such as the
GNU GPL. (In order to accept the program as GNU software, we would have to be happy with your choice of terms.) This does not require a contract between you and the FSF, but we would appreciate having a signed piece of paper to confirm your decision.

If someone violates your terms--for example, if someone gets a copy from us, and uses it as a basis for a proprietary product in violation of the terms--we cannot sue him. You would have to sue, or he gets away with it.

* Public domain.

If you put the program in the public domain, we prefer to have a signed piece of paper--a disclaimer of rights--from you confirming this. If the program is not very important, we can do without one; the worst that could happen is that we might some day be forced to stop using it.

The law says that anyone can copyright a modified version of the public domain work. (This doesn't restrict the original, which remains in the public domain; only the changes are copyrighted.) If we make extensive changes,

we will probably do this and add our usual copyleft. If we make small changes, we will leave the version we distribute in the public domain.

* What about your employer?

If you are employed to do programming, or have made an agreement with your employer that says it owns programs you write, we need a signed piece of paper from your employer disclaiming rights to the program. It should be signed by a vice president or general manager of the company. If you can't get at them, it is almost as good to find someone who signs licenses for software that is purchased. Here is a sample wording:

Digital Simulation Corporation hereby disclaims all copyright interest in the program "sample.el" (a program to direct assemblers to make passes at compilers under GNU Emacs) written by Hugh Hacker.

<signature of Mo Ghoul>, 1 April 1987
Mo Ghoul, President of Vice, Digital Simulation Corp.

The description of what the program does is just to make it clearer what the disclaimer covers.

If
what you did was change an existing program, it should say this:

...in the changes and enhancements made by Hugh Hacker to the program "sample.el".

* Did anyone else contribute?

If someone else contributed more than a few lines here or there to the program, then that person too is an author, and that person too needs to sign papers just as you do. So may that person's employer. However, if his contribution is just a fraction of the whole work, it is satisfactory if he disclaims his own rights, even if you are assigning yours. (If just the minor contributors' work goes in the public domain, that doesn't leave much of a loophole for hoarders.)

If you incorporated packages which you found floating around as "public domain", we might still want to track down their authors, to get disclaimers to reassure us that they really are in the public domain. So keep track of what these packages are and who wrote them.

* A reminder:

In working on a project for GNU, DO NOT study and

follow any Unix
sources or other non-free software that might have any bearing on the
project. Don't refer to them at all, unless you are forced to for
non-GNU reasons.

It is not considered a serious problem if you have read Unix sources
or other non-free source code in the past for other purposes, provided
you don't copy anything in particular from them. However, referring
to them while you do the work could cause us legal problems later.
Please email the following information to assign@gnu.org, and we
will send you the assignment form for your past and future changes.

Please use your full legal name (in ASCII characters) as the subject
line of the message.

REQUEST: SEND FORM FOR PAST AND FUTURE CHANGES

[What is the name of the program or package you're contributing to?]

[Did you copy any files or text written by someone else in these changes?
Even if that material is free software, we need to know about it.]

[Do you have an employer who might have a basis to claim to own
your changes? Do you attend a school which might make such a claim?]

[For the copyright registration, what country are you a citizen of?]

[What year were you born?]

[Please write your email address here.]

[Please write your postal address here.]

[Which files have you changed so far, and which new files have you written
so far?]
Description:
Help make libraries relocatable, that is, to allow them to function
properly when copied to an arbitrary directory.

Files:
doc/relocatable.texi
lib/relocatable.h
lib/relocatable.c
lib/relocatable.valgrind
m4/relocatable-lib.m4

Depends-on:
strdup

configure.ac:
gl_RELOCATABLE_LIBRARY
if test $RELOCATABLE = yes; then
 AC_LIBOBJ([relocatable])
fi

Makefile.am:
DEFS += -DNO_XMALLOC

Include:
"relocatable.h"

License:
LGPLv2+

Maintainer:
Ben Pfaff
Description:
Ensure getcwd(NULL, 0) returns a buffer allocated by the malloc() function.

Files:
lib/getcwd-lgpl.c
m4/getcwd.m4

Depends-on:
unistd
strdup [test $REPLACE_GETCWD = 1]

configure.ac:
gl_FUNC_GETCWD_LGPL
if test $REPLACE_GETCWD = 1; then
 AC_LIBOBJ([getcwd-lgpl])
fi
gl_UNISTD_MODULE_INDICATOR([getcwd])

Makefile.am:

Include:
<unistd.h>

License:
LGPLv2+

Maintainer:
Eric Blake

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Version 2, June 1991

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Program does.

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Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Program.

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<one line to give the program's name and a brief idea of what it does.>
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If the program is interactive, make it output a short notice like this when it starts in an interactive mode:

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This is free software, and you are welcome to redistribute
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The hypothetical commands `show w' and `show c' should show the appropriate parts of the General Public License. Of course, the commands you use may be called something other than `show w' and `show c'; they could even be mouse-clicks or menu items--whatever suits your program.

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Yoyodyne, Inc., hereby disclaims all copyright interest in the program
`Gnomovision' (which makes passes at compilers) written by James Hacker.

<signature of Ty Coon>, 1 April 1989
Ty Coon, President of Vice

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Version 2.1, February 1999

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uses the
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a) Accompany
the work with the complete corresponding
machine-readable source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable "work that uses the Library", as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood

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properly with a modified version of the library, if the user installs one, as long as the modified version is interface-compatible with the version that the work was made with.

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<one line to give the library's name and a brief idea of what it does.>
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school, if any, to sign a "copyright disclaimer" for the library, if
necessary. Here is a sample; alter the names:

Yoyodyne, Inc., hereby disclaims all copyright interest in the
library `Frob' (a library for tweaking knobs) written by James Random Hacker.

<signature of Ty Coon>, 1 April 1990
Ty Coon, President of Vice

That's all there is to it!
Description:
Locating a program in PATH (LGPLed version).

Files:
lib/findprog.h
lib/findprog.c
lib/findprog-lgpl.c
m4/findprog.m4
m4/eaccess.m4

Depends-on:
stdbool
strdup
concat-filename
access
unistd

configure.ac:
gl_FINDPROG
gl_MODULE_INDICATOR([findprog-lgpl])

Makefile.am:
lib_SOURCES += findprog.h findprog.c

Include:
"findprog.h"

License:
LGPLv2+

Maintainer:
all
The files in this directory describe the gnulib modules.
The following copyright notice applies to each of these
description files.

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send you the assignment form that covers the changes you have already
written. That form will cover subsequent corrections to those
changes, but it will not cover other unrelated future changes to the
same program.

Please use your full legal name (in ASCII characters) as the subject line of the message.

REQUEST: SEND FORM FOR CHANGES ALREADY MADE

[What is the name of the program or package you're contributing to?]

[Did you copy any files or text written by someone else in these changes?
Even if that material is free software, we need to know about it.]

[Do you have an employer who might have a basis to claim to own
your changes? Do you attend a school which might make such a claim?]

[For the copyright registration, what country are you a citizen of?]

[What year were you born?]

[Please write your email address here.]

[Please write your
postal address here.]

[Which files have you changed so far, and which new files have you written
so far?]
Files:
tests/test-getcwd-lgpl.c
tests/signature.h
tests/macros.h

Depends-on:

configure.ac:

Makefile.am:
TESTS += test-getcwd-lgpl
check_PROGRAMS += test-getcwd-lgpl
test_getcwd_lgpl_LDADD = $(LDADD) $(LIBINTL)
Please email the following information to assign@gnu.org, and we will
send you the disclaimer form for your changes. This form is preferred
when your changes are small, they do not add any nontrivial new
files, and you are finished making them (aside perhaps from small bug
fixes).

If you would like to make further contributions to the same package,
and you would like to avoid the need to sign more papers when you
contribute them, you have another option: to sign a copyright
assignment covering your future changes. If that is what you want to
do, please tell the maintainer you would prefer to sign an assignment
of past and future changes.

Please use your full legal name (in ASCII characters) as the subject
line of the message.

REQUEST: SEND DISCLAIMER FORM

[What is the name of the program or package you're contributing to?]

[Did you copy any files or text written by someone else in these changes?
Even if that

material is free software, we need to know about it.]

[Do you have an employer who might have a basis to claim to own
your changes?]

[Please write your email address here.]

[Please write your snail address here.]

[Please list the files involved, or give a brief description of the changes
being disclaimed.]
Description:
realpath, canonicalize_file_name: Provide canonical absolute file name

Files:
lib/canonicalize-lgpl.c
m4/canonicalize.m4
m4/double-slash-root.m4

Depends-on:
extensions
stdlib
nocrash
alloca-opt [test $HAVE_CANONICALIZE_FILE_NAME = 0 || test
$REPLACE_CANONICALIZE_FILE_NAME = 1]
errno [test $HAVE_CANONICALIZE_FILE_NAME = 0 || test
$REPLACE_CANONICALIZE_FILE_NAME = 1]
lstat [test $HAVE_CANONICALIZE_FILE_NAME = 0 || test $REPLACE_CANONICALIZE_FILE_NAME
= 1]
malloca [test $HAVE_CANONICALIZE_FILE_NAME = 0 || test
$REPLACE_CANONICALIZE_FILE_NAME = 1]
memmove [test $HAVE_CANONICALIZE_FILE_NAME = 0 || test
$REPLACE_CANONICALIZE_FILE_NAME = 1]
pathmax [test $HAVE_CANONICALIZE_FILE_NAME = 0 || test
$REPLACE_CANONICALIZE_FILE_NAME = 1]
readlink [test $HAVE_CANONICALIZE_FILE_NAME = 0 || test
$REPLACE_CANONICALIZE_FILE_NAME = 1]
sys_stat [test $HAVE_CANONICALIZE_FILE_NAME = 0 || test
$REPLACE_CANONICALIZE_FILE_NAME = 1]

configure.ac:

gl_CANONICALIZE_LGPL
if
 test $HAVE_CANONICALIZE_FILE_NAME = 0 || test $REPLACE_CANONICALIZE_FILE_NAME = 1; then
 AC_LIBOBJ([canonicalize-lgpl])
fi
gl_MODULE_INDICATOR([canonicalize-lgpl])
gl_STDLIB_MODULE_INDICATOR([canonicalize_file_name])
gl_STDLIB_MODULE_INDICATOR([realpath])

Makefile.am:

Include:
<stdlib.h>

License:
LGPLv2+

Maintainer:
all
Description:
Extract specific portions of filenames.

Files:
lib/dirname.h
lib/dirname-lgpl.c
lib/basename-lgpl.c
lib/stripslash.c
m4/dirname.m4

Depends-on:
dosname
double-slash-root
malloc-posix
stdbool

configure.ac:
gl_DIRNAME_LGPL

Makefile.am:
lib_SOURCES += dirname-lgpl.c basename-lgpl.c stripslash.c

Include:
"dirname.h"

License:
LGPLv2+

Maintainer:

Jim Meyering, Eric Blake

1.199 hd-parm 9.38

1.199.1 Available under license :

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to distribute corresponding source code. (This alternative is
allowed only for noncommercial distribution and only if you
received the program
in object code or executable form with such
an offer, in accord with Subsection b above.)

The source code for a work means the preferred form of the work for
making modifications to it. For an executable work, complete source
code means all the source code for all modules it contains, plus any
associated interface definition files, plus the scripts used to
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form) with the major components (compiler, kernel, and so on) of the
operating system on which the executable runs, unless that component
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1.200 libjpeg 8d

1.200.1 Available under license :

This is Debian's prepackaged version of the `jpeg library' by the Independent
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This package was created by Mark Mickan <mmickan@debian.org> from sources
which can be found at ftp://ftp.uu.net/graphics/jpeg/jpegsrc.v6b.tar.gz

It is partly based on the libjpeg6a package originally put together by
Andy Guy <awpguy@acs.ucalgary.ca> and later maintained by Mark Mickan.

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1.201 zlib 1.2.11.dfsg-2ubuntu1.2

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Found license 'General Public License 2.0' in 'No. PKWare has apparently decided to keep that format proprietary, since 42. The match.asm code in contrib is under the GNU General Public License. GNU GPL?'

/* zlib.h -- interface of the 'zlib' general purpose compression library
version 1.2.11, January 15th, 2017

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Jean-loup Gailly Mark Adler
jloup@gzip.org madler@alumni.caltech.edu

The data format used by the zlib library is described by RFCs (Request for
Comments) 1950 to 1952 in the files http://tools.ietf.org/html/rfc1950
(zlib format), rfc1951 (deflate format) and rfc1952 (gzip format).
*/

1.202 xmltooling 3.0.5-1build1

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*
* From: Wilco Dijkstra <Wilco.Dijkstra@ntlworld.com>
* Date: Fri, Jun 24, 2011 at 3:20 AM
* Subject: Re: sqrt routine
* To: Kevin Ma <kma@google.com>
* Hi Kevin,
* Thanks for asking. Those routines are public domain (originally posted to
```

* comp.sys.arm a long time ago), so you can use them freely for any purpose.
* Cheers,
* Wilco
*
* ----- Original Message -----
* From: "Kevin Ma" <kma@google.com>
* To: <Wilco.Dijkstra@ntlworld.com>
* Sent: Thursday, June 23, 2011 11:44 PM
* Subject: Fwd: sqrt routine
* Hi Wilco,
* I saw your sqrt routine from several web sites, including
* http://www.finesse.demon.co.uk/steven/sqrt.html.
 * Just wonder if there's any copyright information with your Successive
* approximation routines, or if I can freely use it for any purpose.
* Thanks.
* Kevin
*/

Files:
modules/audio_coding/codecs/g711/main/source/g711.c
modules/audio_coding/codecs/g711/main/source/g711.h

License:

```
/*
* SpanDSP - a series of DSP components for telephony
*
* g711.h - In line A-law and u-law conversion routines
*
* Written by Steve Underwood <steveu@coppice.org>
*
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modules/audio_coding/codecs/g722/main/source/g722_enc_dec.h
modules/audio_coding/codecs/g722/main/source/g722_encode.c

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```
/*
 * SpanDSP - a series of DSP components for telephony
*
* g722_decode.c - The ITU G.722 codec, decode part.
```

*
* Written by Steve Underwood <steveu@coppice.org>
*
* Copyright (C) 2005 Steve Underwood
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*
* Based in part on a single channel G.722 codec which is:
*
* Copyright (c) CMU 1993
* Computer Science, Speech Group
* Chengxiang Lu and Alex Hauptmann
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modules/audio_device/mac/portaudio/pa_ringbuffer.c
modules/audio_device/mac/portaudio/pa_ringbuffer.h

License:

```
/*
 * $Id: pa_memorybarrier.h 1240 2007-07-17 13:05:07Z bjornroche $
* Portable Audio I/O Library
* Memory barrier utilities
*
* Author: Bjorn Roche, XO Audio, LLC
*
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```

```
*/

/*
* $Id: pa_ringbuffer.c 1421 2009-11-18 16:09:05Z bjornroche $
* Portable Audio I/O Library
* Ring Buffer utility.
*
* Author: Phil Burk, http://www.softsynth.com
* modified for SMP safety on Mac OS X by Bjorn Roche
* modified for SMP safety on Linux by Leland Lucius
* also, allowed for const where possible
* modified for multiple-byte-sized data elements by Sven Fischer
*
* Note that this is safe only for a single-thread reader and a
* single-thread writer.
*
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Source:
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1.212 linux-kernel 4.4.245

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 Video4Linux interface and 2.1.x kernel adaptation

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Ragnar Hojland Espinosa <ragnar@macula.net>
 ConferenceTV card

+ many more (please mail me if you are missing in this list and would
     like to be mentioned)
/* nicstar.c v0.22 Jawaid Bazyar (bazyar@hypermall.com)
* nicstar.c, M. Welsh (matt.welsh@cl.cam.ac.uk)
*
* Hacked October, 1997 by Jawaid Bazyar, Interlink Advertising Services Inc.
* http://www.hypermall.com/
* 10/1/97 - commented out CFG_PHYIE bit - we don't care when the PHY
* interrupts us (except possibly for removal/insertion of the cable?)
* 10/4/97 - began heavy inline documentation of the code. Corrected typos
* and spelling mistakes.
* 10/5/97 - added code to handle PHY interrupts, disable PHY on
* loss of link, and correctly re-enable PHY when link is
* re-established. (put back CFG_PHYIE)
*
*   Modified to work with the IDT7721 nicstar -- AAL5 (tested) only.
*
* R. D. Rechenmacher <ron@fnal.gov>, Aug. 6, 1997
*
* Linux driver for the IDT77201 NICStAR PCI ATM controller.
* PHY component is expected to be 155 Mbps S/UNI-Lite or IDT 77155;
* see init_nicstar() for PHY initialization to change this. This driver
* expects the Linux ATM stack to support scatter-gather
 lists
* (skb->atm.iovcnt != 0) for Rx skb's passed to vcc->push.
*
* Implementing minimal-copy of received data:

```
*   IDT always receives data into a small buffer, then large buffers
*    as needed. This means that data must always be copied to create
*    the linear buffer needed by most non-ATM protocol stacks (e.g. IP)
*    Fix is simple: make large buffers large enough to hold entire
*    SDU, and leave <small_buffer_data> bytes empty at the start. Then
*    copy small buffer contents to head of large buffer.
*   Trick is to avoid fragmenting Linux, due to need for a lot of large
*    buffers. This is done by 2 things:
*      1) skb->destructor / skb->atm.recycle_buffer
*           combined, allow nicstar_free_rx_skb to be called to
*           recycle large data buffers
*      2) skb_clone of received buffers
*   See nicstar_free_rx_skb and linearize_buffer for implementation
*    details.
*
*
*
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*
* M. Welsh, 6 July 1996
*
*
*/
```

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for his work on the initial Linux DVB driver

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for his contributions to the dvb-net driver

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 for CyberLogin for Linux which allows logging onto EON
 (in case you are wondering where CyberLogin is, EON changed its login
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Section 6 states terms for distribution of such executables.

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If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the
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a) Accompany
the work with the complete corresponding
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Version 3, 29 June 2007

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  * Optimize Java serialization of strings so that UTF-8 encoding happens only
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1.232 x264 0.155.2917+git0a84d98-2

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1.233 flyway-test 6.4.0

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Found in path(s):
* /flyway-test-6-4-0-sources-jar/org/flywaydb/test/annotation/package-info.java
* /flyway-test-6-4-0-sources-jar/org/flywaydb/test/annotation/FlywayTest.java
* /flyway-test-6-4-0-sources-jar/org/flywaydb/test/annotation/FlywayTests.java

1.234 flyway-spring5-test 6.4.0

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Found in path(s):
* /flyway-spring5-test-6-4-0-sources-jar/context/dataSourceSingleContext.xml
* /flyway-spring5-test-6-4-0-sources-jar/context/simple_applicationContext.xml
* /flyway-spring5-test-6-4-0-sources-jar/context/flywayContainerContext.xml
* /flyway-spring5-test-6-4-0-sources-jar/context/flywaySingleContext.xml
* /flyway-spring5-test-6-4-0-sources-jar/context/secondFlywayContainerContext.xml
*
/flyway-spring5-test-6-4-0-sources-jar/context/flywayPropertiesContext.xml
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* /flyway-spring5-test-6-4-0-sources-jar/org/flywaydb/test/junit5/annotation/FlywayTestExtension.java
* /flyway-spring5-test-6-4-0-sources-jar/org/flywaydb/test/junit5/FlywayTestExtension.java
* /flyway-spring5-test-6-4-0-sources-jar/org/flywaydb/test/junit/FlywayTestExecutionListener.java
*
/flyway-spring5-test-6-4-0-sources-jar/org/flywaydb/test/ExecutionListenerHelper.java
* /flyway-spring5-test-6-4-0-sources-jar/org/flywaydb/test/junit/FlywayHelperFactory.java
* /flyway-spring5-test-6-4-0-sources-jar/org/flywaydb/test/junit5/annotation/package-info.java
* /flyway-spring5-test-6-4-0-sources-jar/org/flywaydb/test/package-info.java
* /flyway-spring5-test-6-4-0-sources-jar/org/flywaydb/test/junit/package-info.java
* /flyway-spring5-test-6-4-0-sources-jar/org/flywaydb/test/FlywayTestExecutionListener.java
* /flyway-spring5-test-6-4-0-sources-jar/org/flywaydb/test/FlywayHelperFactory.java
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1.235 flyway-core 7.3.1

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Found in path(s):
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/postgresql/PostgreSQLTable.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/configuration/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/license/VersionPrinter.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/command/DbRepair.java
*
 /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/informix/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/InsertRowLock.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/oracle/OracleDatabase.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/parser/PlaceholderReplacingReader.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/clazz/NoopClassProvider.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/output/MigrateResult.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/scanner/classpath/ClassPathScanner.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/cockroachdb/CockroachDBConnection.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/base/SchemaObject.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/jdbc/JdbcNullTypes.java
*

/flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/mysql/MySQLDatabase.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/strategy/BackoffStrategy.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sqlserver/synapse/SynapseDatabaseType.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/util/Locations.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/sqlscript/SqlScriptExecutorFactory.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/scanner/ResourceNameCache.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/oracle/OracleParser.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/redshift/RedshiftDatabaseType.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/scanner/classpath/jboss/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/base/DatabaseType.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/informix/InformixDatabase.java
*
/flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/logging/LogFactory.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sqlserver/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/sqlscript/SqlStatement.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/util/DateUtils.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/logging/log4j2/Log4j2Log.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/redshift/RedshiftDatabase.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/db2/DB2Table.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/output/BaselineResult.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/parser/PositionTrackingReader.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/scanner/ClasspathClassScanner.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/Location.java
*
/flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/oracle/OracleSchema.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/callback/Warning.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/util/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/callback/SimpleContext.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/output/OperationResult.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sybasease/SybaseASETable.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/configuration/ConfigUtils.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/jdbc/WarningImpl.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/db2/DB2Connection.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/postgresql/PostgreSQLConnection.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/parser/Recorder.java
*
/flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/logging/apachecommons/ApacheCommonsLogCreator.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/logging/apachecommons/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/derby/DerbyParser.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/output/ErrorOutput.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/scanner/classpath/JarUtils.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/android/ContextHolder.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sqlite/SQLiteParser.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/oracle/OracleResults.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/output/ValidateOutput.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/scanner/filesystem/FileSystemScanner.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/output/ValidateResult.java

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/flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/authentication/ExternalAuthPropertiesProvider.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/output/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/callback/SqlScriptCallbackFactory.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/parser/ParsingContext.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/redshift/RedshiftType.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/logging/slf4j/Slf4jLog.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/authentication/postgres/PgpassFileReader.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sqlite/SQLiteDatabase.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/migration/Context.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resolver/ResolvedMigrationImpl.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/logging/javautil/JavaUtilLog.java
*
/flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resolver/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resource/s3/AwsS3Resource.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/util/CloseableIterator.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/exception/FlywayDbUpgradeRequiredException.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/h2/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/cockroachdb/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/mysql/MySQLParser.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/h2/H2DatabaseType.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/derby/DerbyDatabase.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sybasease/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/configuration/Configuration.java
*
/flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/util/AsciiTable.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/jdbc/ExecutionTemplateFactory.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resolver/sql/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/util/SqlCallable.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/hsqldb/HSQLDBParser.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/postgresql/PostgreSQLDatabaseType.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/output/RepairOutput.java
* /flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/database/sybasease/SybaseASEJConnectDatabaseType.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/db2/DB2Type.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/resolver/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/sqlscript/SqlScriptMetadata.java
*
/flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/authentication/ExternalAuthFileReader.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/MigrationPattern.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/info/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/mysql/MySQLTable.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/saphana/SAPHANADatabase.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/Flyway.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resource/classpath/ClassPathResource.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resource/classpath/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/scanner/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/FlywayException.java

* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/callback/Context.java
*
 /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/migration/JavaMigration.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/output/RepairResult.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/postgresql/PostgreSQLDatabase.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/schemahistory/SchemaHistory.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/logging/android/AndroidLogCreator.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/informix/InformixTable.java
* /flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/scanner/classpath/JarFileClassPathLocationScanner.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/derby/DerbyDatabaseType.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/sqlscript/SqlScriptFactory.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/exception/FlywayValidateException.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/jdbc/StatementInterceptor.java
*
 /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/redshift/RedshiftSchema.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/info/MigrationInfoContext.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/sqlscript/ParserSqlScript.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/resolver/ChecksumMatcher.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/util/BomFilter.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/callback/Statement.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/jdbc/ErrorImpl.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/logging/LogCreatorFactory.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/migration/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/logging/slf4j/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/output/MigrateOutput.java
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 /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sqlserver/SQLServerTable.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/parser/ParserContext.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/logging/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/saphana/SAPHANAParser.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/output/CommandResultFactory.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resolver/java/JavaMigrationExecutor.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/snowflake/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/base/Database.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/util/FileCopyUtils.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/mysql/MySQLNamedLockTemplate.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/hsqldb/HSQLDBDatabase.java
*
 /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/util/BooleanEvaluator.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/scanner/classpath/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/callback/CallbackExecutor.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sqlserver/SQLServerSchema.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/derby/DerbyTable.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/scanner/cloud/s3/AwsS3Scanner.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/db2/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resolver/sql/DefaultSqlMigrationExecutorFactory.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/snowflake/SnowflakeParser.java

* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/logging/javautil/JavaUtilLogCreator.java
*
 /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/cockroachdb/CockroachDBTable.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/oracle/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sqlserver/SQLServerConnection.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/redshift/RedshiftParser.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resource/StringResource.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resource/gcs/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/parser/PositionTracker.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/jdbc/PlainExecutionTemplate.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resolver/CompositeMigrationResolver.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/scanner/classpath/jboss/JBossVFSv2UrlResolver.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/h2/H2Database.java
*
 /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/parser/Statement.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/callback/BaseCallback.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/resolver/ResolvedMigration.java
* /flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/database/postgresql/PostgreSQLCopyParsedStatement.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/db2/DB2Parser.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/firebird/FirebirdTable.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/scanner/classpath/ResourceAndClassScanner.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/oracle/OracleConnection.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/DefaultExecutionStrategy.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resource/LoadableResource.java
*
 /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/MigrationType.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/output/CleanResult.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/util/ClassUtils.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/logging/apachecommons/ApacheCommonsLog.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/h2/H2Table.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/callback/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/license/FlywayTeamsUpgradeMessage.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/ErrorDetails.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/firebird/FirebirdDatabase.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/db2/DB2DatabaseType.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sqlserver/synapse/SynapseDatabase.java
*
 /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/postgresql/PostgreSQLType.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/base/Function.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resource/ResourceType.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/parser/TokenType.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/util/AbbreviationUtils.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/ErrorCode.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/hsqldb/HSQLDBTable.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/jdbc/JdbcConnectionFactory.java

* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/base/Connection.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sqlserver/SQLServerDatabaseType.java
*
 /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/firebird/FirebirdConnection.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/callback/Event.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/executor/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/sqlscript/ParsedSqlStatement.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sqlserver/SQLServerDatabase.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/sqlscript/Delimiter.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/base/TestContainersDatabaseType.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/util/ExceptionUtils.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/saphana/SAPHANAConnection.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/parser/RecordingReader.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/scanner/Scanner.java
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 /flyway-core-7-3-1-sources-
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* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/authentication/mysql/MySQLOptionFileReader.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/util/IOUtils.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/util/UrlUtils.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/hsqldb/HSQLDBSchema.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/exception/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resource/android/AndroidResource.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/parser/PeekingReader.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resolver/ChecksumCalculator.java
* /flyway-core-7-3-1-sources-
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 /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/output/InfoOutput.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/cockroachdb/CockroachDBParser.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/callback/Error.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resource/Resource.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resource/gcs/GCSResource.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/scanner/classpath/OsgiClassPathLocationScanner.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/InfoOutputProvider.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/license/FlywayEditionUpgradeRequiredException.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/postgresql/PostgreSQLSchema.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/hsqldb/HSQLDBConnection.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/resolver/Context.java
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 /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/util/BomStrippingReader.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/output/UndoOutput.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/license/FlywayTeamsUpgradeRequiredException.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/DatabaseTypeRegister.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sybasease/SybaseASESchema.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/jdbc/TableLockingExecutionTemplate.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/util/TimeFormat.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/util/StopWatch.java

* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/logging/android/AndroidLog.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resource/s3/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/info/MigrationInfoServiceImpl.java
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 /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/base/Schema.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/configuration/S3ClientFactory.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/derby/DerbyConnection.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/scanner/classpath/UrlResolver.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/parser/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sqlserver/SQLServerParser.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/logging/LogCreator.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/jdbc/RowMapper.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/redshift/RedshiftConnection.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resource/ResourceNameValidator.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/executor/MigrationExecutor.java
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 /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/util/StringUtils.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/scanner/android/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/scanner/classpath/ClassPathLocationScanner.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/sqlscript/SqlScript.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/mysql/MySQLConnection.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/util/FeatureDetector.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/postgresql/PostgreSQLParser.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resource/ResourceNameParser.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sqlite/SQLiteSchema.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/executor/Context.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resource/ResourceName.java
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 /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/oracle/OracleDatabaseType.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/command/DbClean.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/snowflake/SnowflakeSchema.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resolver/java/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/h2/H2Connection.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/postgresql/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/MigrationInfo.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/logging/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/MigrationState.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/DatabaseExecutionStrategy.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/jdbc/DriverDataSource.java
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 /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/mysql/mariadb/MariaDBDatabase.java
* /flyway-core-7-3-1-sources-
jar/org/flywaydb/core/internal/database/sybasease/SybaseASEJTDSDatabaseType.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/mysql/mariadb/MariaDBDatabaseType.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/configuration/ConfigurationValidator.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/license/Edition.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/cockroachdb/CockroachDBDatabase.java

* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/license/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sqlite/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/callback/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/firebird/FirebirdSchema.java
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 /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/firebird/FirebirdParser.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/db2/DB2Database.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/configuration/FluentConfiguration.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/h2/H2Schema.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/logging/Log.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/firebird/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sybasease/SybaseASEParser.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/snowflake/SnowflakeDatabase.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/schemahistory/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sybasease/SybaseASEConnection.java
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 /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resource/filesystem/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resource/NoopResourceProvider.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resolver/sql/SqlMigrationExecutorFactory.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/scanner/classpath/DefaultUrlResolver.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/jdbc/Results.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sqlserver/SQLServerEngineEdition.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/util/Pair.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/hsqldb/HSQLDBDatabaseType.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/oracle/OracleTable.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/informix/InformixConnection.java
*
 /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/snowflake/SnowflakeDatabaseType.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/base/Type.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/callback/Callback.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/callback/NoopCallbackExecutor.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/jdbc/Result.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/snowflake/SnowflakeConnection.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sqlserver/synapse/SynapseTable.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/command/DbValidate.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sqlite/SQLiteTable.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/resolver/MigrationResolver.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/command/package-info.java
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 /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/callback/DefaultCallbackExecutor.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/android/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sqlite/SQLiteDatabaseType.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/hsqldb/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sybasease/SybaseASEDatabase.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/jdbc/JdbcTemplate.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/logging/slf4j/Slf4jLogCreator.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/configuration/package-info.java

* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/derby/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/callback/NoopCallback.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/migration/BaseJavaMigration.java
*
 /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/redshift/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/mysql/MySQLSchema.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sqlite/SQLiteConnection.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resolver/sql/SqlMigrationResolver.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/parser/Parser.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resolver/java/FixedJavaMigrationResolver.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/output/InfoResult.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/informix/InformixSchema.java
* /flyway-core-7-3-1-sources-
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* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/MigrationInfoService.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/saphana/SAPHANADatabaseType.java
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* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/clazz/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/parser/StatementType.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/configuration/ClassicConfiguration.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/informix/InformixDatabaseType.java
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* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sqlserver/synapse/SynapseConnection.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/schemahistory/JdbcTableSchemaHistory.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/sqlscript/DefaultSqlScriptExecutor.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/command/DbBaseline.java
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 /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/sqlscript/SqlStatementIterator.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/snowflake/SnowflakeTable.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/strategy/RetryStrategy.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resource/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resolver/java/ResolvedJavaMigration.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/base/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/db2/DB2Schema.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/info/MigrationInfoDumper.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/jdbc/JdbcUtils.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/sqlserver/synapse/SynapseSchema.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resolver/java/ScanningJavaMigrationResolver.java
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* /flyway-core-7-3-1-sources-
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* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/jdbc/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/scanner/cloud/CloudScanner.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/output/OperationResultBase.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/oracle/OracleSqlScriptExecutor.java

* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/db2/DB2Function.java
* /flyway-core-7-3-1-sources-
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* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/schemahistory/SchemaHistoryFactory.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/info/AppliedMigrationAttributes.java
*
/flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/saphana/SAPHANATable.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/logging/javautil/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/ResourceProvider.java
* /flyway-core-7-3-1-sources-
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* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/jdbc/TransactionalExecutionTemplate.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/firebird/FirebirdDatabaseType.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/mysql/MySQLDatabaseType.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resource/filesystem/FileSystemResource.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/ClassProvider.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resolver/ResolvedMigrationComparator.java
*
/flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resolver/sql/SqlMigrationExecutor.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/h2/H2Parser.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/scanner/cloud/gcs/GCSScanner.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/scanner/LocationScannerCache.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/info/MigrationInfoImpl.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/sqlscript/FlywaySqlScriptException.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/mysql/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/derby/DerbySchema.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/command/DbMigrate.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/scanner/android/AndroidScanner.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/schemahistory/AppliedMigration.java
*
/flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/exception/FlywaySqlException.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/jdbc/ExecutionTemplate.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/sqlscript/package-info.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/command/DbSchemas.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/parser/UnboundedReadAheadReader.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/output/CompositeResult.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/informix/InformixParser.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/saphana/SAPHANASchema.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/command/DbInfo.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/MigrationVersion.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/base/Table.java
*
/flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resolver/MigrationInfoHelper.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/parser/Token.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/api/output/UndoResult.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/logging/log4j2/Log4j2LogCreator.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/redshift/RedshiftTable.java
* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/resource/android/package-info.java

* /flyway-core-7-3-1-sources-jar/org/flywaydb/core/internal/database/cockroachdb/CockroachDBSchema.java
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1.236 opencore-amr 0.1.3

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1.238 curl 7.50.1

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1.239 lombok 1.18.12

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1.240 reactive-streams 1.0.3

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1.241 commons-dbcp 1.4

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1.242 jul-to-slf4j 1.7.30

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1.243 spring-retry 1.2.5.RELEASE

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jar/org/springframework/retry/policy/RetryCacheCapacityExceededException.java
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* /spring-retry-1-2-5-release-sources-1-jar/org/springframework/classify/annotation/Classifier.java
* /spring-retry-1-2-5-release-sources-1-jar/org/springframework/classify/BackToBackPatternClassifier.java
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jar/org/springframework/retry/policy/SoftReferenceMapRetryContextCache.java
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jar/org/springframework/retry/interceptor/NewMethodArgumentsIdentifier.java
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jar/org/springframework/retry/interceptor/MethodArgumentsKeyGenerator.java
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* /spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/stats/DefaultStatisticsRepository.java
*
/spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/stats/ExponentialAverageRetryStatistics.java
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* /spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/stats/DefaultRetryStatistics.java
* /spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/stats/StatisticsRepository.java
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 /spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/annotation/Retryable.java
* /spring-retry-1-2-5-release-sources-1-jar/org/springframework/retry/interceptor/Retryable.java
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```
   * Creates a new JSRInliner. <i>Subclasses must not use this
   * constructor</i>. Instead, they must use the
   * {@link #JSRInlinerAdapter(int, MethodVisitor, int, String, String, String, String[])}
   * version.
   *
   * @param mv
   *
  the <code>MethodVisitor</code> to send the resulting inlined
   *          method code to (use <code>null</code> for none).
   * @param access
   *          the method's access flags (see {@link Opcodes}). This
   *          parameter also indicates if the method is synthetic and/or
   *          deprecated.
   * @param name
   *          the method's name.
   * @param desc
   *          the method's descriptor (see {@link Type}).
   * @param signature
   *          the method's signature. May be <tt>null</tt>.
   * @param exceptions
   *          the internal names of the method's exception classes (see
   *          {@link Type#getInternalName() getInternalName}). May be
   *          <tt>null</tt>.
   * @throws IllegalStateException
   *           If a subclass calls this constructor.
   */
```

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/**
   * Constructs a new {@link LocalVariableAnnotationNode}. <i>Subclasses must
   * not use this constructor</i>. Instead, they must use the
   * {@link #LocalVariableAnnotationNode(int, TypePath, LabelNode[], LabelNode[], int[], String)}
   * version.
   *

   * @param typeRef
   *          a reference to the annotated type. See {@link TypeReference}.
   * @param typePath
   *          the path to the annotated type argument, wildcard bound, array
   *          element type, or static inner type within 'typeRef'. May be
   *          <tt>null</tt> if the annotation targets 'typeRef' as a whole.
   * @param start
   *          the fist instructions corresponding to the continuous ranges
   *          that make the scope of this local variable (inclusive).
   * @param end
   *          the last instructions corresponding to the continuous ranges
   *          that make the scope of this local variable (exclusive). This
   *          array must have the same size as the 'start' array.
   * @param index
   *          the local variable's index in each range. This array must have
   *          the same size as the 'start' array.
   * @param desc
   *          the class descriptor of
 the annotation class.
   */
```

Found in path(s):
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/LocalVariableAnnotationNode.java
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*/
/**
   * Constructs a new {@link ClassNode}. <i>Subclasses must not use this
   * constructor</i>. Instead, they must use the {@link #ClassNode(int)}
   * version.
   *
   * @throws IllegalStateException
   *             If a subclass calls this constructor.
    */
```

Found in path(s):
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/ClassNode.java
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*/
/**
   * Creates a new {@link GeneratorAdapter}. <i>Subclasses must not use this
   * constructor</i>. Instead, they must use the
   * {@link #GeneratorAdapter(int, MethodVisitor, int, String, String)}
   * version.
   *
   * @param mv
   *            the
 method visitor to which this adapter delegates calls.
   * @param access
   *            the method's access flags (see {@link Opcodes}).
   * @param name
   *            the method's name.
   * @param desc
   *            the method's descriptor (see {@link Type Type}).
   * @throws IllegalStateException
   *             If a subclass calls this constructor.
   */
```

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* /asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/GeneratorAdapter.java
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* /asm-5-0-4-sources-6-jar/org/objectweb/asm/util/package.html
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/package.html
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/signature/package.html
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/package.html
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/package.html
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* /asm-5-0-4-sources-6-jar/org/objectweb/asm/xml/SAXClassAdapter.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/xml/SAXAdapter.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/xml/SAXAnnotationAdapter.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/xml/Processor.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/xml/SAXFieldAdapter.java
*
 /asm-5-0-4-sources-6-jar/org/objectweb/asm/xml/ASMContentHandler.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/xml/SAXCodeAdapter.java
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* /asm-5-0-4-sources-6-jar/org/objectweb/asm/TypePath.java
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*/
/**
    * Creates a new {@link AnalyzerAdapter}. Subclasses must not use this
    * constructor. Instead, they must use the

```
   * {@link #AnalyzerAdapter(int, String, int, String, String, MethodVisitor)}
   * version.
   *
   * @param owner
   *
     the owner's class name.
   * @param access
   *          the method's access flags (see {@link Opcodes}).
   * @param name
   *          the method's name.
   * @param desc
   *          the method's descriptor (see {@link Type Type}).
   * @param mv
   *          the method visitor to which this adapter delegates calls. May
   *          be <tt>null</tt>.
   * @throws IllegalStateException
   *           If a subclass calls this constructor.
   */
```

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* /asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/AnalyzerAdapter.java
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/**
   * Constructs a new {@link Textifier}. <i>Subclasses must not use this
   * constructor</i>. Instead, they must use the {@link #Textifier(int)}
   * version.
   *
   * @throws IllegalStateException
   *             If a subclass calls this constructor.
    */
```

Found in path(s):
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/util/Textifier.java
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* /asm-5-0-4-sources-6-jar/org/objectweb/asm/AnnotationWriter.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/SimpleVerifier.java
*
 /asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/NameMapping.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/util/Printer.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/Shrinker.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/Method.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/util/CheckAnnotationAdapter.java

* /asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/RemappingSignatureAdapter.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/RemappingFieldAdapter.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/ClassWriter.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/Attribute.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/SourceInterpreter.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/MethodInsnNode.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/MethodVisitor.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/util/TraceFieldVisitor.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/SourceValue.java
*
 /asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/AdviceAdapter.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/Remapper.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/BasicValue.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/FieldWriter.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/ByteVector.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/AbstractInsnNode.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/Interpreter.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/JumpInsnNode.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/TableSwitchGenerator.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/FieldNode.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/FieldInsnNode.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/LabelNode.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/ClassConstantsCollector.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/util/CheckSignatureAdapter.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/BasicVerifier.java
*
 /asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/CodeSizeEvaluator.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/InstructionAdapter.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/IntInsnNode.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/RemappingClassAdapter.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/MultiANewArrayInsnNode.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/ClassReader.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/VarInsnNode.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/RemappingMethodAdapter.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/Value.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/StaticInitMerger.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/AnnotationConstantsCollector.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/AnnotationVisitor.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/InsnNode.java
*
 /asm-5-0-4-sources-6-jar/org/objectweb/asm/signature/SignatureReader.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/LdcInsnNode.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/LookupSwitchInsnNode.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/LineNumberNode.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/JarOptimizer.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/LocalVariablesSorter.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/util/TraceAnnotationVisitor.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/Constant.java

* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/TypeAnnotationNode.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/Handle.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/TryCatchBlockNode.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/ClassOptimizer.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/util/ASMifier.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/util/TraceClassVisitor.java
*
/asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/TableSwitchInsnNode.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/Frame.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/InvokeDynamicInsnNode.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/AnalyzerException.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/Subroutine.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/SerialVersionUIDAdder.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/InnerClassNode.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/ParameterNode.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/LocalVariableNode.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/Analyzer.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/SmallSet.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/RemappingAnnotationAdapter.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/TypeInsnNode.java
*
/asm-5-0-4-sources-6-jar/org/objectweb/asm/util/TraceSignatureVisitor.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/IincInsnNode.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/MethodOptimizer.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/util/CheckFieldAdapter.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/Frame.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/util/CheckMethodAdapter.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/SimpleRemapper.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/AnnotationNode.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/FieldVisitor.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/Context.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/util/TraceMethodVisitor.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/MethodConstantsCollector.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/Handler.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/MethodNode.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/InsnList.java
*
/asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/FieldConstantsCollector.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/MethodWriter.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/analysis/BasicInterpreter.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/signature/SignatureWriter.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/commons/TryCatchBlockSorter.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/Item.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/Edge.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/ClassVisitor.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/tree/FrameNode.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/optimizer/ConstantPool.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/Opcodes.java

* /asm-5-0-4-sources-6-jar/org/objectweb/asm/util/CheckClassAdapter.java
* /asm-5-0-4-sources-6-jar/org/objectweb/asm/signature/SignatureVisitor.java

1.246 jakarta-annotation-api 1.3.5

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* https://github.com/eclipse-ee4j/common-annotations-api

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src/test/org/apache/commons/codec/language/DoubleMetaphoneTest.java
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1.249 ehcache 3.8.1

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Found in path(s):
* /ehcache-3-8-1-sources-1-jar/META-INF/maven/org.ehcache.modules/ehcache-impl/pom.xml
* /ehcache-3-8-1-sources-1-jar/META-INF/maven/org.ehcache.modules/ehcache-core/pom.xml
* /ehcache-3-8-1-sources-1-jar/META-INF/maven/org.ehcache.modules/ehcache-107/pom.xml
* /ehcache-3-8-1-sources-1-jar/META-INF/maven/org.ehcache.modules/ehcache-xml/pom.xml
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* /ehcache-3-8-1-sources-1-jar/ehcache-multi.xsd
* /ehcache-3-8-1-sources-1-jar/ehcache-core.xsd

* /ehcache-3-8-1-sources-1-jar/ehcache-107-ext.xsd
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Found in path(s):
* /ehcache-3-8-1-sources-1-jar/org/ehcache/jsr107/DefaultConfigurationResolver.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/spi/service/package-info.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/events/InvocationScopedEventSink.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/config/ResourceUnit.java
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 /ehcache-3-8-1-sources-1-jar/org/ehcache/core/Jsr107Cache.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/config/SizedResourcePoolImpl.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/serialization/CompactJavaSerializer.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/jsr107/Eh107IdentityCopier.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/spi/service/OptionalServiceDependencies.java
* /ehcache-3-8-1-sources-1-
jar/org/ehcache/impl/internal/spi/loaderwriter/DefaultCacheLoaderWriterProviderFactory.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/jsr107/CacheResources.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/sizeof/DefaultSizeOfEngineProviderFactory.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/jsr107/CloseUtil.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/spi/loaderwriter/CacheLoaderWriter.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/spi/store/heap/SizeOfEngineProvider.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/InternalStatus.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/executor/PooledExecutionService.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/spi/loaderwriter/BulkCacheLoadingException.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/loaderwriter/LocalLoaderWriterStore.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/CacheIterationException.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/config/builders/package-info.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/config/CoreConfigurationBuilder.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/jsr107/package-info.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/statistics/OperationStatistic.java

* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/serialization/DoubleSerializer.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/statistics/LatencyHistogramConfiguration.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/xml/CacheServiceConfigurationParser.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/expiry/ExpiryPolicy.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/config/loaderwriter/package-info.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/loaderwriter/writebehind/operations/WriteOperation.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/config/store/disk/OffHeapDiskStoreProviderConfiguration.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/classes/ClassInstanceProvider.java
* /ehcache-3-8-1-sources-1-
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/jsr107/Eh107Configuration.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/spi/copy/DefaultCopyProviderFactory.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/store/DefaultStoreEventDispatcher.java
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 /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/serialization/CharSerializer.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/xml/provider/WriteBehindProviderConfigurationParser.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/config/persistence/CacheManagerPersistenceConfiguration.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/spi/service/ServiceDependencies.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/config/Eviction.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/jsr107/Jsr107Service.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/offheap/OffHeapStore.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/offheap/HeuristicConfiguration.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/serialization/LongSerializer.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/disk/factories/EhcachePersistentSegmentFactory.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/config/DefaultConfiguration.java
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 /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/config/serializer/DefaultSerializationProviderConfiguration.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/internal/util/ValueSuppliers.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/heap/holders/LookupOnlyOnHeapKey.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/serialization/ByteArraySerializer.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/spi/time/TimeSourceService.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/heap/holders/OnHeapKey.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/spi/copy/CopyProvider.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/spi/service/ServiceCreationConfiguration.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/spi/service/ServiceProvider.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/spi/resilience/ResilienceStrategyProvider.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/events/StoreEventDispatcher.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/xml/JaxbHelper.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/config/copy/DefaultCopyProviderConfiguration.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/xml/model/CacheSpec.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/BinaryValueHolder.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/jsr107/internal/WrappedCacheLoaderWriter.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/offheap/portability/SerializerPortability.java

* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/statistics/DefaultStatisticsService.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/config/units/package-info.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/offheap/BinaryOffHeapValueHolder.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/statistics/TierStatistics.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/config/store/package-info.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/xml/service/SimpleCoreServiceConfigurationParser.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/xml/model/CacheDefinition.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/config/loaderwriter/DefaultCacheLoaderWriterConfiguration.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/serialization/TransientStateRepository.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/jsr107/Unwrap.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/executor/PartitionedUnorderedExecutor.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/jsr107/EhcacheExpiryWrapper.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/jsr107/NullCompletionListener.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/offheap/AbstractOffHeapStore.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/config/BaseCacheConfiguration.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/persistence/package-info.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/statistics/DefaultTierStatistics.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/config/builders/CacheManagerBuilder.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/jsr107/config/package-info.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/spi/loaderwriter/BulkCacheWritingException.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/copy/IdentityCopier.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/TimeSourceConfiguration.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/spi/store/tiering/CachingTier.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/loaderwriter/writebehind/operations/SingleOperation.java
* /ehcache-3-8-1-sources-1-
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/xml/provider/SimpleCoreServiceCreationConfigurationParser.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/event/CacheEvent.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/spi/loaderwriter/CacheLoadingException.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/config/builders/WriteBehindConfigurationBuilder.java

* /ehcache-3-8-1-sources-1-jar/org/ehcache/event/EventFiring.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/spi/serialization/DefaultSerializationProviderFactory.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/offheap/factories/EhcacheSegmentFactory.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/StateTransitionException.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/events/StateChangeListener.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/expiry/Expiry.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/events/CloseableStoreEventSink.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/xml/provider/PooledExecutionServiceConfigurationParser.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/copy/ReadWriteCopier.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/event/EventType.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/config/persistence/DefaultPersistenceConfiguration.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/events/EventListenerWrapper.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/config/FluentConfigurationBuilder.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/heap/OnHeapStoreProviderFactory.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/xml/CacheManagerServiceConfigurationParser.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/spi/store/events/StoreEvent.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/offheap/OffHeapValueHolder.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/config/SizedResourcePool.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/classes/ClassInstanceConfiguration.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/config/units/EntryUnit.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/spi/store/tiering/package-info.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/executor/OnDemandExecutionService.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/jsr107/ConfigurationMerger.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/config/builders/ConfigurationBuilder.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/xml/ResourceConfigurationParser.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/sizeof/listeners/exceptions/VisitorListenerException.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/spi/service/Service.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/expiry/Duration.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/spi/loaderwriter/CacheLoaderWriterConfiguration.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/executor/OutOfBandScheduledExecutor.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/config/event/DefaultCacheEventListenerConfiguration.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/spi/ServiceLocator.java
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/ehcache-3-8-1-sources-1-jar/org/ehcache/core/statistics/HigherCachingTierOperationOutcomes.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/copy/package-info.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/loaderwriter/writebehind/WriteBehind.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/config/event/DefaultCacheEventDispatcherConfiguration.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/spi/loaderwriter/package-info.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/PersistentUserManagedCache.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/statistics/LowerCachingTierOperationsOutcome.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/spi/store/tiering/AuthoritativeTier.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/spi/store/events/StoreEventSource.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/CacheConfigurationProperty.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/ValueSupplier.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/events/StoreEvents.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/persistence/DefaultLocalPersistenceService.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/statistics/ChainedOperationObserver.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/osgi/SafeOsgi.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/statistics/StoreOperationOutcomes.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/jsr107/Eh107Cache.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/serialization/IntegerSerializer.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/events/NullStoreEventDispatcher.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/heap/holders/CopiedOnHeapValueHolder.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/serialization/TransientStateHolder.java
*
 /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/config/store/heap/DefaultSizeOfEngineConfiguration.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/config/store/disk/package-info.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/jsr107/internal/Jsr107CacheLoaderWriter.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/config/copy/DefaultCopierConfiguration.java

* /ehcache-3-8-1-sources-1-jar/org/ehcache/xml/service/DefaultCacheLoaderWriterConfigurationParser.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/xml/model/Expiry.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/events/ThreadLocalStoreEventDispatcher.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/offheap/MemorySizeParser.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/CacheManager.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/spi/service/FileBasedPersistenceContext.java
*
 /ehcache-3-8-1-sources-1-jar/org/ehcache/core/util/ByteBufferInputStream.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/xml/CacheResourceConfigurationParser.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/EhcacheBase.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/xml/ConfigurationParser.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/xml/service/DefaultSizeOfEngineConfigurationParser.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/xml/exceptions/XmlConfigurationException.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/heap/OnHeapStore.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/xml/ServiceCreationConfigurationParser.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/spi/persistence/StateRepository.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/config/Configuration.java
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* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/spi/store/heap/SizeOfEngine.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/event/CacheEventListener.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/spi/persistence/StateHolder.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/store/heap/KeyCopyBackend.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/classes/ClassInstanceProviderConfiguration.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/sizeof/listeners/EhcacheVisitorListener.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/events/CacheEvents.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/osgi/OsgiServiceLoader.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/statistics/ZeroOperationStatistic.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/spi/store/Store.java
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 /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/util/ServiceUtil.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/serialization/FloatSerializer.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/events/AbstractStoreEventDispatcher.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/config/copy/package-info.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/CacheConfigurationChangeEvent.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/config/resilience/DefaultResilienceStrategyConfiguration.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/statistics/SourceStatistic.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/spi/store/ConfigurationChangeSupport.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/config/AbstractResourcePool.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/event/EventOrdering.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/statistics/CacheStatistics.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/config/CacheRuntimeConfiguration.java
*

/ehcache-3-8-1-sources-1-jar/org/ehcache/xml/CoreCacheConfigurationParser.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/jsr107/internal/Jsr107CacheConfigurationParser.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/spi/service/package-info.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/core/statistics/Jsr107LatencyMonitor.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/xml/provider/DefaultSizeOfEngineProviderConfigurationParser.java
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*
/ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/classes/commonslang/ClassUtils.java
* /ehcache-3-8-1-sources-1-jar/org/ehcache/impl/internal/classes/commonslang/reflect/MethodUtils.java
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org.ehcache.jsr107.internal.Jsr107CacheConfigurationParser

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Other developers who have contributed code are:

* Brian Langel

1.251 commons-lang3 3.10

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* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/NegativeOrZero.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ConstraintViolation.java
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* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/ValidateUnwrappedValue.java
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* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/groups/package-info.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/spi/ValidationProvider.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ElementKind.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/GroupConversionDescriptor.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/valueextraction/ExtractedValue.java
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* /jakarta-validation-api-2-0-2-sources-3-
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* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/ConstructorDescriptor.java
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* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/Path.java

* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/executable/package-info.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/valueextraction/package-info.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/PositiveOrZero.java
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 /jakarta-validation-api-2-0-2-sources-3-
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* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/BootstrapConfiguration.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/ElementDescriptor.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/ContainerElementTypeDescriptor.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/GroupDefinitionException.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/Min.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/groups/ConvertGroup.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/Scope.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/Max.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ReportAsSingleViolation.java
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*
 /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ParameterNameProvider.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/Pattern.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/NoProviderFoundException.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/Validation.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ValidatorContext.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/NotBlank.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/spi/package-info.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/Constraint.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/Valid.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/CrossParameterDescriptor.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ClockProvider.java
*
 /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/Configuration.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/executable/ValidateOnExecution.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/Size.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/PastOrPresent.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ConstraintViolationException.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/bootstrap/package-info.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/TraversableResolver.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/executable/ExecutableValidator.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ValidationProviderResolver.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ValidatorFactory.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/ContainerDescriptor.java
*
 /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/ConstraintDescriptor.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/ParameterDescriptor.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/NotNull.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/package-info.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/GroupSequence.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/Negative.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ConstraintValidatorFactory.java

* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ValidationException.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/OverridesAttribute.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/spi/BootstrapState.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/Email.java
*
/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ConstraintDeclarationException.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/metadata/PropertyDescriptor.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/ConstraintValidator.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/executable/ExecutableType.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/AssertFalse.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/Future.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/DecimalMax.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/Positive.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/NotEmpty.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/spi/ConfigurationState.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/Payload.java
*
/jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/DecimalMin.java
* /jakarta-validation-api-2-0-2-sources-3-jar/javax/validation/constraints/Past.java

1.254 hibernate-commons-annotations 5.1.0.Final

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1.256 javassist 3.24.0-GA

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/javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/annotation/ArrayMemberValue.java
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 /javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/MethodInfo.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/NotFoundException.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/CtClass.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/scopedpool/SoftValueHashMap.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/CtField.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/compiler/MemberResolver.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/compiler/CodeGen.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/Translator.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/Opcode.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/expr/NewExpr.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/annotation/AnnotationsWriter.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/CtConstructor.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/util/proxy/MethodHandler.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/compiler/Javac.java
*
 /javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/LocalVariableTypeAttribute.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/LocalVariableAttribute.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/stackmap/TypeTag.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/analysis/Type.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/runtime/DotClass.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/runtime/Desc.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/compiler/ast/StringL.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/scopedpool/ScopedClassPoolRepositoryImpl.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/compiler/ast/Member.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/expr/Expr.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/util/proxy/Proxy.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/tools/rmi/RemoteException.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/analysis/Executor.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/analysis/MultiType.java
*
 /javassist-3-24-0-ga-sources-5-jar/javassist/compiler/ast/MethodDecl.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/ClassFile.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/analysis/MultiArrayType.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/CannotCompileException.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/util/proxy/RuntimeSupport.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/AttributeInfo.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/bytecode/FieldInfo.java
* /javassist-3-24-0-ga-sources-5-jar/javassist/tools/rmi/ObjectNotFoundException.java

1.257 spring-security-config 5.3.4.RELEASE

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* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/configurers/ChannelSecurityConfigurer.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/configurers/PortMapperConfigurer.java
*
/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/configurers/DefaultLoginPageConfigurer.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/HttpSecurityBuilder.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/configurers/AnonymousConfigurer.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/configurers/RequestCacheConfigurer.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/AbstractSecurityBuilder.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/authentication/configurers/userdetails/UserDetailsServiceConfigurer.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/configuration/SpringWebMvcImportSelector.java
*
/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/authentication/configurers/provisioning/InMemoryUserDetailsManagerConfigurer.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/authentication/configurers/userdetails/AbstractDaoAuthenticationConfigurer.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/authentication/builders/AuthenticationManagerBuilder.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/configurers/JeeConfigurer.java

* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/configurers/FormLoginConfigurer.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/servlet/configuration/EnableWebMvcSecurity.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/SecurityConfigurer.java
*
/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/method/configuration/EnableGlobalMethodSecurity.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/SecurityConfigurerAdapter.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/AbstractConfiguredSecurityBuilder.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/authentication/ProviderManagerBuilder.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/authentication/configuration/EnableGlobalAuthentication.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/SecurityBuilder.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/authentication/configurers/provisioning/JdbcUserDetailsManagerConfigurer.java
*
/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/configurers/PermitAllSupport.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/configurers/AbstractHttpConfigurer.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/authentication/configurers/userdetails/UserDetailsAwareConfigurer.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/AlreadyBuiltException.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/configurers/AbstractConfigAttributeRequestMatcherRegistry.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/authentication/configurers/userdetails/DaoAuthenticationConfigurer.java
*
/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/method/configuration/GlobalMethodSecurityAspectJAutoProxyRegistrar.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/ObjectPostProcessor.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/configuration/AutowiredWebSecurityConfigurersIgnoreParents.java
* /spring-security-config-5-3-4-release-sources-

jar/org/springframework/security/config/annotation/web/builders/FilterComparator.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/web/configurers/AbstractInterceptUrlConfigurer.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/authentication/configurers/provisioning/UserDetailsManagerConfigurer.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/web/WebSecurityConfigurer.java
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Found in path(s):
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/method/configuration/ReactiveMethodSecuritySelector.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/authentication/configuration/GlobalAuthenticationConfigurerAdapter.java
*
 /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/web/reactive/EnableWebFluxSecurity.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/core/userdetails/UserDetailsMapFactoryBean.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/method/configuration/EnableReactiveMethodSecurity.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/web/configurers/oauth2/client/ImplicitGrantConfigurer.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/server/SecurityWebFiltersOrder.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/core/userdetails/ReactiveUserDetailsServiceResourceFactoryBean.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/provisioning/UserDetailsManagerResourceFactoryBean.java
*

/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/server/AbstractServerWebExchangeMatcherRegistry.java
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* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/X509Dsl.kt
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/session/SessionConcurrencyDsl.kt
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/http/OAuth2ClientBeanDefinitionParser.java
*
/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/server/ServerHttpSecurity.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/headers/FrameOptionsDsl.kt
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/headers/ReferrerPolicyDsl.kt
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/headers/XssProtectionConfigDsl.kt
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/PortMapperDsl.kt
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/FormLoginDsl.kt
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/AuthorizeRequestsDsl.kt
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/CsrfDsl.kt
*
/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/oauth2/resourceserver/JwtDsl.kt
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/http/AuthenticationConfigBuilder.java
* /spring-security-config-5-3-4-release-sources-

jar/org/springframework/security/config/web/servlet/RequestCacheDsl.kt
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/http/OAuth2LoginBeanDefinitionParser.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/SecurityMarker.kt
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/oauth2/resourceserver/OpaqueTokenDsl.kt
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/HttpSecurityDsl.kt
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/LogoutDsl.kt
*
/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/Saml2Dsl.kt
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/oauth2/login/RedirectionEndpointDsl.kt
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/oauth2/login/UserInfoEndpointDsl.kt
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/oauth2/login/TokenEndpointDsl.kt
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/session/SessionFixationDsl.kt
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/oauth2/client/AuthorizationCodeGrantDsl.kt
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/http/SecurityFilters.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/web/configuration/SecurityReactorContextConfiguration.java
*
/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/headers/HttpPublicKeyPinningDsl.kt
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/headers/HttpStrictTransportSecurityDsl.kt
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/headers/ContentTypeOptionsDsl.kt
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/Elements.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/headers/ContentSecurityPolicyDsl.kt
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/headers/CacheControlDsl.kt
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/oauth2/client/ClientRegistrationsBeanDefinitionParser.java
*
/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/SessionManagementDsl.kt
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/http/HttpSecurityBeanDefinitionParser.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/web/configurers/oauth2/server/resource/OAuth2ResourceServer
Configurer.java
* /spring-security-config-5-3-4-release-sources-

jar/org/springframework/security/config/web/servlet/AbstractRequestMatcherDsl.kt
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/web/builders/WebSecurity.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/OAuth2LoginDsl.kt
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/ExceptionHandlingDsl.kt
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/http/CsrfBeanDefinitionParser.java
*
/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/http/HttpConfigurationBuilder.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/web/servlet/CorsDsl.kt
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/OAuth2ClientDsl.kt
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/AnonymousDsl.kt
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/oauth2/login/AuthorizationEndpointDsl.kt
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/OAuth2ResourceServerDsl.kt
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/HttpBasicDsl.kt
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/http/OAuth2ResourceServerBeanDefinitionParser.java
*
/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/web/servlet/RequiresChannelDsl.kt
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* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/configurers/RememberMeConfigurer.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/http/RememberMeBeanDefinitionParser.java
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* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/ldap/LdapUserServiceBeanDefinitionParser.java
* /spring-security-config-5-3-4-release-sources-

jar/org/springframework/security/config/authentication/JdbcUserServiceBeanDefinitionParser.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/authentication/AuthenticationProviderBeanDefinitionParser.java
*
/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/http/FilterChainBeanDefinitionParser.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/authentication/PasswordEncoderParser.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/http/HttpFirewallBeanDefinitionParser.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/http/ChannelAttributeFactory.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/BeanIds.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/method/ProtectPointcutPostProcessor.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/package-info.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/http/package-info.java
*
/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/ldap/ContextSourceSettingPostProcessor.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/http/MatcherType.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/method/InterceptMethodsBeanDefinitionDecorator.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/authentication/package-info.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/http/FilterChainMapBeanDefinitionDecorator.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/authentication/AbstractUserDetailsServiceBeanDefinitionParser.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/ldap/package-info.java
*
/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/method/package-info.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/ldap/LdapProviderBeanDefinitionParser.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/http/FilterInvocationSecurityMetadataSourceParser.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/http/SessionCreationPolicy.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/http/PortMappingsBeanDefinitionParser.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/http/UserDetailsServiceFactoryBean.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/annotation/web/messaging/MessageSecurityMetadataSourceRegistry.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/DebugBeanDefinitionParser.java
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/spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/authentication/UserServiceBeanDefinitionParser.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/http/DefaultFilterChainValidator.java
* /spring-security-config-5-3-4-release-sources-
jar/org/springframework/security/config/method/MethodSecurityMetadataSourceBeanDefinitionParser.java
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jar/org/springframework/security/config/annotation/rsocket/EnableRSocketSecurity.java
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jar/org/springframework/security/config/annotation/rsocket/SecuritySocketAcceptorInterceptorConfiguration.java
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 /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/http/HeadersBeanDefinitionParser.java
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* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/authentication/configuration/InitializeAuthenticationProviderBeanManagerConfigurer.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/configurers/oauth2/client/OAuth2ClientConfigurer.java
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* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/authentication/configuration/InitializeUserDetailsBeanManagerConfigurer.java
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* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/configuration/ObjectPostProcessorConfiguration.java
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/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/Customizer.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/ldap/LdapServerBeanDefinitionParser.java
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* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/configuration/WebSecurityConfigurerAdapter.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/configuration/EnableWebSecurity.java
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* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/oauth2/client/CommonOAuth2Provider.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/authentication/AuthenticationManagerBeanDefinitionParser.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/http/CorsBeanDefinitionParser.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/configurers/UrlAuthorizationConfigurer.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/configuration/AutowireBeanFactoryObjectPostProcessor.java
*
/spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/core/userdetails/UserDetailsResourceFactoryBean.java
* /spring-security-config-5-3-4-release-sources-jar/org/springframework/security/config/annotation/web/configurers/SecurityContextConfigurer.java

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1.258 postgresql-jdbc 42.2.14

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1.265 sysv-init 2.93-8

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1.266 zstd 1.3.8+dfsg-3+deb10u2

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/* checkTag : validation tool for libzstd
* command :
* $ ./checkTag tag
* checkTag validates tags of following format : v[0-9].[0-9].[0-9]{any}
* The tag is then compared to zstd version number.
* They are compatible if first 3 digits are identical.
* Anything beyond that is free, and doesn't impact validation.
* Example : tag v1.8.1.2 is compatible with version 1.8.1
* When tag and version are not compatible, program exits with error code 1.
* When they are compatible, it exists with a code 0.
* checkTag is intended to be used in automated testing environment.
*/

1.269 libtasn 4.16.0-2

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1.272 libdrm 2.4.45

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```
#!/usr/bin/tclsh.docsrc
#### Import of wapp.tcl
# Copyright (c) 2017 D. Richard Hipp
#
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# known as the "2-Clause License" or "FreeBSD License".)
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#
#-------------------------------------------------------------------------
#
# Design rules:
#
#   (1)  All identifiers in the global namespace begin with "wapp"
#
#   (2)  Indentifiers intended for internal use only begin with "wappInt"
#

# Add text to the end of the HTTP reply.  No interpretation or transformation
# of the text is performs.  The argument should be enclosed within {...}
#
proc wapp {txt} {
 global wapp
 dict append wapp .reply $txt
}

# Add
 text to the page under construction.  Do no escaping on the text.
#
# Though "unsafe" in general, there are uses for this kind of thing.
# For example, if you want to return the complete, unmodified content of
# a file:
#
#       set fd [open content.html rb]
#       wapp-unsafe [read $fd]
#       close $fd
```

```
#
# You could do the same thing using ordinary "wapp" instead of "wapp-unsafe".
# The difference is that wapp-safety-check will complain about the misuse
# of "wapp", but it assumes that the person who write "wapp-unsafe" understands
# the risks.
#
# Though occasionally necessary, the use of this interface should be minimized.
#
proc wapp-unsafe {txt} {
 global wapp
 dict append wapp .reply $txt
}

# Add text to the end of the reply under construction.  The following
# substitutions are made:
#
#     %html(...)         Escape text for inclusion in HTML
#     %url(...)          Escape text for use as a URL
#     %qp(...)           Escape text for use as a URI query parameter
#
     %string(...)       Escape text for use within a JSON string
#     %unsafe(...)       No transformations of the text
#
# The substitutions above terminate at the first ")" character.  If the
# text of the TCL string in ... contains ")" characters itself, use instead:
#
#     %html%(...)%
#     %url%(...)%
#     %qp%(...)%
#     %string%(...)%
#     %unsafe%(...)%
#
# In other words, use "%(...)%" instead of "(...)" to include the TCL string
# to substitute.
#
# The %unsafe substitution should be avoided whenever possible, obviously.
# In addition to the substitutions above, the text also does backslash
# escapes.
#
proc wapp-subst {txt} {
 global wapp
 regsub -all {%(html|url|qp|string|unsafe){1,1}?(|%)\((.+)\)\2} $txt \
       {[wappInt-enc-\1 "\3"]} txt
 dict append wapp .reply [uplevel 1 [list subst -novariables $txt]]
}

# Works like wapp-subst, but also removes whitespace from the beginning
# of lines.
```

```
#
proc wapp-trim {txt} {
 global wapp
 regsub -all {\n\s+} [string
 trim $txt] \n txt
 regsub -all {%(html|url|qp|string|unsafe){1,1}?(|%)\((.+)\)\2} $txt \
       {[wappInt-enc-\1 "\3"]} txt
 dict append wapp .reply [uplevel 1 [list subst -novariables $txt]]
}

# There must be a wappInt-enc-NAME routine for each possible substitution
# in wapp-subst.  Thus there are routines for "html", "url", "qp", and "unsafe".
#
#    wappInt-enc-html          Escape text so that it is safe to use in the
#                              body of an HTML document.
#
#    wappInt-enc-url           Escape text so that it is safe to pass as an
#                              argument to href= and src= attributes in HTML.
#
#    wappInt-enc-qp            Escape text so that it is safe to use as the
#                              value of a query parameter in a URL or in
#                              post data or in a cookie.
#
#    wappInt-enc-string        Escape ", ', \, and < for using inside of a
#                              javascript string literal.
  The < character
#                              is escaped to prevent "</script>" from causing
#                              problems in embedded javascript.
#
#    wappInt-enc-unsafe        Perform no encoding at all.  Unsafe.
#
proc wappInt-enc-html {txt} {
 return [string map {& &amp; < &lt; > &gt; \" &quot; \\ &#92;} $txt]
}
proc wappInt-enc-unsafe {txt} {
 return $txt
}
proc wappInt-enc-url {s} {
 if {[regsub -all {[^-{}@~?=#_.:/a-zA-Z0-9]} $s {[wappInt-%HHchar {&}]} s]} {
   set s [subst -novar -noback $s]
 }
 if {[regsub -all {[{}]} $s {[wappInt-%HHchar \\&]} s]} {
   set s [subst -novar -noback $s]
 }
 return $s
}
proc wappInt-enc-qp {s} {
 if {[regsub -all {[^-{}_.a-zA-Z0-9]} $s {[wappInt-%HHchar {&}]} s]} {
```

```
  set s [subst -novar -noback $s]
 }
 if {[regsub -all {[{}]} $s {[wappInt-%HHchar \\&]} s]} {
  set s [subst -novar -noback $s]
 }
 return $s
}
proc wappInt-enc-string {s} {
 return [string map {\\ \\\\ \" \\\" ' \\' < \\u003c} $s]
}

# This is a
 helper routine for wappInt-enc-url and wappInt-enc-qp.  It returns
# an appropriate %HH encoding for the single character c.  If c is a unicode
# character, then this routine might return multiple bytes:  %HH%HH%HH
#
proc wappInt-%HHchar {c} {
 if {$c==" "} {return +}
 return [regsub -all .. [binary encode hex [encoding convertto utf-8 $c]] {%&}]
}



# Undo the www-url-encoded format.
#
# HT: This code stolen from ncgi.tcl
#
proc wappInt-decode-url {str} {
 set str [string map [list + { } "\\" "\\\\" \[ \\\[ \] \\\]] $str]
 regsub -all -- \
    {%([Ee][A-Fa-f0-9])%([89ABab][A-Fa-f0-9])%([89ABab][A-Fa-f0-9])} \
    $str {[encoding convertfrom utf-8 [binary decode hex \1\2\3]]} str
 regsub -all -- \
    {%([CDcd][A-Fa-f0-9])%([89ABab][A-Fa-f0-9])}                    \
    $str {[encoding convertfrom utf-8 [binary decode hex \1\2]]} str
 regsub -all -- {%([0-7][A-Fa-f0-9])} $str {\\u00\1} str
 return [subst -novar $str]
}

# Reset the document back to an empty string.
#
proc
 wapp-reset {} {
 global wapp
 dict set wapp .reply {}
}

# Change the mime-type of the result document.
#
```

```
proc wapp-mimetype {x} {
 global wapp
 dict set wapp .mimetype $x
}

# Change the reply code.
#
proc wapp-reply-code {x} {
 global wapp
 dict set wapp .reply-code $x
}

# Set a cookie
#
proc wapp-set-cookie {name value} {
 global wapp
 dict lappend wapp .new-cookies $name $value
}

# Unset a cookie
#
proc wapp-clear-cookie {name} {
 wapp-set-cookie $name {}
}

# Add extra entries to the reply header
#
proc wapp-reply-extra {name value} {
 global wapp
 dict lappend wapp .reply-extra $name $value
}

# Specifies how the web-page under construction should be cached.
# The argument should be one of:
#
#    no-cache
#    max-age=N            (for some integer number of seconds, N)
#    private,max-age=N
#
proc wapp-cache-control {x} {
 wapp-reply-extra Cache-Control $x
}

# Redirect to a different web page
#
proc wapp-redirect {uri} {
 wapp-reply-code {307 Redirect}
 wapp-reply-extra
```

```
 Location $uri
}

# Return the value of a wapp parameter
#
proc wapp-param {name {dflt {}}} {
 global wapp
 if {![dict exists $wapp $name]} {return $dflt}
 return [dict get $wapp $name]
}

# Return true if a and only if the wapp parameter $name exists
#
proc wapp-param-exists {name} {
 global wapp
 return [dict exists $wapp $name]
}

# Set the value of a wapp parameter
#
proc wapp-set-param {name value} {
 global wapp
 dict set wapp $name $value
}

# Return all parameter names that match the GLOB pattern, or all
# names if the GLOB pattern is omitted.
#
proc wapp-param-list {{glob {*}}} {
 global wapp
 return [dict keys $wapp $glob]
}

# By default, Wapp does not decode query parameters and POST parameters
# for cross-origin requests.  This is a security restriction, designed to
# help prevent cross-site request forgery (CSRF) attacks.
#
# As a consequence of this restriction, URLs for sites generated by Wapp
# that contain query parameters will not work as URLs
 found in other
# websites.  You cannot create a link from a second website into a Wapp
# website if the link contains query planner, by default.
#
# Of course, it is sometimes desirable to allow query parameters on external
# links.  For URLs for which this is safe, the application should invoke
# wapp-allow-xorigin-params.  This procedure tells Wapp that it is safe to
# go ahead and decode the query parameters even for cross-site requests.
#
```

```
# In other words, for Wapp security is the default setting.  Individual pages
# need to actively disable the cross-site request security if those pages
# are safe for cross-site access.
#
proc wapp-allow-xorigin-params {} {
 global wapp
 if {![dict exists $wapp .qp] && ![dict get $wapp SAME_ORIGIN]} {
   wappInt-decode-query-params
 }
}

# Set the content-security-policy.
#
# The default content-security-policy is very strict:  "default-src 'self'"
# The default policy prohibits the use of in-line javascript or CSS.
#
# Provide an alternative
 CSP as the argument.  Or use "off" to disable
# the CSP completely.
#
proc wapp-content-security-policy {val} {
 global wapp
 if {$val=="off"} {
   dict unset wapp .csp
 } else {
   dict set wapp .csp $val
 }
}

# Examine the bodys of all procedures in this program looking for
# unsafe calls to various Wapp interfaces.  Return a text string
# containing warnings. Return an empty string if all is ok.
#
# This routine is advisory only.  It misses some constructs that are
# dangerous and flags others that are safe.
#
proc wapp-safety-check {} {
 set res {}
 foreach p [info procs] {
   set ln 0
   foreach x [split [info body $p] \n] {
     incr ln
     if {[regexp {^[ \t]*wapp[ \t]+([^\n]+)} $x all tail]
      && [string index $tail 0]!="\173"
      && [regexp {[[$]} $tail]
     } {
       append res "$p:$ln: unsafe \"wapp\" call: \"[string trim $x]\"\n"
     }
```

```
    if {[regexp {^[ \t]*wapp-(subst|trim)[ \t]+[^\173]} $x all cx]} {
      append res "$p:$ln: unsafe \"wapp-$cx\"
 call: \"[string trim $x]\"\n"
    }
  }
 }
 return $res
}

# Return a string that descripts the current environment.  Applications
# might find this useful for debugging.
#
proc wapp-debug-env {} {
 global wapp
 set out {}
 foreach var [lsort [dict keys $wapp]] {
  if {[string index $var 0]=="."} continue
  append out "$var = [list [dict get $wapp $var]]\n"
 }
 append out "\[pwd\] = [list [pwd]]\n"
 return $out
}

# Tracing function for each HTTP request.  This is overridden by wapp-start
# if tracing is enabled.
#
proc wappInt-trace {} {}

# Start up a listening socket.  Arrange to invoke wappInt-new-connection
# for each inbound HTTP connection.
#
#    port           Listen on this TCP port.  0 means to select a port
#                   that is not currently in use
#
#    wappmode       One of "scgi", "server", or "local".
#
proc wappInt-start-listener {port wappmode} {
 if {$wappmode=="scgi"} {
  set type SCGI
  set server [list wappInt-new-connection
 wappInt-scgi-readable $wappmode]
 } else {
  set type HTTP
  set server [list wappInt-new-connection wappInt-http-readable $wappmode]
 }
 if {$wappmode=="local"} {
  set x [socket -server $server -myaddr 127.0.0.1 $port]
 } else {
```

```
  set x [socket -server $server $port]
 }
 set coninfo [chan configure $x -sockname]
 set port [lindex $coninfo 2]
 if {$wappmode=="local"} {
  wappInt-start-browser http://127.0.0.1:$port/
 } else {
  puts "Listening for $type requests on TCP port $port"
 }
}

# Start a web-browser and point it at $URL
#
proc wappInt-start-browser {url} {
 global tcl_platform
 if {$tcl_platform(platform)=="windows"} {
  exec cmd /c start $url &
 } elseif {$tcl_platform(os)=="Darwin"} {
  exec open $url &
 } elseif {[catch {exec xdg-open $url}]} {
  exec firefox $url &
 }
}

# This routine is a "socket -server" callback.  The $chan, $ip, and $port
# arguments are added by the socket command.
#
# Arrange to invoke $callback when content is available
 on the new socket.
# The $callback will process inbound HTTP or SCGI content.
#
proc wappInt-new-connection {callback wappmode chan ip port} {
 upvar #0 wappInt-$chan W
 set W [dict create REMOTE_ADDR $ip REMOTE_PORT $port WAPP_MODE $wappmode \
       .header {}]
 fconfigure $chan -blocking 0 -translation binary
 fileevent $chan readable [list $callback $chan]
}

# Close an input channel
#
proc wappInt-close-channel {chan} {
 if {$chan=="stdout"} {
  # This happens after completing a CGI request
  exit 0
 } else {
  unset ::wappInt-$chan
  close $chan
```

```
 }
}

# Process new text received on an inbound HTTP request
#
proc wappInt-http-readable {chan} {
 if {[catch [list wappInt-http-readable-unsafe $chan] msg]} {
   puts stderr "$msg\n$::errorInfo"
   wappInt-close-channel $chan
 }
}
proc wappInt-http-readable-unsafe {chan} {
 upvar #0 wappInt-$chan W wapp wapp
 if {![dict exists $W .toread]} {
   # If the .toread key is not set, that means we are still reading
    # the header
   set line [string trimright [gets $chan]]
   set n [string length $line]
   if {$n>0} {
     if {[dict get $W .header]=="" || [regexp {^\s+} $line]} {
       dict append W .header $line
     } else {
       dict append W .header \n$line
     }
     if {[string length [dict get $W .header]]>100000} {
       error "HTTP request header too big - possible DOS attack"
     }
   } elseif {$n==0} {
     # We have reached the blank line that terminates the header.
     global argv0
     set a0 [file normalize $argv0]
     dict set W SCRIPT_FILENAME $a0
     dict set W DOCUMENT_ROOT [file dir $a0]
     if {[wappInt-parse-header $chan]} {
       catch {close $chan}
       return
     }
     set len 0
     if {[dict exists $W CONTENT_LENGTH]} {
       set len [dict get $W CONTENT_LENGTH]
     }
     if {$len>0} {
       # Still need to read the query content
       dict set W .toread $len
     } else {
       # There is no query content, so handle
 the request immediately
       set wapp $W
```

```
      wappInt-handle-request $chan 0
    }
  }
 } else {
  # If .toread is set, that means we are reading the query content.
  # Continue reading until .toread reaches zero.
  set got [read $chan [dict get $W .toread]]
  dict append W CONTENT $got
  dict set W .toread [expr {[dict get $W .toread]-[string length $got]}]
  if {[dict get $W .toread]<=0} {
    # Handle the request as soon as all the query content is received
    set wapp $W
    wappInt-handle-request $chan 0
  }
 }
}

# Decode the HTTP request header.
#
# This routine is always running inside of a [catch], so if
# any problems arise, simply raise an error.
#
proc wappInt-parse-header {chan} {
 upvar #0 wappInt-$chan W
 set hdr [split [dict get $W .header] \n]
 if {$hdr==""} {return 1}
 set req [lindex $hdr 0]
 dict set W REQUEST_METHOD [set method [lindex $req 0]]
 if {[lsearch {GET HEAD POST} $method]<0} {
  error "unsupported request method:
 \"[dict get $W REQUEST_METHOD]\""
 }
 set uri [lindex $req 1]
 set split_uri [split $uri ?]
 set uri0 [lindex $split_uri 0]
 if {![regexp {^/[-.a-z0-9_/]*$} $uri0]} {
  error "invalid request uri: \"$uri0\""
 }
 dict set W REQUEST_URI $uri0
 dict set W PATH_INFO $uri0
 set uri1 [lindex $split_uri 1]
 dict set W QUERY_STRING $uri1
 set n [llength $hdr]
 for {set i 1} {$i<$n} {incr i} {
  set x [lindex $hdr $i]
  if {![regexp {^(.+): +(.*)$} $x all name value]} {
    error "invalid header line: \"$x\""
  }
```

```
  set name [string toupper $name]
  switch -- $name {
    REFERER {set name HTTP_REFERER}
    USER-AGENT {set name HTTP_USER_AGENT}
    CONTENT-LENGTH {set name CONTENT_LENGTH}
    CONTENT-TYPE {set name CONTENT_TYPE}
    HOST {set name HTTP_HOST}
    COOKIE {set name HTTP_COOKIE}
    ACCEPT-ENCODING {set name HTTP_ACCEPT_ENCODING}
    default {set name .hdr:$name}
  }
  dict set W $name $value
 }
 return 0
}

# Decode the QUERY_STRING
 parameters from a GET request or the
# application/x-www-form-urlencoded CONTENT from a POST request.
#
# This routine sets the ".qp" element of the ::wapp dict as a signal
# that query parameters have already been decoded.
#
proc wappInt-decode-query-params {} {
 global wapp
 dict set wapp .qp 1
 if {[dict exists $wapp QUERY_STRING]} {
  foreach qterm [split [dict get $wapp QUERY_STRING] &] {
    set qsplit [split $qterm =]
    set nm [lindex $qsplit 0]
    if {[regexp {^[a-z][a-z0-9]*$} $nm]} {
      dict set wapp $nm [wappInt-decode-url [lindex $qsplit 1]]
    }
  }
 }
 if {[dict exists $wapp CONTENT_TYPE] && [dict exists $wapp CONTENT]} {
  set ctype [dict get $wapp CONTENT_TYPE]
  if {$ctype=="application/x-www-form-urlencoded"} {
    foreach qterm [split [string trim [dict get $wapp CONTENT]] &] {
      set qsplit [split $qterm =]
      set nm [lindex $qsplit 0]
      if {[regexp {^[a-z][-a-z0-9_]*$} $nm]} {
        dict set wapp $nm [wappInt-decode-url
[lindex $qsplit 1]]
      }
    }
  } elseif {[string match multipart/form-data* $ctype]} {
    regexp {^(.*?)\r\n(.*)$} [dict get $wapp CONTENT] all divider body
```

```
    set ndiv [string length $divider]
    while {[string length $body]} {
      set idx [string first $divider $body]
      set unit [string range $body 0 [expr {$idx-3}]]
      set body [string range $body [expr {$idx+$ndiv+2}] end]
      if {[regexp {^Content-Disposition: form-data; (.*?)\r\n\r\n(.*)$} \
          $unit unit hdr content] &&
         [regexp {name="(.*)"; filename="(.*)"\r\nContent-Type: (.*?)$}\
           $hdr hr name filename mimetype]} {
        dict set wapp $name.filename \
         [string map [list \\\" \" \\\\ \\] $filename]
        dict set wapp $name.mimetype $mimetype
        dict set wapp $name.content $content
      }
    }
  }
 }
}

# Invoke application-supplied methods to generate a reply to
# a single HTTP request.
#
# This routine always
 runs within [catch], so handle exceptions by
# invoking [error].
#
proc wappInt-handle-request {chan useCgi} {
 global wapp
 dict set wapp .reply {}
 dict set wapp .mimetype {text/html; charset=utf-8}
 dict set wapp .reply-code {200 Ok}
 dict set wapp .csp {default-src 'self'}

 # Set up additional CGI environment values
 #
 if {![dict exists $wapp HTTP_HOST]} {
  dict set wapp BASE_URL {}
 } elseif {[dict exists $wapp HTTPS]} {
  dict set wapp BASE_URL https://[dict get $wapp HTTP_HOST]
 } else {
  dict set wapp BASE_URL http://[dict get $wapp HTTP_HOST]
 }
 if {![dict exists $wapp REQUEST_URI]} {
  dict set wapp REQUEST_URI /
 } elseif {[regsub {\?.*} [dict get $wapp REQUEST_URI] {} newR]} {
  # Some servers (ex: nginx) append the query parameters to REQUEST_URI.
  # These need to be stripped off
  dict set wapp REQUEST_URI $newR
```

```
}
if {[dict exists $wapp SCRIPT_NAME]} {
  dict append wapp BASE_URL [dict get $wapp SCRIPT_NAME]
} else {
  dict set wapp
SCRIPT_NAME {}
}
if {![dict exists $wapp PATH_INFO]} {
  # If PATH_INFO is missing (ex: nginx) the construct it
  set URI [dict get $wapp REQUEST_URI]
  set skip [string length [dict get $wapp SCRIPT_NAME]]
  dict set wapp PATH_INFO [string range $URI $skip end]
}
if {[regexp {^/([^/]+)(.*)$} [dict get $wapp PATH_INFO] all head tail]} {
  dict set wapp PATH_HEAD $head
  dict set wapp PATH_TAIL [string trimleft $tail /]
} else {
  dict set wapp PATH_INFO {}
  dict set wapp PATH_HEAD {}
  dict set wapp PATH_TAIL {}
}
dict set wapp SELF_URL [dict get $wapp BASE_URL]/[dict get $wapp PATH_HEAD]

# Parse query parameters from the query string, the cookies, and
# POST data
#
if {[dict exists $wapp HTTP_COOKIE]} {
  foreach qterm [split [dict get $wapp HTTP_COOKIE] {;}] {
    set qsplit [split [string trim $qterm] =]
    set nm [lindex $qsplit 0]
    if {[regexp {^[a-z][-a-z0-9_]*$} $nm]} {
      dict set wapp $nm [wappInt-decode-url [lindex
$qsplit 1]]
    }
  }
}
set same_origin 0
if {[dict exists $wapp HTTP_REFERER]} {
  set referer [dict get $wapp HTTP_REFERER]
  set base [dict get $wapp BASE_URL]
  if {$referer==$base || [string match $base/* $referer]} {
    set same_origin 1
  }
}
dict set wapp SAME_ORIGIN $same_origin
if {$same_origin} {
  wappInt-decode-query-params
}
```

```
# Invoke the application-defined handler procedure for this page
# request.  If an error occurs while running that procedure, generate
# an HTTP reply that contains the error message.
#
wapp-before-dispatch-hook
wappInt-trace
set mname [dict get $wapp PATH_HEAD]
if {[catch {
  if {$mname!="" && [llength [info proc wapp-page-$mname]]>0} {
    wapp-page-$mname
  } else {
    wapp-default
  }
} msg]} {
  if {[wapp-param WAPP_MODE]=="local" || [wapp-param WAPP_MODE]=="server"} {
    puts "ERROR: $::errorInfo"
  }
  wapp-reset
  wapp-reply-code "500 Internal Server Error"
  wapp-mimetype
text/html
  wapp-trim {
    <h1>Wapp Application Error</h1>
    <pre>%html($::errorInfo)</pre>
  }
  dict unset wapp .new-cookies
}

# Transmit the HTTP reply
#
if {$chan=="stdout"} {
  puts $chan "Status: [dict get $wapp .reply-code]\r"
} else {
  puts $chan "HTTP/1.1 [dict get $wapp .reply-code]\r"
  puts $chan "Server: wapp\r"
  puts $chan "Connection: close\r"
}
if {[dict exists $wapp .reply-extra]} {
  foreach {name value} [dict get $wapp .reply-extra] {
    puts $chan "$name: $value\r"
  }
}
if {[dict exists $wapp .csp]} {
  puts $chan "Content-Security-Policy: [dict get $wapp .csp]\r"
}
set mimetype [dict get $wapp .mimetype]
puts $chan "Content-Type: $mimetype\r"
```

```
 if {[dict exists $wapp .new-cookies]} {
   foreach {nm val} [dict get $wapp .new-cookies] {
     if {[regexp {^[a-z][-a-z0-9_]*$} $nm]} {
       if {$val==""} {
         puts $chan "Set-Cookie: $nm=; HttpOnly; Path=/; Max-Age=1\r"
       } else {
         set
 val [wappInt-enc-url $val]
         puts $chan "Set-Cookie: $nm=$val; HttpOnly; Path=/\r"
       }
     }
   }
 }
 if {[string match text/* $mimetype]} {
   set reply [encoding convertto utf-8 [dict get $wapp .reply]]
   if {[regexp {\ygzip\y} [wapp-param HTTP_ACCEPT_ENCODING]]} {
     catch {
       set x [zlib gzip $reply]
       set reply $x
       puts $chan "Content-Encoding: gzip\r"
     }
   }
 } else {
   set reply [dict get $wapp .reply]
 }
 puts $chan "Content-Length: [string length $reply]\r"
 puts $chan \r
 puts $chan $reply
 flush $chan
 wappInt-close-channel $chan
}

# This routine runs just prior to request-handler dispatch.  The
# default implementation is a no-op, but applications can override
# to do additional transformations or checks.
#
proc wapp-before-dispatch-hook {} {return}

# Process a single CGI request
#
proc wappInt-handle-cgi-request {} {
 global wapp env
 foreach key {
   CONTENT_LENGTH
   CONTENT_TYPE
   DOCUMENT_ROOT
   HTTP_ACCEPT_ENCODING
```

```
   HTTP_COOKIE
  HTTP_HOST
  HTTP_REFERER
  HTTP_USER_AGENT
  HTTPS
  PATH_INFO
  QUERY_STRING
  REMOTE_ADDR
  REQUEST_METHOD
  REQUEST_URI
  REMOTE_USER
  SCRIPT_FILENAME
  SCRIPT_NAME
  SERVER_NAME
  SERVER_PORT
  SERVER_PROTOCOL
 } {
  if {[info exists env($key)]} {
    dict set wapp $key $env($key)
  }
 }
 set len 0
 if {[dict exists $wapp CONTENT_LENGTH]} {
  set len [dict get $wapp CONTENT_LENGTH]
 }
 if {$len>0} {
  fconfigure stdin -translation binary
  dict set wapp CONTENT [read stdin $len]
 }
 dict set wapp WAPP_MODE cgi
 fconfigure stdout -translation binary
 wappInt-handle-request stdout 1
}

# Process new text received on an inbound SCGI request
#
proc wappInt-scgi-readable {chan} {
 if {[catch [list wappInt-scgi-readable-unsafe $chan] msg]} {
  puts stderr "$msg\n$::errorInfo"
  wappInt-close-channel $chan
 }
}
proc wappInt-scgi-readable-unsafe {chan} {
 upvar #0 wappInt-$chan W wapp wapp
 if
 {![dict exists $W .toread]} {
  # If the .toread key is not set, that means we are still reading
  # the header.
```

```
  #
  # An SGI header is short.  This implementation assumes the entire
  # header is available all at once.
  #
  set req [read $chan 15]
  set n [string length $req]
  scan $req %d:%s len hdr
  incr len [string length "$len:,"]
  append hdr [read $chan [expr {$len-15}]]
  foreach {nm val} [split $hdr \000] {
    if {$nm==","} break
    dict set W $nm $val
  }
  set len 0
  if {[dict exists $W CONTENT_LENGTH]} {
    set len [dict get $W CONTENT_LENGTH]
  }
  if {$len>0} {
    # Still need to read the query content
    dict set W .toread $len
  } else {
    # There is no query content, so handle the request immediately
    set wapp $W
    wappInt-handle-request $chan 0
  }
 } else {
  # If .toread is set, that means we are reading the query content.
  # Continue reading until .toread reaches zero.
  set got [read
 $chan [dict get $W .toread]]
  dict append W CONTENT $got
  dict set W .toread [expr {[dict get $W .toread]-[string length $got]}]
  if {[dict get $W .toread]<=0} {
    # Handle the request as soon as all the query content is received
    set wapp $W
    wappInt-handle-request $chan 0
  }
 }
}

# Start up the wapp framework.  Parameters are a list passed as the
# single argument.
#
#    -server $PORT         Listen for HTTP requests on this TCP port $PORT
#
#    -local $PORT          Listen for HTTP requests on 127.0.0.1:$PORT
#
#    -scgi $PORT           Listen for SCGI requests on TCP port $PORT
```

```
#
#    -cgi                Handle a single CGI request
#
# With no arguments, the behavior is called "auto".  In "auto" mode,
# if the GATEWAY_INTERFACE environment variable indicates CGI, then run
# as CGI.  Otherwise, start an HTTP server bound to the loopback address
# only, on an arbitrary TCP port, and automatically launch a web browser
# on that TCP port.
#
# Additional
 options:
#
#    -trace              "puts" each request URL as it is handled, for
#                        debugging
#
#    -lint               Run wapp-safety-check on the application instead
#                        of running the application itself
#
#    -Dvar=value         Set TCL global variable "var" to "value"
#
#
proc wapp-start {arglist} {
 global env
 set mode auto
 set port 0
 set n [llength $arglist]
 for {set i 0} {$i<$n} {incr i} {
  set term [lindex $arglist $i]
  if {[string match --* $term]} {set term [string range $term 1 end]}
  switch -glob -- $term {
    -server {
      incr i;
      set mode "server"
      set port [lindex $arglist $i]
    }
    -local {
      incr i;
      set mode "local"
      set port [lindex $arglist $i]
    }
    -scgi {
      incr i;
      set mode "scgi"
      set port [lindex $arglist $i]
    }
    -cgi {
      set mode "cgi"
    }
```

```
    -trace {
      proc wappInt-trace {} {

    set q [wapp-param QUERY_STRING]
        set uri [wapp-param BASE_URL][wapp-param PATH_INFO]
        if {$q!=""} {append uri ?$q}
        puts $uri
      }
    }
    -lint {
      set res [wapp-safety-check]
      if {$res!=""} {
        puts "Potential problems in this code:"
        puts $res
        exit 1
      } else {
        exit
      }
    }
    -D*=* {
      if {[regexp {^.D([^=]+)=(.*)$} $term all var val]} {
        set ::$var $val
      }
    }
    default {
      error "unknown option: $term"
    }
  }
}
if {($mode=="auto"
     && [info exists env(GATEWAY_INTERFACE)]
     && [string match CGI/1.* $env(GATEWAY_INTERFACE)])
  || $mode=="cgi"
} {
  wappInt-handle-cgi-request
  return
}
if {$mode=="scgi"} {
  wappInt-start-listener $port scgi
} elseif {$mode=="server"} {
  wappInt-start-listener $port server
} else {
  wappInt-start-listener $port local
}
vwait ::forever
}

# Call this version
```

```
 1.0
package provide wapp 1.0

#### End of wapp.tcl

# Generate all header content for the output document
#
proc search_header {} {
 wapp-trim {
<!DOCTYPE html>
<html><head>
<meta name="viewport" content="width=device-width, initial-scale=1.0">
<meta http-equiv="content-type" content="text/html; charset=UTF-8">
<link href="sqlite.css" rel="stylesheet">
<title>Search SQLite Documentation</title>
<!-- path= -->
</head>
<body>
<div class=nosearch>
<a href="index.html">
<img class="logo" src="images/sqlite370_banner.gif" alt="SQLite" border="0">
</a>
<div><!-- IE hack to prevent disappearing logo --></div>
<div class="tagline desktoponly">
Small. Fast. Reliable.<br>Choose any three.
</div>
<div class="menu mainmenu">
<ul>
<li><a href="index.html">Home</a>
<li class='mobileonly'><a href="javascript:void(0)" onclick='toggle_div("submenu")'>Menu</a>
<li class='wideonly'><a href='about.html'>About</a>
<li class='desktoponly'><a href="docs.html">Documentation</a>
<li class='desktoponly'><a href="download.html">Download</a>
<li
 class='wideonly'><a href='copyright.html'>License</a>
<li class='desktoponly'><a href="support.html">Support</a>
<li class='desktoponly'><a href="prosupport.html">Purchase</a>
<li class='search' id='search_menubutton'>
<a href="javascript:void(0)" onclick='toggle_search()'>Search</a>
</ul>
</div>
<div class="menu submenu" id="submenu">
<ul>
<li><a href='about.html'>About</a>
<li><a href='docs.html'>Documentation</a>
<li><a href='download.html'>Download</a>
<li><a href='support.html'>Support</a>
<li><a href='prosupport.html'>Purchase</a>
```

```
</ul>
</div>
<div class="searchmenu" id="searchmenu">
<form method="GET" action="search">
<select name="s" id="searchtype">
<option value="d">Search Documentation</option>
<option value="c">Search Changelog</option>
</select>
<input type="text" name="q" id="searchbox" value="">
<input type="submit" value="Go">
</form>
</div>
</div>
<script>
function toggle_div(nm) {
var w = document.getElementById(nm);
if( w.style.display=="block"
 ){
w.style.display = "none";
}else{
w.style.display = "block";
}
}
function toggle_search() {
var w = document.getElementById("searchmenu");
if( w.style.display=="block" ){
w.style.display = "none";
} else {
w.style.display = "block";
setTimeout(function(){
document.getElementById("searchbox").focus()
}, 30);
}
}
function div_off(nm){document.getElementById(nm).style.display="none";}
window.onbeforeunload = function(e){div_off("submenu");}
/* Disable the Search feature if we are not operating from CGI, since */
/* Search is accomplished using CGI and will not work without it. */
if( !location.origin.match || !location.origin.match(/http/) ){
document.getElementById("search_menubutton").style.display = "none";
}
/* Used by the Hide/Show button beside syntax diagrams, to toggle the */
function hideorshow(btn,obj){
var x = document.getElementById(obj);
var b = document.getElementById(btn);
if( x.style.display!='none' ){
x.style.display = 'none';
b.innerHTML='show';
```

```
}else{
x.style.display
 = '';
b.innerHTML='hide';
}
return false;
}
</script>
</div>
 }
}

#--------------------------------------------------------------------------
# Add an entry to the log database for the current query. Which
# returns $nRes results.
#
proc search_add_log_entry {nRes} {
 if {[wapp-param-exists donotlog]} return
 sqlite3 db2 [file dir [wapp-param SCRIPT_FILENAME]]/search.d/searchlog.db
 db2 timeout 10000
 set ip [wapp-param REMOTE_ADDR]
 set query [wapp-param q]
 db2 eval {
   PRAGMA synchronous=OFF;
   PRAGMA journal_mode=OFF;
   BEGIN;
     CREATE TABLE IF NOT EXISTS log(
       ip,                -- IP query was made from
       query,               -- Fts5 query string
       nres,               -- Number of results
       timestamp DEFAULT CURRENT_TIMESTAMP
     );
     INSERT INTO log(ip, query, nres) VALUES($ip, $query, $nRes);
   COMMIT;
 }
 db2 close
}

#--------------------------------------------------------------------------
# This command
 is similar to the builtin Tcl [time] command, except that
# it only ever runs the supplied script once. Also, instead of returning
# a string like "xxx microseconds per iteration", it returns "x.yy ms" or
# "x.yy s", depending on the magnitude of the time spent running the
# command. For example:
#
#   % ttime {after 1500}
#   1.50 s
```

```
#   % ttime {after 45}
#   45.02 ms
#
proc ttime {script} {
 set t [lindex [time [list uplevel $script]] 0]
 if {$t>1000000} { return [format "%.2f s" [expr {$t/1000000.0}]] }
 return [format "%.2f ms" [expr {$t/1000.0}]]
}

#-------------------------------------------------------------------------
# Do a search of the change log
#
proc searchchanges {} {
 set q [wapp-param q]
 if {$q==""} {return {}}
 if {[regexp -all \x22 $q] % 2} { append q \x22 }
 set x ""
 foreach word [split $q " "] {
  append x " \"[string map [list "\"" "\"\""] $word]\""
 }
 set q [string trim $x]
 set open {<span style="background-color:#d9f2e6">}
 set close {</span>}
  set query {
  SELECT url, version, idx, highlight(change, 3, $open, $close) AS text
  FROM change($q) ORDER BY rowid ASC
 }
 wapp-trim {
  <p>Change log entries mentioning: <b>%html($q)</b>
  <table border=0>
 }
 set s2 "style=\"margin-top:0\""
 set s1 "style=\"font-size:larger; text-align:left\" class=nounderline"
 set prev ""
 db eval $query {
  if {$prev!=$version} {
    wapp-trim {
      <tr> <td %unsafe($s1) valign=top> <a href='%url($url)'>%html($version)</a>
      <td> <ul %unsafe($s2)>
    }
    set prev $version
  }
  wapp-subst {<li value=%html($idx)> (%html($idx)) %unsafe($text)\n}
 }
 wapp-trim {
  </table>
  <center><p>You can also see the <a href=changes.html>entire
  changelog as a single page</a> if you wish.</center>
```

```
 }
}

#---------------------------------------------------------------------
# Do a search over all documentation other than the change log
#
proc searchresults {} {
 set q [wapp-param q]
 if {$q==""} {return
 ""}

 # Count the "" characters in $::A(q). If there is an odd number of
 # occurences, add a " to the end of the query so that fts5 can parse
 # it without error.
 if {[regexp -all \x22 $q] % 2} { append q \x22 }

 # Set iStart to the index of the first result to display. Results are
 # indexed starting at zero from most to least relevant.
 #
 set iStart 0
 catch {set iStart [expr {[wapp-param i 0]*10}]}

 # Grab a list of rowid results.
 #
 set sql {
  SELECT rowid FROM page WHERE page MATCH $q
  ORDER BY srank(page) DESC,
  rank * COALESCE(
    (SELECT percent FROM weight WHERE id=page.rowid), 100
  );
 }
 if {[catch { set lRowid [db eval $sql] }]} {
  set x ""
  foreach word [split $q " "] {
    append x " \"[string map [list "\"" "\"\""] $word]\""
  }
  set q [string trim $x]
  set lRowid [db eval $sql]
 }

 set lRes [list]
 foreach rowid $lRowid {
  if {$rowid > 1000} {
    set parent [expr $rowid / 1000]
    lappend subsections($parent)
 $rowid
  } else {
    lappend lRes $rowid
```

```
  }
}

set nRes [llength $lRes]
set lRes [lrange $lRes $iStart [expr $iStart+9]]

# Add an entry to the log database.
#
search_add_log_entry $nRes

# If there are no results, return a message to that effect.
#
if {[llength $lRes] == 0} {
  wapp-subst {<p>No Results for: <b>%html($q)</b>\n}
}

# HTML markup used to highlight keywords within FTS5 generated snippets.
#
set open {<span style="background-color:#d9f2e6">}
set close {</span>}
set ellipsis {<b> ... </b>}

# Grab the required data
#
db eval [string map [list %LIST% [join $lRowid ,]] {
  SELECT
    rowid AS parentid,
    snippet(page, 0, $open, $close, $ellipsis, 6)  AS s_apis,
    snippet(page, 2, $open, $close, '', 40)        AS s_title1,
    snippet(page, 3, $open, $close, $ellipsis, 40) AS s_title2,
    snippet(page, 4, $open, $close, $ellipsis, 40) AS s_content,
    url, rank
  FROM page($q)
  WHERE rowid
IN (%LIST%)
}] X {
  foreach k [array names X] { set data($X(parentid),$k) [set X($k)] }
}

set i1 [expr {$iStart+1}]
set i2 [expr {($nRes < $iStart+10) ? $nRes : $iStart+10}]
wapp-trim {
  <table border=0>
  <p>Search results %html($i1)..%html($i2) of %html($nRes) for: <b>%html($q)</b>
}

foreach rowid $lRes {
```

```
  foreach a {parentid s_apis s_title1 s_content url rank} {
    set $a $data($rowid,$a)
  }

  if {[info exists subsections($parentid)]} {
    set childid [lindex $subsections($parentid) 0]
    set link $data($childid,url)
    set hdr $data($childid,s_title2)

    if {$hdr==""} {
      set s_content ""
    } else {
      set s_content [subst {
        <b><a style=color:#044a64 href=$link>$hdr</a></b>
      }]
    }

    append s_content " $data($childid,s_content)"
  }

  wapp-trim {<tr>
    <td valign=top style="line-height:150%">
      <div style="white-space:wrap;font-size:larger" class=nounderline>
        <a href="%url($url)">%unsafe($s_title1)</a>

        <div style="float:right;font-size:smaller;color:#BBB">(%url($url))</div>
      </div>
        <div style="margin-left: 10ex; font:larger monospace">%unsafe($s_apis)</div>
      <div style="margin-left: 4ex; margin-bottom:1.5em">
        %unsafe($s_content)
      </div>
    </td>
  }
}
wapp-subst {</table>\n}


# If the query returned more than 10 results, add up to 10 links to
# each set of 10 results (first link to results 1-10, second to 11-20,
# third to 21-30, as required).
#
if {$nRes>10} {
  set s(0) {border:solid #044a64 1px;padding:1ex;margin:1ex;line-height:300%;}
  set s(1) "$s(0);background:#044a64;color:white"
  wapp-subst {<center><p>\n}
  for {set i 0} {$i < 10 && ($i*10)<$nRes} {incr i} {
    set style $s([expr {($iStart/10)==$i}])
    wapp-trim {
```

```
      <a style="%html($style)"
        href="search?q=%qp($q)&i=%qp($i)">%html([expr $i+1])</a>
    }
  }
  wapp-subst {</center>\n}
 }
}

# This is the main entry point into the search result page generator
#
proc wapp-default {} {
 wapp-content-security-policy {default-src 'self' 'unsafe-inline'}
 wapp-allow-xorigin-params
 if {[wapp-param-exists env]} {
  search_header
  wapp-trim {
   <h1>Environment Dump For Debugging</h1>
   <pre>%html([wapp-debug-env])</pre>
  }
  return
 }

 # When running using the built-in webserver in Wapp (in other words,
 # when not running as CGI) any filename that contains a "." loads
 # directly from the filesystem.
 if {[wapp-param WAPP_MODE]!="cgi"
  && [string match *.* [wapp-param PATH_INFO]]
 } {
  set altfile [file dir [wapp-param SCRIPT_FILENAME]][wapp-param PATH_INFO]
  set fd [open $altfile rb]
  fconfigure $fd -translation binary
  wapp-unsafe [read $fd]
  close $fd
  switch -glob -- $altfile {
   *.html {
    wapp-mimetype text/html
   }
   *.css {
    wapp-mimetype text/css
   }
   *.gif {
    wapp-mimetype
 image/gif
   }
  }
  return
 }
```

```
 search_header
 sqlite3 db [file dir [wapp-param SCRIPT_FILENAME]]/search.d/search.db
 set searchType [wapp-param s d]
 if {$searchType=="c"} {
   set cmd searchchanges
 } else {
   set cmd searchresults
 }
 db transaction {
   set t [ttime {$cmd}]
 }
 wapp-trim {
   <center>
   <p>Page generated by <a href='fts5.html'>FTS5</a> in about %html($t).
   </center>
   <script>
     window.addEventListener('load', function() {
       var w = document.getElementById("searchmenu");
       w.style.display = "block";
       w = document.getElementById("searchtype");
       w.value = "%string($searchType)"
       setTimeout(function(){
         var s = document.getElementById("searchbox");
         s.value = "%string([wapp-param q])"
         s.focus();
         s.select();
       }, 30);
     });
   </script>
 }
}
wapp-start $argv
```

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/search
No license file was found, but licenses were detected in source scan.

SQLite is high-quality, public domain software. The goal of
members can also request their own private, proprietary extensions

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/consortium.html
No license file was found, but licenses were detected in source scan.

<h2>SQLite Is Public Domain</h2>
Public Domain
public domain
the public domain and originals of

author, and all of those authors have public domain dedications
domain and ensure that the code does not become contaminated with proprietary
SQLite is in the public domain and does not require a license.
the public domain.
have the legal right to dedicate the SQLite to the public domain, and

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/copyright.html
No license file was found, but licenses were detected in source scan.

public domain. No claim of ownership is made

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/faq.html
No license file was found, but licenses were detected in source scan.

<html>
<body bgcolor="white">
FOR IMMEDIATE RELEASE:

<h2 align="center">SQLite Consortium Launches With Mozilla And Symbian As Charter Members</h2>

<h3 align="center">Ensures independent technical direction for world's
most deployed SQL database engine</h3>

Charlotte, North Carolina - December 12, 2007 - The SQLite Consortium,
a new membership association dedicated to maintaining SQLite as a fully open
and independent product, was formally announced today. Mozilla and Symbian Ltd.
have joined the SQLite Consortium as charter members.

SQLite is a compact, high efficiency, high reliability, embeddable SQL database
engine. The source code to SQLite is in the public domain and is available with
no associated fees. SQLite is the most deployed SQL database engine in the world
and is currently used in a wide range of commercial software products and electronic
devices from leading manufacturers.
 SQLite is found today in many mobile phones,
MP3 players, set-top boxes, and PCs.

The mission of the SQLite Consortium is to continue developing and enhancing
SQLite as a product that anyone may use without paying royalties or licensing fees.
Members of the SQLite Consortium provide funding to enable this mission and in
return receive enterprise-level technical support. Technical control and direction
of SQLite remains entirely with the SQLite developers.

Mozilla, developer of the popular open-source Firefox web browser, and Symbian,
the market-leading open operating system for advanced data-enabled smartphones,
both deploy the SQLite database engine in their products. As charter members of

the Consortium, Mozilla and Symbian are ensuring the development and support of SQLite as a freely accessible and public domain software asset.

"SQLite has become a popular embedded database because it is lightweight, fast, and open source," said Michael Schroepfer,
Vice President of Engineering, Mozilla.
"As a charter member of the SQLite Consortium, Mozilla is excited to help ensure SQLite remains a vibrant and open technology, in line with our mission to promote choice and innovation on the Internet."

"The SQLite Consortium will help set the standards for database management which are essential in smartphone functionality and will also help create a pool of developers, highly-skilled in SQLite for future mobile phone development, " said Bruce Carney, Director, Developer Programmes & Services, Symbian.
"Our involvement with the SQL Consortium not only demonstrates Symbian's commitment to open standards in the industry, but as mobile phones become increasingly powerful and smartphones become increasingly popular, we are focused on ensuring that desktop developers, who move to the mobile space, have the easiest and most productive experience possible."

SQLite is a winner of the 2005 Google/O'Reilly Open Source Award. Additional information
regarding the SQLite Consortium is available at the SQLite website, http://www.sqlite.org/.

# # #

About SQLite

SQLite is a software library that implements a self-contained, embeddable, serverless, zero-configuration, transactional SQL database engine. The code for SQLite is in the public domain and is free for any use, commercial or private. SQLite is currently found in countless software titles and electronic devices.

SQLite was originally developed and released 2000 by Dr. D. Richard Hipp. The code continues to be maintained and enhanced by an international team of developers under Hipp's direction.

CONTACT INFORMATION:
SQLite Consortium
Dr. D. Richard Hipp
6200 Maple Cove Lane
Charlotte, NC 28269
Email: drh@sqlite.org

http://www.sqlite.org/
Tel: +1.704.948.4565

About Mozilla

Mozilla is a global community dedicated to building free, open source products

and technologies that improve the online experience for people everywhere.
Mozilla works in the open with a highly disciplined, transparent and cooperative
development process, under the umbrella of the non-profit Mozilla Foundation.
As a wholly owned subsidiary, the Mozilla Corporation organizes the development
and marketing of Mozilla products. This unique structure has enabled Mozilla to
financially support and cultivate competitive, viable community innovation.
For more information, visit www.mozilla.com.

CONTACT INFORMATION:
Mozilla Corporation
Jessica Waight
Tel: +1.415.345.4754
Email: jwaight@outcastpr.com

About Symbian Limited

Symbian is a software licensing company that develops and licenses Symbian OS,
the market-leading open operating system for advanced, data-enabled mobile phones
known as smartphones.

Symbian licenses Symbian OS to the world's leading handset manufacturers
and has built close co-operative business
relationships with leading companies
across the mobile industry. During Q3 2007, 20.4 million Symbian smartphones
were sold worldwide to over 250 major network operators, bringing the total
number of Symbian smartphones shipped up to 30 September 2007 to 165 million.

Symbian has its headquarters in London, United Kingdom, with offices in the
United States, United Kingdom, Asia (India, P.R. China, and Korea) and Japan.
For more information, please visit www.symbian.com.

CONTACT INFORMATION:
Symbian Global Press Office
Karen Hamblen
+44 207 154 1707
press@symbian.com

</body></html>

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/pressrelease-20071212.html
No license file was found, but licenses were detected in source scan.

<html>
<head>
<title>SQLite Consortium Agreement</title>
</head>
<body bgcolor="white">
<h1 align="center">
SQLite Consortium Agreement
</h1>

This SQLite Consortium Agreement ("Agreement") is made and
entered into as of the _____ day of _____, 2007 ("Effective Date")
by and between _____ (the "Company"), and
Hipp, Wyrick & Company, Inc., a Georgia Corporation with
headquarters at 6200 Maple Cove Lane, Charlotte, NC ("Hwaci").

WHEREAS, Hwaci is the developer of a serverless, embeddable, public
domain SQL database engine available at
http://www.sqlite.org/
("SQLite"); and

WHEREAS, Company wishes to support the independent development of
the SQLite database engine to insure the continuing reliability,
vitality, and independence of SQLite, and in connection therewith,
Company wishes to provide funds for ongoing research, development,
and
 maintenance of the SQLite code base, operation of the SQLite
website, protection and maintenance of the SQLite
trademark, as well as for promotion of SQLite at conferences and
trade shows; and

WHEREAS, Company wishes to receive benefits in the form of
services from Hwaci in consideration for their support of SQLite; and

WHEREAS, Company and Hwaci each wish SQLite to be supported and
maintained as an independent, community-driven project, and to
ensure the SQLite development team remains independent.

NOW, THEREFORE, in consideration of the mutual promises contained
herein, the parties agree as follows:

<h2>1.0 Definitions</h2>

<h3>1.1 SQLite Developers</h3>

The "SQLite Developers" are the employees or contractors of Hwaci engaged
in the development of SQLite, including without limitation the
SQLite Architect.

<h3>1.2 SQLite Architect</h3>
The "SQLite Architect" is the SQLite Developer with ultimate
responsibility and authority over changes
and maintenance of the
SQLite code. The current SQLite Architect is the original designer
and developer of SQLite, D. Richard Hipp. Hwaci may change the
SQLite Architect from time to time upon approval by Company.

<h3>1.3 Consortium Member</h3>
A "Consortium Member" is a company or organization, including
but not limited to Company, which has entered into an agreement
with Hwaci which is substantially similar to this Agreement.

<h2>2.0 Agreement<h2>

<h3>2.1 Responsibilities And Obligations Of SQLite Developers</h3>

<h4>2.1.1 General Support</h4>
The SQLite Developers shall provide, without limit,
timely and accurate answers, advice, and instruction
in response to questions and comments from Company about SQLite
submitted by email or by telephone at any time day or night.

<h4>2.1.2 Debugging Support</h4>
The SQLite Developers shall at Company's request provide
Company with direct assistance
in debugging applications that are built upon or use SQLite.
The combined
time for Debugging Support and Custom
Development for Company is limited to 330 hours per year.

<h4>2.1.3 Custom Development</h4>
The SQLite Developers shall at the request of Company
write new extensions or enhancements
to SQLite according to Company's specifications. These extensions
and enhancements may be proprietary to Company or open source or
with the consent of both Company and the SQLite Architect may
be folded into the public domain SQLite source tree.
The time devoted to Custom Development for Company is limited 220 hours
per year.

<h4>2.1.4 Custom Builds</h4>
The SQLite Developers shall at Company's request provide Company
with specialized builds of SQLite according to Company's specifications.

<h4>2.1.5 Legacy Support</h4>
The SQLite Developers shall at Company's request provide support
and bug-fix patches for any historical version of SQLite.

<h4>2.1.6 Custom Testing</h4>
The SQLite Developers shall at Company's request set up and
run
acceptance tests according Company's specifications that are specifically
designed to exercise SQLite as configured and used by Company.
These acceptance tests shall be run and shall pass prior to any release
of SQLite.

<h4>2.1.7 Priority Bug Fixes</h4>
The SQLite Developers shall assign highest priority to fixing bugs
in SQLite that are reported by Company or in which Company has
expressed a specific interest.

<h4>2.1.8 Code Quality</h4>
The SQLite Developers shall at all times keep the SQLite source
code well commented and documented and clearly structured and
organized so that an experienced and competent programmer can
understand it and support it after no more than a few months of study.

<h4>2.1.9 Backwards Compatibility</h4>
The SQLite Developers recognize that Company uses SQLite
in mission-critical applications and therefore shall work diligently
to ensure continuing bug-free correct operation and backwards
compatibility with prior releases.

<h4>2.1.10
Test Coverage</h4>
The SQLite Developers shall maintain the SQLite test suite such
that no less than 95% source code coverage is provided.

<h4>2.1.11 Website</h4>
The SQLite Developers shall maintain the SQLite website at

http://www.sqlite.org/
in good working order and all SQLite source code shall
be made freely available at such website.

<h3>2.2 Responsibilities And Obligations Of The SQLite Architect</h3>

<h4>2.2.1 Private Briefings</h4>
The SQLite Architect shall, at the request of Company,
provide Company with private notification and briefings
of any new bugs or new features in SQLite that might
effect Company's products.

<h4>2.2.2 Direction</h4>
The SQLite Architect shall coordinate the activities of SQLite
Developers and shall publish from time to time a roadmap of
proposed future changes and enhancements to SQLite.

<h4>2.2.3 Oversight</h4>
The SQLite Architect shall personally
review all changes to
the SQLite Source Code and take responsibility for the quality
and correctness of those changes.

<h4>2.2.4 Continuity</h4>
The initial SQLite Architect shall be the original developer
of SQLite, D. Richard Hipp. The role of SQLite Architect shall
not be assigned to another during the term of this Agreement except
due to the disability of Dr. Hipp and with approval of Company.

<h3>2.3 Responsibilities And Obligations Of Hwaci</h3>

<h4>2.3.1 Employer</h4>
Hwaci shall act as the employer of the SQLite Developers and
SQLite Architect and shall make all tax and legal filings
and tax withholding required by employers. Hwaci shall provide
Company with W-9 information upon request.

<h4>2.3.2 Responsible Party</h4>
All obligations of the SQLite Developers set forth in this
agreement are deemed obligations of Hwaci. Hwaci shall recruit,
employ, and supervise SQLite Developers in such a way that the

responsibilities and obligations of the SQLite
Developers set
forth in this agreement are upheld.

<h4>2.3.3 Multiple Developers</h4>
Hwaci shall recruit and employ as many SQLite Developers for as
many hours as can be reasonably achieved using the funds received
from Consortium Members under this agreement.
So that support for SQLite will not be interrupted by the
disability or withdrawal of any one SQLite Developer, Hwaci will
keep at least two knowledgeable and competent SQLite Developers
on staff.

<h4>2.3.4 Mentorship</h4>
Hwaci shall work to encourage independent
programmers from around the world
to become familiar with SQLite internals so that there will be a
pool of talent able to support SQLite in the future.

<h4>2.3.5 Audits</h4>
Hwaci shall keep and maintain complete and accurate records
of the use of development funds provided by Company
and shall allow Company, or its representative, a certified
public accountant mutually acceptable to Hwaci and Company,
during office hours and at reasonable
intervals, no more than
once every 12 months, to inspect and make extracts or copies
of such records solely for the purpose of ascertaining Hwaci's
compliance with the objectives and requirements of this agreement.

<h4>2.3.6 Disaster Planning</h4>
Hwaci shall maintain backup copies of all
SQLite source files and documentation, current and historical,
at at least two separate locations separated from each
other and from the primary on-line SQLite repository
by at least 400 kilometers.

<h4>2.3.7 Trademark</h4>
Hwaci shall maintain ownership of the SQLite trademark and
the sqlite.org domain name and shall purchase bandwidth and
server space for the
http://www.sqlite.org/ website.

<h4>2.3.8 No Take-overs or Buy-outs</h4>

Neither Hwaci nor the SQLite Architect shall relinquish development
control of SQLite during the term of this Agreement, by acquisition or merger
or by any other means,
except with the consent of Company.

<h4>2.3.9
New Consortium Members</h4>
New Consortium Members may be accepted into the consortium from
time to time under identical terms as this agreement, or under
substantially similar terms that have been approved by existing
Consortium Members.

<h4>2.3.10 Adequate Staff</h4>
Hwaci shall recruit and employ a sufficient number of qualified
SQLite Developers to easily cover all custom development,
debugging, and general support service obligations for all
Consortium Members while still providing ample time for
the SQLite Developers to engage in general maintenance
and extension of SQLite.

<h4>2.3.11 Use Of Funds</h4>
Hwaci shall use the funds provided hereunder
solely for the development and maintenance of SQLite as set forth in
this Agreement.
Interest on funds received in advance and held in trust will
be reinvested and used for the same purposes as the principal.

<h3>2.4 Responsibilities And Obligations Of Company</h3>

<h4>2.4.1 Funding</h4>
Company
shall provide funding for the ongoing support and
maintenance of SQLite as set forth in section 3.0 "Fees".

<h4>2.4.2 Copyright Disclaimer</h4>
Company acknowledges that SQLite source code and documentation
published on the SQLite website
is in the public domain and that nothing in this agreement shall change
that fact.

<h2>3.0 Fees</h2>

In consideration of the performance

by Hwaci, the SQLite Developers, and the SQLite Architect
of the obligations described herein,
Company shall pay Hwaci at least US $75,000 per year in advance
either annually, quarterly, or monthly, at Company's discretion.

<h2>4.0 Confidentiality</h2>

<h3>4.1 Definition of Confidential Information</h3>

"Confidential Information" means any Company proprietary information,
technical data, trade secrets or know-how, including, but not limited to,
research, product plans, products, services, customers, customer lists,
markets, software, developments,
inventions, processes, formulas,
technology, designs, drawings, engineering, hardware configuration
information, marketing, finances or other business information
disclosed by Company either directly or indirectly in writing,
orally or by drawings or inspection of parts or equipment.

<h3>4.2 Non-Use and Non-Disclosure.</h3>

Hwaci shall not, during or subsequent to the term of this Agreement,
use Company's Confidential Information for any purpose whatsoever
other than the performance of the Services or disclose
Company's Confidential Information to any third party. The parties
acknowledge that Confidential Information will remain the sole
property of Company. Hwaci shall take all reasonable precautions
to prevent any unauthorized disclosure of Confidential Information
including, but not limited to, having each employee or
consultant of Hwaci, if any, with access to any
Confidential Information, execute a nondisclosure agreement
containing provisions in Company's
favor substantially similar
to this Agreement. Confidential Information does not include
information that: (i) is known to Hwaci at the time of
disclosure to Hwaci by Company as evidenced by written
records of Hwaci; (ii) has become publicly known and made
generally available through no wrongful act of Hwaci; or
(iii) has been received by Hwaci from a third party who is
authorized to make such disclosure.

<h4>4.2.1 Disclosure Required by Law</h4>
In the event any Confidential Information is required to be disclosed
by Hwaci under the terms of a valid and effective subpoena or order
issued by a court of competent jurisdiction, or by a demand or
information request from an executive or administrative agency
or other governmental authority, Hwaci shall, unless prohibited
by the terms of a subpoena, order, or demand, promptly notify

Company of the existence, terms and circumstances surrounding
such demand or request, shall consult with Company on the
advisability of
taking legally available steps to resist
or narrow such demand or request, and, if disclosure of
such Confidential Information is required, shall exercise
its reasonable best efforts to narrow the scope of disclosure
and obtain an order or other reliable assurance that
confidential treatment will be accorded to such
Confidential Information. To the extent that Hwaci
is prohibited from notifying Company of a subpoena,
order or demand, by the terms of same, Hwaci shall exercise
its reasonable efforts to narrow the scope of disclosure.

<h3>4.3 Return of Materials.</h3>

Upon the termination of this Agreement, or upon Company's
earlier request, Hwaci shall deliver to Company all of
Company's property or Confidential Information that Hwaci
may have in Hwaci's possession or control.

<h2>5.0 Intellectual Property</h2>

<h3>5.1 No Assignment</h3>

Company acknowledges that all copyrightable material, notes,
records, drawings, designs, inventions, improvements, developments,

discoveries and trade secrets made, generated, conceived, or
reduced to practice by Hwaci related to SQLite
will remain the property of Hwaci. Nothing in this Agreement
will be construed to transfer any intellectual property right
of Hwaci to Company.

<h3>5.2 Availability and Public Domain Dedication</h3>

The SQLite Developers and Hwaci shall,
subject to their discretion as to the quality
and suitability of the SQLite source code and documentation
for public release, make
the SQLite source code and documentation
publicly available as downloadable files
and make a public statement ceding all intellectual
property rights, including but not limited to copyright
and patent rights, in the SQLite source code and documentation
to the public domain.
To the extent that the SQLite Developers and Hwaci
elect not to release the SQLite

source code and documentation
publicly, they shall provide copies thereof to
Company and hereby grants to Company, under all of the
SQLite
Developers' and Hwaci's
rights
including but not limited to copyright and patent rights,
in and to the SQLite source code and documentation,
perpetual, irrevocable,
worldwide, non-exclusive, sublicenseable license to use,
copy, prepare derivative works of, publicly perform and
display the SQLite source code and documentation
and derivative works thereof.

<h3>5.3 Trademark</h3>

Hwaci shall use the name "SQLite" only to apply to the
publicly available project known by such name as of the
Effective Date. Hwaci may in its discretion file such
trademark applications or registrations as it deems
appropriate to protect or record its rights therein,
and may set such policies as it deems appropriate for
licensing the use of the trademark.

<h2>6.0 Representations And Warranties</h3>

<h3>6.1 Intellectual Property Clearances.</h3>

Hwaci hereby represents and warrants that Hwaci shall
enter into agreements with the SQLite Developers sufficient
to enable Hwaci to
undertake the obligations of Section 5.

<h3>6.2 Disclaimer.</h3>

THE WORK PRODUCT AND ALL MATERIAL PROVIDED BY HWACI AND
COMPANY ARE PROVIDED "AS IS." NEITHER PARTY MAKES ANY
REPRESENTATIONS OR WARRANTIES OF ANY KIND, WHETHER ORAL
OR WRITTEN, WHETHER EXPRESS, IMPLIED, OR ARISING BY STATUTE,
CUSTOM, COURSE OF DEALING OR TRADE USAGE, WITH RESPECT TO
THE SUBJECT MATTER HEREOF, IN CONNECTION WITH THIS AGREEMENT.
EACH PARTY SPECIFICALLY DISCLAIMS ANY AND ALL IMPLIED
WARRANTIES OR CONDITIONS OF TITLE, MERCHANTABILITY,
FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT.

<h2>7.0 Term And Termination</h2>

<h3>7.1 Term.</h3>

This Agreement will commence on the Effective Date and
will continue until 12 months after the Effective Date.
Thereafter, the parties may by mutual consent renew
this Agreement subject to agreement on fees to be paid by
Company for sponsorship for additional periods.

<h3>7.2 Termination.</h3>

If either party materially defaults in
the performance
of any of its material obligations hereunder and if any
such default is not corrected within 30 days after notice
in writing, then the non-defaulting party, at its option,
may, in addition to any other remedies it may have, thereupon
terminate this Agreement by giving written notice of
termination to the defaulting party.

<h3>7.3 Survival.</h3>

Upon such termination all rights and duties of the
parties toward each other will cease except:
Sections 4 (Confidentiality), 5 (Intellectual Property),
and 8 (Miscellaneous) will survive termination of this Agreement.

<h2>8. Miscellaneous</h2>

<h3>8.1 Nonassignment/Binding Agreement.</h3>

The parties acknowledge that the unique nature of
Hwaci's services are substantial consideration for the
parties' entering into this Agreement. Neither this
Agreement nor any rights under this Agreement may be
assigned or otherwise transferred by Hwaci, in whole
or in part, whether voluntarily or by operation
of law,
without the prior written consent of Company, which
consent will not be unreasonably withheld.
Subject to the foregoing, this Agreement will be binding
upon and will inure to the benefit of the parties and
their respective successors and assigns. Any assignment
in violation of the foregoing will be null and void.

<h3>8.2 Notices.</h3>

Any notice required or permitted under the terms of
this Agreement or required by law must be in writing
and must be: (a) delivered in person; (b) sent by first

class registered mail, or air mail, as appropriate; or
(c) sent by overnight air courier, in each case properly
posted and fully prepaid to the appropriate address set
forth in the preamble to this Agreement. Either party
may change its address for notice by notice to the other
party given in accordance with this Section. Notices
will be considered to have been given at the time of
actual delivery in person, three business days after
deposit in the mail as set forth
above, or one day after
delivery to an overnight air courier service.

<h3>8.3 Waiver.</h3>

Any waiver of the provisions of this Agreement or
of a party's rights or remedies under this Agreement
must be in writing to be effective. Failure, neglect,
or delay by a party to enforce the provisions of this
Agreement or its rights or remedies at any time, will
not be construed as a waiver of such party's rights
under this Agreement and will not in any way affect
the validity of the whole or any part of this Agreement
or prejudice such party's right to take subsequent action.
No exercise or enforcement by either party of any right
or remedy under this Agreement will preclude the
enforcement by such party of any other right or remedy
under this Agreement or that such party is entitled by
law to enforce.

<h3>8.4 Severability.</h3>

If any term, condition, or provision in this Agreement
is found to be invalid, unlawful or unenforceable to
any extent, the parties
shall endeavor in good faith
to agree to such amendments that will preserve, as far
as possible, the intentions expressed in this Agreement.
If the parties fail to agree on such an amendment,
such invalid term, condition or provision will be
severed from the remaining terms, conditions and
provisions, which will continue to be valid and
enforceable to the fullest extent permitted by law.

<h3>8.5 Integration.</h3>

This Agreement contains the entire agreement of the
parties with respect to the subject matter of this
Agreement and supersedes all previous communications,

representations, understandings and agreements,
either oral or written, between the parties with
respect to said subject matter. This Agreement
may not be amended, except by a writing signed by both parties.

<h3>8.6 Counterparts.</h3>

This Agreement may be executed in counterparts,
each of which so executed will be deemed to be an
original and such counterparts together will constitute
one
 and the same agreement.

<h3>8.7 Governing Law.</h3>

This Agreement will be interpreted and construed in
accordance with the laws of the State of North Carolina
and the United States of America, without regard to
conflict of law principles. All disputes arising out
of this Agreement will be subject to the exclusive
jurisdiction of the state and federal courts located in
North Carolina, and each party hereby consents to the
personal jurisdiction thereof.

<h3>8.8 Independent Contractors.</h3>

It is the intention of the parties that Hwaci is an
independent contractor. Nothing in this Agreement will
in any way be construed to constitute Hwaci or any of
its employees as an agent, employee or representative
of Company.

<h2>9.0 Signatures</h2>

The parties have executed this Agreement below to
indicate their acceptance of its terms.

<table width="100%" border="0">
<tr><td valign="top">
HWACI
By:<hr>

Print Name:<hr>

Title:<hr>

</td><td

width="10%"></td>
<td valign="top">
COMPANY
By:<hr>

Print Name:<hr>

Title:<hr>

</td></tr></table>

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/consortium_agreement-20071201.html
No license file was found, but licenses were detected in source scan.

SQLite core and like the SQLite core are in the public domain. The
The TH3 test harness is a set of proprietary tests, written in
Beginning in late 2018, SQLite has been fuzzed using a new proprietary

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/testing.html
No license file was found, but licenses were detected in source scan.

is free to use SQLite from multiple threads, but it must make sure

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/custombuild.html
No license file was found, but licenses were detected in source scan.

SQLite is open source, and is available in the public domain

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/books.html
No license file was found, but licenses were detected in source scan.

SQLite is in the public domain. This document describes what that means

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/docs.html
No license file was found, but licenses were detected in source scan.

If N>0 then the connection is free to use more of the WAL file beyond

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/walformat.html
No license file was found, but licenses were detected in source scan.

<html>

<title>SQLite Copyright Release Template</title>
<body bgcolor="white">
<h1 align="center">
Copyright Release for
Contributions To SQLite
</h1>

SQLite is software that implements an embeddable SQL database engine.
SQLite is available for free download from http://www.sqlite.org/.
The principal author and maintainer of SQLite has disclaimed all
copyright interest in his contributions to SQLite
and thus released his contributions into the public domain.
In order to keep the SQLite software unencumbered by copyright
claims, the principal author asks others who may from time to
time contribute changes and enhancements to likewise disclaim
their own individual copyright interest.

Because the SQLite software found at http://www.sqlite.org/ is in the
public domain, anyone is free to download the SQLite software
from that website, make changes to the software, use, distribute,
or sell the modified software,
 under either the original name or
under some new name, without any need to obtain permission, pay
royalties, acknowledge the original source of the software, or
in any other way compensate, identify, or notify the original authors.
Nobody is in any way compelled to contribute their SQLite changes and
enhancements back to the SQLite website. This document concerns
only changes and enhancements to SQLite that are intentionally and
deliberately contributed back to the SQLite website.

For the purposes of this document, "SQLite software" shall mean any
computer source code, documentation, makefiles, test scripts, or
other information that is published on the SQLite website,
http://www.sqlite.org/. Precompiled binaries are excluded from
the definition of "SQLite software" in this document because the
process of compiling the software may introduce information from
outside sources which is not properly a part of SQLite.

The header comments on the SQLite source
 files exhort the reader to
share freely and to never take more than one gives.

In the spirit of that exhortation I make the following declarations:

I dedicate to the public domain
any and all copyright interest in the SQLite software that
was publicly available on the SQLite website (http://www.sqlite.org/) prior
to the date of the signature below and any changes or enhancements to
the SQLite software
that I may cause to be published on that website in the future.
I make this dedication for the benefit of the public at large and
to the detriment of my heirs and successors. I intend this
dedication to be an overt act of relinquishment in perpetuity of
all present and future rights to the SQLite software under copyright
law.

To the best of my knowledge and belief, the changes and enhancements that
I have contributed to SQLite are either originally written by me
or are derived from prior works which I have verified are also
in the public domain
 and are not subject to claims of copyright
by other parties.

To the best of my knowledge and belief, no individual, business, organization,
government, or other entity has any copyright interest
in the SQLite software as it existed on the
SQLite website as of the date on the signature line below.

I agree never to publish any additional information
to the SQLite website (by CVS, email, scp, FTP, or any other means) unless
that information is an original work of authorship by me or is derived from
prior published versions of SQLite.
I agree never to copy and paste code into the SQLite code base from
other sources.
I agree never to publish on the SQLite website any information that
would violate a law or breach a contract.

<table width="100%" cellpadding="0" cellspacing="0">

<tr>
<td width="60%" valign="top">
Signature:

</td><td valign="top" align="left">
Date:
</td></tr>
<td colspan=2>
Name
(printed):
</td>
</tr>
</table>
</body>
</html>

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/copyright-release.html
No license file was found, but licenses were detected in source scan.

<h2>Proprietary SQLite Extensions</h2>
public domain. But there also exist
proprietary, licensed extensions to SQLite.

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/support.html
No license file was found, but licenses were detected in source scan.

SQLite itself is in the public domain and
can be used for any purpose. But TH3 is proprietary and requires a license.

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/th3.html
No license file was found, but licenses were detected in source scan.

application is free to use the same database connection or the

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/c3ref/c_config_covering_index_scan.html
No license file was found, but licenses were detected in source scan.

public domain and so most

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/famous.html

No license file was found, but licenses were detected in source scan.

Public domain
The source code for SQLite is in the public domain. No claim of copyright

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/different.html
No license file was found, but licenses were detected in source scan.

other proprietary or non-standard VFSes.

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/uri.html
No license file was found, but licenses were detected in source scan.

public domain.

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/changes.html
No license file was found, but licenses were detected in source scan.

Sources are in the public domain.
or some proprietary format into

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/features.html
No license file was found, but licenses were detected in source scan.

 Public domain source code
public domain and is thus free for

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/about.html
No license file was found, but licenses were detected in source scan.

without a shared lock, other processes are free to modify the database

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/atomiccommit.html
No license file was found, but licenses were detected in source scan.

<dd> The psow query parameter works with the default windows and unix VFSes but might be a no-op for other proprietary or non-standard VFSes.
<dd> One might, for example, want to query all objects that overlap with the 35th parallel: SELECT id FROM demo_index WHERE maxY>=35.0 AND minY<=35.0; But, generally speaking, the more constraints that the R*Tree module has to work with, and the smaller the bounding box, the faster the results will come back. 3.4. Roundoff Error By default, coordinates are stored in an R*Tree using 32-bit floating point values. When a coordinate cannot be exactly represented by a 32-bit floating point number, the lower-bound coordinates are

rounded down and the upper-bound coordinates are rounded up. Thus, bounding boxes might be slightly larger than specified, but will never be any smaller. This is exactly what is desired for doing the more common "overlapping" queries where the application

wants to find every entry in the R*Tree that overlaps a query bounding box. Rounding the entry bounding boxes outward might cause a few extra entries to appears in an overlapping query if the edge of the entry bounding box corresponds to an edge of the query bounding box. But the overlapping query will never miss a valid table entry. However, for a "contained-within" style query, rounding the bounding boxes outward might cause some entries to be excluded from the result set if the edge of the entry bounding box corresponds to the edge of the query bounding box. To guard against this, applications should expand their contained-within query boxes slightly (by 0.000012%) by rounding down the lower coordinates and rounding up the top coordinates, in each dimension. 3.5. Reading And Writing At The Same Time It is the nature of the Guttman R-Tree algorithm that any write might radically restructure the tree, and in the process change the scan order of the nodes. For this reason, it is not

generally possible to modify the R-Tree in the middle of a query of the R-Tree. Attempts to do so will fail with a SQLITE_LOCKED "database table is locked" error. So, for example, suppose an application runs one query against an R-Tree like this: SELECT id FROM demo_index WHERE maxY>=35.0 AND minY<=35.0; Then for each "id" value returned, suppose the application creates an UPDATE statement like the following and binds the "id" value returned against the "?1" parameter: UPDATE demo_index SET maxY=maxY+0.5 WHERE id=?1; Then the UPDATE might fail with an SQLITE_LOCKED error. The reason is that the initial query has not run to completion. It is remembering its place in the middle of a scan of the R-Tree. So an update to the R-Tree cannot be tolerated as this would disrupt the scan. It is also possible to express this kind of simultaneous read and write on an R-Tree within a single query, for example if an UPDATE statement tries to change the value of one row of the R-Tree based on a complicated

query from another row of the same R-Tree, perhaps something like this: UPDATE demo_index SET maxY = (SELECT max(maxX) FROM demo_index AS x2 WHERE x2.maxY>demo_index.x2) WHERE maxY>=35.0 AND minY<=35.0; This is a limitation of the R-Tree extension only. Ordinary tables in SQLite are able to read and write at the same time. Other virtual tables might (or might not) also that capability. And R-Tree can appear to read and write at the same time in some circumstances, if it can figure out how to reliably run the query to completion before starting the update. But you shouldn't count on that for every query. Generally speaking, it is best to avoid running queries and updates to the same R-Tree at the same time. If you really need to update an R-Tree based on complex queries against the same R-Tree, it is best to run the complex queries first and store the results in a temporary table, then update the R-Tree based on the values stored in the temporary table. 4. Using R*Trees Effectively

For SQLite versions prior to 3.24.0 (2018-06-04), the only information that an R*Tree index stores about an object is its integer ID and its bounding box. Additional information needs to be stored in separate tables and related to the R*Tree index using the primary key. For the example above, one might create an auxiliary table as follows: CREATE TABLE demo_data(id INTEGER PRIMARY KEY, -- primary key objname TEXT, -- name of the object objtype TEXT, -- object type boundary BLOB -- detailed boundary of object); In this example, the demo_data.boundary field is intended to hold some kind of binary representation of the precise boundaries of the object. The R*Tree index only holds an axis-aligned rectangular boundary for the object. The R*Tree boundary is just an approximation of the true object boundary. So what typically happens is that the R*Tree index is used to narrow a search down to a list of candidate objects and then more detailed and expensive computations are done on each candidate

to find if the candidate truly meets the search criteria. Key Point: An R*Tree index does not normally provide the exact answer but merely reduces the set of potential answers from millions to dozens. Suppose the demo_data.boundary field holds some proprietary data description of a complex two-dimensional boundary for an object and suppose that the application has used the sqlite3_create_function() interface to created application-defined functions "contained_in" and "overlaps" accepting two demo_data.boundary objects and return true or false. One may assume that "contained_in" and "overlaps" are relatively slow functions that we do not want to invoke too frequently. Then an efficient way to find the name of all objects located within the North Carolina 12th District, one

may be to run a query like this: SELECT objname FROM demo_data, demo_index WHERE demo_data.id=demo_index.id AND contained_in(demo_data.boundary, :boundary) AND minX>=-81.0 AND maxX<=-79.6 AND minY>=35.0 AND maxY>=36.2;
In the query above, one would presumably bind the binary BLOB description of the precise boundary of the 12th district to the ":boundary" parameter. Notice how the query above works: The R*Tree index runs in the outer loop to find entries that are contained within the bounding box of longitude -81..-79.6 and latitude 35.0..36.2. For each object identifier found, SQLite looks up the corresponding entry in the demo_data table. It then uses the boundary field from the demo_data table as a parameter to the contained_in() function and if that function returns true, the objname field from the demo_data table is returned as the next row of query result. One would get the same answer without the use of the R*Tree index using the following simpler query: SELECT objname FROM demo_data WHERE contained_in(demo_data.boundary, :boundary); The problem with this latter query is that it must apply the contained_in() function to millions of entries in the demo_data table. The use of the R*Tree
in the penultimate query reduces the number of calls to contained_in() function to a small subset of the entire table. The R*Tree index did not find the exact answer itself, it merely limited the search space. 4.1. Auxiliary Columns Beginning with SQLite version 3.24.0 (2018-06-04), r-tree tables can have auxiliary columns that store arbitrary data. Auxiliary columns can be used in place of secondary tables such as "demo_data". Auxiliary columns are marked with a "+" symbol before the column name. Auxiliary columns must come after all of the coordinate boundary columns. There is a limit of no more than 100 auxiliary columns. The following example shows an r-tree table with auxiliary columns that is equivalent to the two tables "demo_index" and "demo_data" above: CREATE VIRTUAL TABLE demo_index2 USING rtree(id, -- Integer primary key minX, maxX, -- Minimum and maximum X coordinate minY, maxY, -- Minimum and maximum Y coordinate +objname TEXT, -- name of the object +objtype TEXT, -- object
type +boundary BLOB -- detailed boundary of object);

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/requirements.html
No license file was found, but licenses were detected in source scan.

Suppose the demo_data.boundary field holds some proprietary data description

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/rtree.html
No license file was found, but licenses were detected in source scan.

application code is free to use these routines as well, if desired.

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/34to35.html
No license file was found, but licenses were detected in source scan.

access to all proprietary extensions and test suites.
access to all proprietary extensions and test suites.
public domain,

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/prosupport.html
No license file was found, but licenses were detected in source scan.

```
#!/usr/bin/tclsh.docsrc
#### Import of wapp.tcl
# Copyright (c) 2017 D. Richard Hipp
#
# This program is free software; you can redistribute it and/or
# modify it under the terms of the Simplified BSD License (also
# known as the "2-Clause License" or "FreeBSD License".)
#
# This program is distributed in the hope that it will be useful,
# but without any warranty; without even the implied warranty of
# merchantability or fitness for a particular purpose.
#
#-------------------------------------------------------------------------
#
# Design rules:
#
#   (1)  All identifiers in the global namespace begin with "wapp"
#
#   (2)  Indentifiers intended for internal use only begin with "wappInt"
#

# Add text to the end of the HTTP reply.  No interpretation or transformation
# of the text is performs.  The argument should be enclosed within {...}
#
proc wapp {txt} {
 global wapp
 dict append wapp .reply $txt
}

# Add
 text to the page under construction.  Do no escaping on the text.
#
# Though "unsafe" in general, there are uses for this kind of thing.
# For example, if you want to return the complete, unmodified content of
# a file:
#
#       set fd [open content.html rb]
#       wapp-unsafe [read $fd]
#       close $fd
#
# You could do the same thing using ordinary "wapp" instead of "wapp-unsafe".
# The difference is that wapp-safety-check will complain about the misuse
# of "wapp", but it assumes that the person who write "wapp-unsafe" understands
# the risks.
#
# Though occasionally necessary, the use of this interface should be minimized.
#
proc wapp-unsafe {txt} {
```

```
 global wapp
 dict append wapp .reply $txt
}

# Add text to the end of the reply under construction.  The following
# substitutions are made:
#
#     %html(...)          Escape text for inclusion in HTML
#     %url(...)           Escape text for use as a URL
#     %qp(...)            Escape text for use as a URI query parameter
#
     %string(...)        Escape text for use within a JSON string
#     %unsafe(...)        No transformations of the text
#
# The substitutions above terminate at the first ")" character.  If the
# text of the TCL string in ... contains ")" characters itself, use instead:
#
#     %html%(...)%
#     %url%(...)%
#     %qp%(...)%
#     %string%(...)%
#     %unsafe%(...)%
#
# In other words, use "%(...)%" instead of "(...)" to include the TCL string
# to substitute.
#
# The %unsafe substitution should be avoided whenever possible, obviously.
# In addition to the substitutions above, the text also does backslash
# escapes.
#
proc wapp-subst {txt} {
 global wapp
 regsub -all {%(html|url|qp|string|unsafe){1,1}?(|%)\((.+)\)\2} $txt \
       {[wappInt-enc-\1 "\3"]} txt
 dict append wapp .reply [uplevel 1 [list subst -novariables $txt]]
}

# Works like wapp-subst, but also removes whitespace from the beginning
# of lines.
#
proc wapp-trim {txt} {
 global wapp
 regsub -all {\n\s+} [string
 trim $txt] \n txt
 regsub -all {%(html|url|qp|string|unsafe){1,1}?(|%)\((.+)\)\2} $txt \
       {[wappInt-enc-\1 "\3"]} txt
 dict append wapp .reply [uplevel 1 [list subst -novariables $txt]]
}
```

```
# There must be a wappInt-enc-NAME routine for each possible substitution
# in wapp-subst.  Thus there are routines for "html", "url", "qp", and "unsafe".
#
#   wappInt-enc-html          Escape text so that it is safe to use in the
#                             body of an HTML document.
#
#   wappInt-enc-url           Escape text so that it is safe to pass as an
#                             argument to href= and src= attributes in HTML.
#
#   wappInt-enc-qp            Escape text so that it is safe to use as the
#                             value of a query parameter in a URL or in
#                             post data or in a cookie.
#
#   wappInt-enc-string        Escape ", ', \, and < for using inside of a
#                             javascript string literal.
  The < character
#                             is escaped to prevent "</script>" from causing
#                             problems in embedded javascript.
#
#   wappInt-enc-unsafe        Perform no encoding at all.  Unsafe.
#
proc wappInt-enc-html {txt} {
 return [string map {& &amp; < &lt; > &gt; \" &quot; \\ &#92;} $txt]
}
proc wappInt-enc-unsafe {txt} {
 return $txt
}
proc wappInt-enc-url {s} {
 if {[regsub -all {[^-{}@~?=#_.:/a-zA-Z0-9]} $s {[wappInt-%HHchar {&}]} s]} {
   set s [subst -novar -noback $s]
 }
 if {[regsub -all {[{}]} $s {[wappInt-%HHchar \\&]} s]} {
   set s [subst -novar -noback $s]
 }
 return $s
}
proc wappInt-enc-qp {s} {
 if {[regsub -all {[^-{}_.a-zA-Z0-9]} $s {[wappInt-%HHchar {&}]} s]} {
   set s [subst -novar -noback $s]
 }
 if {[regsub -all {[{}]} $s {[wappInt-%HHchar \\&]} s]} {
   set s [subst -novar -noback $s]
 }
 return $s
}
proc wappInt-enc-string {s} {
 return [string map {\\ \\\\ \" \\\" ' \\' < \\u003c} $s]
```

```
}

# This is a
 helper routine for wappInt-enc-url and wappInt-enc-qp.  It returns
# an appropriate %HH encoding for the single character c.  If c is a unicode
# character, then this routine might return multiple bytes:  %HH%HH%HH
#
proc wappInt-%HHchar {c} {
 if {$c==" "} {return +}
 return [regsub -all .. [binary encode hex [encoding convertto utf-8 $c]] {%&}]
}



# Undo the www-url-encoded format.
#
# HT: This code stolen from ncgi.tcl
#
proc wappInt-decode-url {str} {
 set str [string map [list + { } "\\" "\\\\" \[ \\\[ \] \\\]] $str]
 regsub -all -- \
    {%([Ee][A-Fa-f0-9])%([89ABab][A-Fa-f0-9])%([89ABab][A-Fa-f0-9])} \
    $str {[encoding convertfrom utf-8 [binary decode hex \1\2\3]]} str
 regsub -all -- \
    {%([CDcd][A-Fa-f0-9])%([89ABab][A-Fa-f0-9])}                    \
    $str {[encoding convertfrom utf-8 [binary decode hex \1\2]]} str
 regsub -all -- {%([0-7][A-Fa-f0-9])} $str {\\u00\1} str
 return [subst -novar $str]
}

# Reset the document back to an empty string.
#
proc
 wapp-reset {} {
 global wapp
 dict set wapp .reply {}
}

# Change the mime-type of the result document.
#
proc wapp-mimetype {x} {
 global wapp
 dict set wapp .mimetype $x
}

# Change the reply code.
#
proc wapp-reply-code {x} {
 global wapp
```

```
 dict set wapp .reply-code $x
}

# Set a cookie
#
proc wapp-set-cookie {name value} {
 global wapp
 dict lappend wapp .new-cookies $name $value
}

# Unset a cookie
#
proc wapp-clear-cookie {name} {
 wapp-set-cookie $name {}
}

# Add extra entries to the reply header
#
proc wapp-reply-extra {name value} {
 global wapp
 dict lappend wapp .reply-extra $name $value
}

# Specifies how the web-page under construction should be cached.
# The argument should be one of:
#
#    no-cache
#    max-age=N            (for some integer number of seconds, N)
#    private,max-age=N
#
proc wapp-cache-control {x} {
 wapp-reply-extra Cache-Control $x
}

# Redirect to a different web page
#
proc wapp-redirect {uri} {
 wapp-reply-code {307 Redirect}
 wapp-reply-extra
 Location $uri
}

# Return the value of a wapp parameter
#
proc wapp-param {name {dflt {}}} {
 global wapp
 if {![dict exists $wapp $name]} {return $dflt}
 return [dict get $wapp $name]
```

```
}

# Return true if a and only if the wapp parameter $name exists
#
proc wapp-param-exists {name} {
 global wapp
 return [dict exists $wapp $name]
}

# Set the value of a wapp parameter
#
proc wapp-set-param {name value} {
 global wapp
 dict set wapp $name $value
}

# Return all parameter names that match the GLOB pattern, or all
# names if the GLOB pattern is omitted.
#
proc wapp-param-list {{glob {*}}} {
 global wapp
 return [dict keys $wapp $glob]
}

# By default, Wapp does not decode query parameters and POST parameters
# for cross-origin requests.  This is a security restriction, designed to
# help prevent cross-site request forgery (CSRF) attacks.
#
# As a consequence of this restriction, URLs for sites generated by Wapp
# that contain query parameters will not work as URLs
 found in other
# websites.  You cannot create a link from a second website into a Wapp
# website if the link contains query planner, by default.
#
# Of course, it is sometimes desirable to allow query parameters on external
# links.  For URLs for which this is safe, the application should invoke
# wapp-allow-xorigin-params.  This procedure tells Wapp that it is safe to
# go ahead and decode the query parameters even for cross-site requests.
#
# In other words, for Wapp security is the default setting.  Individual pages
# need to actively disable the cross-site request security if those pages
# are safe for cross-site access.
#
proc wapp-allow-xorigin-params {} {
 global wapp
 if {![dict exists $wapp .qp] && ![dict get $wapp SAME_ORIGIN]} {
   wappInt-decode-query-params
 }
```

```
}

# Set the content-security-policy.
#
# The default content-security-policy is very strict:  "default-src 'self'"
# The default policy prohibits the use of in-line javascript or CSS.
#
# Provide an alternative
 CSP as the argument.  Or use "off" to disable
# the CSP completely.
#
proc wapp-content-security-policy {val} {
 global wapp
 if {$val=="off"} {
   dict unset wapp .csp
 } else {
   dict set wapp .csp $val
 }
}

# Examine the bodys of all procedures in this program looking for
# unsafe calls to various Wapp interfaces.  Return a text string
# containing warnings. Return an empty string if all is ok.
#
# This routine is advisory only.  It misses some constructs that are
# dangerous and flags others that are safe.
#
proc wapp-safety-check {} {
 set res {}
 foreach p [info procs] {
   set ln 0
   foreach x [split [info body $p] \n] {
     incr ln
     if {[regexp {^[ \t]*wapp[ \t]+([^\n]+)} $x all tail]
      && [string index $tail 0]!="\173"
      && [regexp {[[$]} $tail]
     } {
       append res "$p:$ln: unsafe \"wapp\" call: \"[string trim $x]\"\n"
     }
     if {[regexp {^[ \t]*wapp-(subst|trim)[ \t]+[^\173]} $x all cx]} {
       append res "$p:$ln: unsafe \"wapp-$cx\"
 call: \"[string trim $x]\"\n"
     }
   }
 }
 return $res
}
```

```
# Return a string that descripts the current environment.  Applications
# might find this useful for debugging.
#
proc wapp-debug-env {} {
 global wapp
 set out {}
 foreach var [lsort [dict keys $wapp]] {
  if {[string index $var 0]=="."} continue
  append out "$var = [list [dict get $wapp $var]]\n"
 }
 append out "\[pwd\] = [list [pwd]]\n"
 return $out
}

# Tracing function for each HTTP request.  This is overridden by wapp-start
# if tracing is enabled.
#
proc wappInt-trace {} {}

# Start up a listening socket.  Arrange to invoke wappInt-new-connection
# for each inbound HTTP connection.
#
#    port            Listen on this TCP port.  0 means to select a port
#                    that is not currently in use
#
#    wappmode        One of "scgi", "server", or "local".
#
proc wappInt-start-listener {port wappmode} {
 if {$wappmode=="scgi"} {
  set type SCGI
  set server [list wappInt-new-connection
 wappInt-scgi-readable $wappmode]
 } else {
  set type HTTP
  set server [list wappInt-new-connection wappInt-http-readable $wappmode]
 }
 if {$wappmode=="local"} {
  set x [socket -server $server -myaddr 127.0.0.1 $port]
 } else {
  set x [socket -server $server $port]
 }
 set coninfo [chan configure $x -sockname]
 set port [lindex $coninfo 2]
 if {$wappmode=="local"} {
  wappInt-start-browser http://127.0.0.1:$port/
 } else {
  puts "Listening for $type requests on TCP port $port"
 }
```

```
}

# Start a web-browser and point it at $URL
#
proc wappInt-start-browser {url} {
 global tcl_platform
 if {$tcl_platform(platform)=="windows"} {
   exec cmd /c start $url &
 } elseif {$tcl_platform(os)=="Darwin"} {
   exec open $url &
 } elseif {[catch {exec xdg-open $url}]} {
   exec firefox $url &
 }
}

# This routine is a "socket -server" callback.  The $chan, $ip, and $port
# arguments are added by the socket command.
#
# Arrange to invoke $callback when content is available
 on the new socket.
# The $callback will process inbound HTTP or SCGI content.
#
proc wappInt-new-connection {callback wappmode chan ip port} {
 upvar #0 wappInt-$chan W
 set W [dict create REMOTE_ADDR $ip REMOTE_PORT $port WAPP_MODE $wappmode \
        .header {}]
 fconfigure $chan -blocking 0 -translation binary
 fileevent $chan readable [list $callback $chan]
}

# Close an input channel
#
proc wappInt-close-channel {chan} {
 if {$chan=="stdout"} {
   # This happens after completing a CGI request
   exit 0
 } else {
   unset ::wappInt-$chan
   close $chan
 }
}

# Process new text received on an inbound HTTP request
#
proc wappInt-http-readable {chan} {
 if {[catch [list wappInt-http-readable-unsafe $chan] msg]} {
   puts stderr "$msg\n$::errorInfo"
   wappInt-close-channel $chan
```

```
 }
}
proc wappInt-http-readable-unsafe {chan} {
 upvar #0 wappInt-$chan W wapp wapp
 if {![dict exists $W .toread]} {
  # If the .toread key is not set, that means we are still reading
   # the header
  set line [string trimright [gets $chan]]
  set n [string length $line]
  if {$n>0} {
    if {[dict get $W .header]=="" || [regexp {^\s+} $line]} {
      dict append W .header $line
    } else {
      dict append W .header \n$line
    }
    if {[string length [dict get $W .header]]>100000} {
      error "HTTP request header too big - possible DOS attack"
    }
  } elseif {$n==0} {
    # We have reached the blank line that terminates the header.
    global argv0
    set a0 [file normalize $argv0]
    dict set W SCRIPT_FILENAME $a0
    dict set W DOCUMENT_ROOT [file dir $a0]
    if {[wappInt-parse-header $chan]} {
      catch {close $chan}
      return
    }
    set len 0
    if {[dict exists $W CONTENT_LENGTH]} {
      set len [dict get $W CONTENT_LENGTH]
    }
    if {$len>0} {
      # Still need to read the query content
      dict set W .toread $len
    } else {
      # There is no query content, so handle
 the request immediately
      set wapp $W
      wappInt-handle-request $chan 0
    }
  }
 } else {
  # If .toread is set, that means we are reading the query content.
  # Continue reading until .toread reaches zero.
  set got [read $chan [dict get $W .toread]]
  dict append W CONTENT $got
  dict set W .toread [expr {[dict get $W .toread]-[string length $got]}]
```

```
  if {[dict get $W .toread]<=0} {
    # Handle the request as soon as all the query content is received
    set wapp $W
    wappInt-handle-request $chan 0
  }
 }
}

# Decode the HTTP request header.
#
# This routine is always running inside of a [catch], so if
# any problems arise, simply raise an error.
#
proc wappInt-parse-header {chan} {
 upvar #0 wappInt-$chan W
 set hdr [split [dict get $W .header] \n]
 if {$hdr==""} {return 1}
 set req [lindex $hdr 0]
 dict set W REQUEST_METHOD [set method [lindex $req 0]]
 if {[lsearch {GET HEAD POST} $method]<0} {
  error "unsupported request method:
\"[dict get $W REQUEST_METHOD]\""
 }
 set uri [lindex $req 1]
 set split_uri [split $uri ?]
 set uri0 [lindex $split_uri 0]
 if {![regexp {^/[-.a-z0-9_/]*$} $uri0]} {
  error "invalid request uri: \"$uri0\""
 }
 dict set W REQUEST_URI $uri0
 dict set W PATH_INFO $uri0
 set uri1 [lindex $split_uri 1]
 dict set W QUERY_STRING $uri1
 set n [llength $hdr]
 for {set i 1} {$i<$n} {incr i} {
  set x [lindex $hdr $i]
  if {![regexp {^(.+): +(.*)$} $x all name value]} {
    error "invalid header line: \"$x\""
  }
  set name [string toupper $name]
  switch -- $name {
    REFERER {set name HTTP_REFERER}
    USER-AGENT {set name HTTP_USER_AGENT}
    CONTENT-LENGTH {set name CONTENT_LENGTH}
    CONTENT-TYPE {set name CONTENT_TYPE}
    HOST {set name HTTP_HOST}
    COOKIE {set name HTTP_COOKIE}
    ACCEPT-ENCODING {set name HTTP_ACCEPT_ENCODING}
```

```
    default {set name .hdr:$name}
   }
   dict set W $name $value
  }
  return 0
}

# Decode the QUERY_STRING
 parameters from a GET request or the
# application/x-www-form-urlencoded CONTENT from a POST request.
#
# This routine sets the ".qp" element of the ::wapp dict as a signal
# that query parameters have already been decoded.
#
proc wappInt-decode-query-params {} {
 global wapp
 dict set wapp .qp 1
 if {[dict exists $wapp QUERY_STRING]} {
  foreach qterm [split [dict get $wapp QUERY_STRING] &] {
   set qsplit [split $qterm =]
   set nm [lindex $qsplit 0]
   if {[regexp {^[a-z][a-z0-9]*$} $nm]} {
    dict set wapp $nm [wappInt-decode-url [lindex $qsplit 1]]
   }
  }
 }
 if {[dict exists $wapp CONTENT_TYPE] && [dict exists $wapp CONTENT]} {
  set ctype [dict get $wapp CONTENT_TYPE]
  if {$ctype=="application/x-www-form-urlencoded"} {
   foreach qterm [split [string trim [dict get $wapp CONTENT]] &] {
    set qsplit [split $qterm =]
    set nm [lindex $qsplit 0]
    if {[regexp {^[a-z][-a-z0-9_]*$} $nm]} {
     dict set wapp $nm [wappInt-decode-url
[lindex $qsplit 1]]
    }
   }
  } elseif {[string match multipart/form-data* $ctype]} {
   regexp {^(.*?)\r\n(.*)$} [dict get $wapp CONTENT] all divider body
   set ndiv [string length $divider]
   while {[string length $body]} {
    set idx [string first $divider $body]
    set unit [string range $body 0 [expr {$idx-3}]]
    set body [string range $body [expr {$idx+$ndiv+2}] end]
    if {[regexp {^Content-Disposition: form-data; (.*?)\r\n\r\n(.*)$} \
        $unit unit hdr content] &&
       [regexp {name="(.*)"; filename="(.*)"\r\nContent-Type: (.*?)$}\
         $hdr hr name filename mimetype]} {
```

```
        dict set wapp $name.filename \
          [string map [list \\\" \" \\\\ \\] $filename]
        dict set wapp $name.mimetype $mimetype
        dict set wapp $name.content $content
       }
     }
   }
 }
}

# Invoke application-supplied methods to generate a reply to
# a single HTTP request.
#
# This routine always
 runs within [catch], so handle exceptions by
# invoking [error].
#
proc wappInt-handle-request {chan useCgi} {
 global wapp
 dict set wapp .reply {}
 dict set wapp .mimetype {text/html; charset=utf-8}
 dict set wapp .reply-code {200 Ok}
 dict set wapp .csp {default-src 'self'}

 # Set up additional CGI environment values
 #
 if {![dict exists $wapp HTTP_HOST]} {
   dict set wapp BASE_URL {}
 } elseif {[dict exists $wapp HTTPS]} {
   dict set wapp BASE_URL https://[dict get $wapp HTTP_HOST]
 } else {
   dict set wapp BASE_URL http://[dict get $wapp HTTP_HOST]
 }
 if {![dict exists $wapp REQUEST_URI]} {
   dict set wapp REQUEST_URI /
 } elseif {[regsub {\?.*} [dict get $wapp REQUEST_URI] {} newR]} {
   # Some servers (ex: nginx) append the query parameters to REQUEST_URI.
   # These need to be stripped off
   dict set wapp REQUEST_URI $newR
 }
 if {[dict exists $wapp SCRIPT_NAME]} {
   dict append wapp BASE_URL [dict get $wapp SCRIPT_NAME]
 } else {
   dict set wapp
 SCRIPT_NAME {}
 }
 if {![dict exists $wapp PATH_INFO]} {
   # If PATH_INFO is missing (ex: nginx) the construct it
```

```
  set URI [dict get $wapp REQUEST_URI]
  set skip [string length [dict get $wapp SCRIPT_NAME]]
  dict set wapp PATH_INFO [string range $URI $skip end]
}
if {[regexp {^/([^/]+)(.*)$} [dict get $wapp PATH_INFO] all head tail]} {
  dict set wapp PATH_HEAD $head
  dict set wapp PATH_TAIL [string trimleft $tail /]
} else {
  dict set wapp PATH_INFO {}
  dict set wapp PATH_HEAD {}
  dict set wapp PATH_TAIL {}
}
dict set wapp SELF_URL [dict get $wapp BASE_URL]/[dict get $wapp PATH_HEAD]

# Parse query parameters from the query string, the cookies, and
# POST data
#
if {[dict exists $wapp HTTP_COOKIE]} {
  foreach qterm [split [dict get $wapp HTTP_COOKIE] {;}] {
    set qsplit [split [string trim $qterm] =]
    set nm [lindex $qsplit 0]
    if {[regexp {^[a-z][-a-z0-9_]*$} $nm]} {
      dict set wapp $nm [wappInt-decode-url [lindex
$qsplit 1]]
    }
  }
}
set same_origin 0
if {[dict exists $wapp HTTP_REFERER]} {
  set referer [dict get $wapp HTTP_REFERER]
  set base [dict get $wapp BASE_URL]
  if {$referer==$base || [string match $base/* $referer]} {
    set same_origin 1
  }
}
dict set wapp SAME_ORIGIN $same_origin
if {$same_origin} {
  wappInt-decode-query-params
}

# Invoke the application-defined handler procedure for this page
# request.  If an error occurs while running that procedure, generate
# an HTTP reply that contains the error message.
#
wapp-before-dispatch-hook
wappInt-trace
set mname [dict get $wapp PATH_HEAD]
if {[catch {
```

```
  if {$mname!="" && [llength [info proc wapp-page-$mname]]>0} {
    wapp-page-$mname
  } else {
    wapp-default
  }
} msg]} {
  if {[wapp-param WAPP_MODE]=="local" || [wapp-param WAPP_MODE]=="server"} {
    puts "ERROR: $::errorInfo"
  }
  wapp-reset
  wapp-reply-code "500 Internal Server Error"
  wapp-mimetype
text/html
  wapp-trim {
    <h1>Wapp Application Error</h1>
    <pre>%html($::errorInfo)</pre>
  }
  dict unset wapp .new-cookies
}

# Transmit the HTTP reply
#
if {$chan=="stdout"} {
  puts $chan "Status: [dict get $wapp .reply-code]\r"
} else {
  puts $chan "HTTP/1.1 [dict get $wapp .reply-code]\r"
  puts $chan "Server: wapp\r"
  puts $chan "Connection: close\r"
}
if {[dict exists $wapp .reply-extra]} {
  foreach {name value} [dict get $wapp .reply-extra] {
    puts $chan "$name: $value\r"
  }
}
if {[dict exists $wapp .csp]} {
  puts $chan "Content-Security-Policy: [dict get $wapp .csp]\r"
}
set mimetype [dict get $wapp .mimetype]
puts $chan "Content-Type: $mimetype\r"
if {[dict exists $wapp .new-cookies]} {
  foreach {nm val} [dict get $wapp .new-cookies] {
    if {[regexp {^[a-z][-a-z0-9_]*$} $nm]} {
      if {$val==""} {
        puts $chan "Set-Cookie: $nm=; HttpOnly; Path=/; Max-Age=1\r"
      } else {
        set
val [wappInt-enc-url $val]
        puts $chan "Set-Cookie: $nm=$val; HttpOnly; Path=/\r"
```

```
      }
    }
  }
 }
 if {[string match text/* $mimetype]} {
  set reply [encoding convertto utf-8 [dict get $wapp .reply]]
  if {[regexp {\ygzip\y} [wapp-param HTTP_ACCEPT_ENCODING]]} {
    catch {
      set x [zlib gzip $reply]
      set reply $x
      puts $chan "Content-Encoding: gzip\r"
    }
  }
 } else {
  set reply [dict get $wapp .reply]
 }
 puts $chan "Content-Length: [string length $reply]\r"
 puts $chan \r
 puts $chan $reply
 flush $chan
 wappInt-close-channel $chan
}

# This routine runs just prior to request-handler dispatch.  The
# default implementation is a no-op, but applications can override
# to do additional transformations or checks.
#
proc wapp-before-dispatch-hook {} {return}

# Process a single CGI request
#
proc wappInt-handle-cgi-request {} {
 global wapp env
 foreach key {
  CONTENT_LENGTH
  CONTENT_TYPE
  DOCUMENT_ROOT
  HTTP_ACCEPT_ENCODING
   HTTP_COOKIE
  HTTP_HOST
  HTTP_REFERER
  HTTP_USER_AGENT
  HTTPS
  PATH_INFO
  QUERY_STRING
  REMOTE_ADDR
  REQUEST_METHOD
  REQUEST_URI
```

```
  REMOTE_USER
  SCRIPT_FILENAME
  SCRIPT_NAME
  SERVER_NAME
  SERVER_PORT
  SERVER_PROTOCOL
 } {
  if {[info exists env($key)]} {
    dict set wapp $key $env($key)
  }
 }
 set len 0
 if {[dict exists $wapp CONTENT_LENGTH]} {
  set len [dict get $wapp CONTENT_LENGTH]
 }
 if {$len>0} {
  fconfigure stdin -translation binary
  dict set wapp CONTENT [read stdin $len]
 }
 dict set wapp WAPP_MODE cgi
 fconfigure stdout -translation binary
 wappInt-handle-request stdout 1
}

# Process new text received on an inbound SCGI request
#
proc wappInt-scgi-readable {chan} {
 if {[catch [list wappInt-scgi-readable-unsafe $chan] msg]} {
  puts stderr "$msg\n$::errorInfo"
  wappInt-close-channel $chan
 }
}
proc wappInt-scgi-readable-unsafe {chan} {
 upvar #0 wappInt-$chan W wapp wapp
 if
 {![dict exists $W .toread]} {
  # If the .toread key is not set, that means we are still reading
  # the header.
  #
  # An SGI header is short.  This implementation assumes the entire
  # header is available all at once.
  #
  set req [read $chan 15]
  set n [string length $req]
  scan $req %d:%s len hdr
  incr len [string length "$len:,"]
  append hdr [read $chan [expr {$len-15}]]
  foreach {nm val} [split $hdr \000] {
```

```
    if {$nm==","} break
    dict set W $nm $val
   }
   set len 0
   if {[dict exists $W CONTENT_LENGTH]} {
    set len [dict get $W CONTENT_LENGTH]
   }
   if {$len>0} {
    # Still need to read the query content
    dict set W .toread $len
   } else {
    # There is no query content, so handle the request immediately
    set wapp $W
    wappInt-handle-request $chan 0
   }
  } else {
   # If .toread is set, that means we are reading the query content.
   # Continue reading until .toread reaches zero.
   set got [read
  $chan [dict get $W .toread]]
   dict append W CONTENT $got
   dict set W .toread [expr {[dict get $W .toread]-[string length $got]}]
   if {[dict get $W .toread]<=0} {
    # Handle the request as soon as all the query content is received
    set wapp $W
    wappInt-handle-request $chan 0
   }
  }
}

# Start up the wapp framework.  Parameters are a list passed as the
# single argument.
#
#    -server $PORT        Listen for HTTP requests on this TCP port $PORT
#
#    -local $PORT         Listen for HTTP requests on 127.0.0.1:$PORT
#
#    -scgi $PORT          Listen for SCGI requests on TCP port $PORT
#
#    -cgi                 Handle a single CGI request
#
# With no arguments, the behavior is called "auto".  In "auto" mode,
# if the GATEWAY_INTERFACE environment variable indicates CGI, then run
# as CGI.  Otherwise, start an HTTP server bound to the loopback address
# only, on an arbitrary TCP port, and automatically launch a web browser
# on that TCP port.
#
# Additional
```

```
 options:
#
#    -trace              "puts" each request URL as it is handled, for
#                        debugging
#
#    -lint               Run wapp-safety-check on the application instead
#                        of running the application itself
#
#    -Dvar=value         Set TCL global variable "var" to "value"
#
#
proc wapp-start {arglist} {
 global env
 set mode auto
 set port 0
 set n [llength $arglist]
 for {set i 0} {$i<$n} {incr i} {
  set term [lindex $arglist $i]
  if {[string match --* $term]} {set term [string range $term 1 end]}
  switch -glob -- $term {
    -server {
      incr i;
      set mode "server"
      set port [lindex $arglist $i]
    }
    -local {
      incr i;
      set mode "local"
      set port [lindex $arglist $i]
    }
    -scgi {
      incr i;
      set mode "scgi"
      set port [lindex $arglist $i]
    }
    -cgi {
      set mode "cgi"
    }
    -trace {
      proc wappInt-trace {} {

    set q [wapp-param QUERY_STRING]
        set uri [wapp-param BASE_URL][wapp-param PATH_INFO]
        if {$q!=""} {append uri ?$q}
        puts $uri
      }
    }
    -lint {
```

```
      set res [wapp-safety-check]
      if {$res!=""} {
        puts "Potential problems in this code:"
        puts $res
        exit 1
      } else {
        exit
      }
    }
    -D*=* {
      if {[regexp {^.D([^=]+)=(.*)$} $term all var val]} {
        set ::$var $val
      }
    }
    default {
      error "unknown option: $term"
    }
  }
}
if {($mode=="auto"
     && [info exists env(GATEWAY_INTERFACE)]
     && [string match CGI/1.* $env(GATEWAY_INTERFACE)])
  || $mode=="cgi"
} {
  wappInt-handle-cgi-request
  return
}
if {$mode=="scgi"} {
  wappInt-start-listener $port scgi
} elseif {$mode=="server"} {
  wappInt-start-listener $port server
} else {
  wappInt-start-listener $port local
}
vwait ::forever
}

# Call this version
 1.0
package provide wapp 1.0

#### End of wapp.tcl

# Generate all header content for the output document
#
proc search_header {} {
 wapp-trim {
<!DOCTYPE html>
```

```
<html><head>
<meta name="viewport" content="width=device-width, initial-scale=1.0">
<meta http-equiv="content-type" content="text/html; charset=UTF-8">
<link href="../sqlite.css" rel="stylesheet">
<title>Search SQLite Stats</title>
<!-- path=../ -->
</head>
<body>
<div class=nosearch>
<a href="../index.html">
<img class="logo" src="../images/sqlite370_banner.gif" alt="SQLite" border="0">
</a>
<div><!-- IE hack to prevent disappearing logo --></div>
<div class="tagline desktoponly">
Small. Fast. Reliable.<br>Choose any three.
</div>
<div class="menu mainmenu">
<ul>
<li><a href="../index.html">Home</a>
<li class='mobileonly'><a href="javascript:void(0)" onclick='toggle_div("submenu")'>Menu</a>
<li class='wideonly'><a href='../about.html'>About</a>
<li class='desktoponly'><a href="../docs.html">Documentation</a>
<li class='desktoponly'><a
 href="../download.html">Download</a>
<li class='wideonly'><a href='../copyright.html'>License</a>
<li class='desktoponly'><a href="../support.html">Support</a>
<li class='desktoponly'><a href="../prosupport.html">Purchase</a>
<li class='search' id='search_menubutton'>
<a href="javascript:void(0)" onclick='toggle_search()'>Search</a>
</ul>
</div>
<div class="menu submenu" id="submenu">
<ul>
<li><a href='../about.html'>About</a>
<li><a href='../docs.html'>Documentation</a>
<li><a href='../download.html'>Download</a>
<li><a href='../support.html'>Support</a>
<li><a href='../prosupport.html'>Purchase</a>
</ul>
</div>
<div class="searchmenu" id="searchmenu">
<form method="GET" action="../search">
<select name="s" id="searchtype">
<option value="d">Search Documentation</option>
<option value="c">Search Changelog</option>
</select>
<input type="text" name="q" id="searchbox" value="">
<input type="submit" value="Go">
```

```
</form>
</div>
</div>
<script>
function toggle_div(nm) {
var w =
 document.getElementById(nm);
if( w.style.display=="block" ){
w.style.display = "none";
}else{
w.style.display = "block";
}
}
function toggle_search() {
var w = document.getElementById("searchmenu");
if( w.style.display=="block" ){
w.style.display = "none";
} else {
w.style.display = "block";
setTimeout(function(){
document.getElementById("searchbox").focus()
}, 30);
}
}
function div_off(nm){document.getElementById(nm).style.display="none";}
window.onbeforeunload = function(e){div_off("submenu");}
/* Disable the Search feature if we are not operating from CGI, since */
/* Search is accomplished using CGI and will not work without it. */
if( !location.origin.match || !location.origin.match(/http/) ){
document.getElementById("search_menubutton").style.display = "none";
}
/* Used by the Hide/Show button beside syntax diagrams, to toggle the */
function hideorshow(btn,obj){
var x = document.getElementById(obj);
var b = document.getElementById(btn);
if( x.style.display!='none' ){
x.style.display
 = 'none';
b.innerHTML='show';
}else{
x.style.display = '';
b.innerHTML='hide';
}
return false;
}
</script>
</div>
 }
```

```
}

proc wapp-default {} {
 # When running using the built-in webserver in Wapp (in other words,
 # when not running as CGI) any filename that contains a "." loads
 # directly from the filesystem.
 if {[wapp-param WAPP_MODE]!="cgi"]
  && [string match *.* [wapp-param PATH_INFO]]
 } {
  set altfile [file dir [wapp-param SCRIPT_FILENAME]]/../[wapp-param PATH_INFO]
  set fd [open $altfile rb]
  fconfigure $fd -translation binary
  wapp-unsafe [read $fd]
  close $fd
  switch -glob -- $altfile {
    *.html {
      wapp-mimetype text/html
    }
    *.css {
      wapp-mimetype text/css
    }
    *.gif {
      wapp-mimetype image/gif
    }
  }
  return
 }
 wapp-page-admin
}
proc wapp-page-admin {} {
 wapp-allow-xorigin-params
 wapp-content-security-policy off
 if {[wapp-param-exists env]} {
  search_header
  wapp-trim {

  <h1>Environment</h1>
    <pre>%html([wapp-debug-env])</pre>
  }
  return
 }
 sqlite3 db2 [file dir [wapp-param SCRIPT_FILENAME]]/searchlog.db
 set where ""
 set res ""

 set ipfilter ""
 set ipaddr [wapp-param ip]
 if {$ipaddr!=""} {
```

```
  set where {WHERE ip = $ipaddr}
  set ipfilter $ipaddr
}

set checked ""
set isUnique [expr {[wapp-param unique 0]+0}]
if {$isUnique} {
  set checked "checked"
}

set limit [wapp-param limit 10]
set s10 ""
set s100 ""
set s1000 ""
if {$limit==10} {set s10 selected}
if {$limit==100} {set s100 selected}
if {$limit==1000} {set s1000 selected}

search_header
set self [wapp-param PATH_HEAD]
wapp-trim {
  <div style="margin:2em">
  <center>
  <form action='%url($self)' method='GET'>
    Results: <select name=limit onChange="this.form.submit()">
      <option %html($s10) value="10">10</option>
      <option %html($s100) value="100">100</option>
      <option %html($s1000) value="1000">1000</option>
     </select>
    IP: <input type=input name=ip value="%html($ipfilter)">
    Unique: <input
      type=checkbox name=unique value=1
      $checked
      onChange="this.form.submit()">
    <input type=submit>
  </form>
  </center>
  </div>
  <table border=1 cellpadding=10 align=center>
  <tr><td><th>IP <th>Query <th> Results <th> Timestamp
}

set i 0
db2 eval "
  SELECT rowid, ip, query, nres, timestamp FROM log $where
  ORDER BY rowid DESC
" {
```

```
  if {$isUnique} {
    if {[info exists seen($query)]} continue
    set seen($query) 1
  }

  wapp-trim {
    <tr><td>%html($rowid)
        <td><a href='%url($self)?ip=%qp($ip)'>%html($ip)</a>
        <td><a href='../search?q=%qp($query)&donotlog=1'>%html($query)</a>
        <td>%html($nres)<td>%html($timestamp)
  }
  incr i
  if {$i >= $limit} break
 }
 wapp-subst {</table\n}
 db2 close
}
wapp-start $argv
```

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/search.d/admin
No license file was found, but licenses were detected in source scan.

application is free to use the same database connection or the

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/capi3ref.html
No license file was found, but licenses were detected in source scan.

data, so do not send the ".fullschema" output of a proprietary database

Found in path(s):
* /sqlite3-3-31-1-orig-www-1-tar-xz/www/cli.html

1.277 docker 1.9.1

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1.278 jackson-databind-nullable 0.2.1

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1.279 xorg-randr 1.5.0

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12. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING
WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR
REDISTRIBUTE THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR
DAMAGES,
INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING
OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED
TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY

YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

END OF TERMS AND CONDITIONS

How to Apply These Terms to Your New Programs

If you develop a new program, and you want it to be of the greatest possible use to the public, the best way to achieve this is to make it free software which everyone can redistribute and change under these terms.

To do so, attach the following notices to the program. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

<one
line to give the program's name and a brief idea of what it does.>
Copyright (C) <year> <name of author>

This program is free software; you can redistribute it and/or modify
it under the terms of the GNU General Public License as published by
the Free Software Foundation; either version 2 of the License, or
(at your option) any later version.

This program is distributed in the hope that it will be useful,
but WITHOUT ANY WARRANTY; without even the implied warranty of
MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
GNU General Public License for more details.

You should have received a copy of the GNU General Public License along
with this program; if not, write to the Free Software Foundation, Inc.,
51 Franklin Street, Fifth Floor, Boston, MA 02110-1301 USA.

Also add information on how to contact you by electronic and paper mail.

If the program is interactive, make it output a short notice like this when it starts
in an interactive mode:

Gnomovision version 69, Copyright (C) year name of author
Gnomovision comes with ABSOLUTELY NO WARRANTY; for details type `show w'.
This is free software, and you are welcome to redistribute it
under certain conditions; type `show c' for details.

The hypothetical commands `show w' and `show c' should show the appropriate parts of the General Public License. Of course, the commands you use may

be called something other than `show w' and `show c'; they could even be
mouse-clicks or menu items--whatever suits your program.

You should also get your employer (if you work as a programmer) or your
school, if any, to sign a "copyright disclaimer" for the program, if
necessary. Here is a sample; alter the names:

 Yoyodyne, Inc., hereby disclaims all copyright interest in the program
 `Gnomovision' (which makes passes at compilers) written by James Hacker.

 <signature of Ty Coon>, 1 April 1989
 Ty Coon, President of Vice

This General Public License
 does not permit incorporating your program into
proprietary programs. If your program is a subroutine library, you may
consider it more useful to permit linking proprietary applications with the
library. If this is what you want to do, use the GNU Lesser General
Public License instead of this License.

1.282 bzip2 1.0.6-9.2~deb10u1

1.282.1 Available under license :

This program, "bzip2", the associated library "libbzip2", and all
documentation, are copyright (C) 1996-2010 Julian R Seward. All
rights reserved.

Redistribution and use in source and binary forms, with or without
modification, are permitted provided that the following conditions
are met:

1. Redistributions of source code must retain the above copyright
  notice, this list of conditions and the following disclaimer.

2. The origin of this software must not be misrepresented; you must
  not claim that you wrote the original software. If you use this
  software in a product, an acknowledgment in the product
  documentation would be appreciated but is not required.

3. Altered source versions must be plainly marked as such, and must
  not be misrepresented as being the original software.

4. The name of the author may not be used to endorse or promote
  products derived from this software without specific

prior written
permission.

THIS SOFTWARE IS PROVIDED BY THE AUTHOR ``AS IS'' AND ANY EXPRESS
OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED
WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE
ARE DISCLAIMED. IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY
DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL
DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE
GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS
INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY,
WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING
NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS
SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Julian Seward, jseward@bzip.org
bzip2/libbzip2 version 1.0.6 of 6 September 2010

1.283 sqlite 3.27.2-3+deb10u1

1.283.1 Available under license :

No license file was found, but licenses were detected in source scan.

<html>
<head>
<title>SQLite Consortium Agreement</title>
</head>
<body bgcolor="white">
<h1 align="center">
SQLite Consortium Agreement
</h1>

This SQLite Consortium Agreement ("Agreement") is made and
entered into as of the _____ day of _____, 2007 ("Effective Date")
by and between _____ (the "Company"), and
Hipp, Wyrick & Company, Inc., a Georgia Corporation with
headquarters at 6200 Maple Cove Lane, Charlotte, NC ("Hwaci").

WHEREAS, Hwaci is the developer of a serverless, embeddable, public
domain SQL database engine available at
http://www.sqlite.org/
("SQLite"); and

WHEREAS, Company wishes to support the independent development of
the SQLite database engine to insure the continuing reliability,

vitality, and independence of SQLite, and in connection therewith,
Company wishes to provide funds for ongoing research, development,
and
 maintenance of the SQLite code base, operation of the SQLite
website, protection and maintenance of the SQLite
trademark, as well as for promotion of SQLite at conferences and
trade shows; and

WHEREAS, Company wishes to receive benefits in the form of
services from Hwaci in consideration for their support of SQLite; and

WHEREAS, Company and Hwaci each wish SQLite to be supported and
maintained as an independent, community-driven project, and to
ensure the SQLite development team remains independent.

NOW, THEREFORE, in consideration of the mutual promises contained
herein, the parties agree as follows:

<h2>1.0 Definitions</h2>

<h3>1.1 SQLite Developers</h3>
The "SQLite Developers" are the employees or contractors of Hwaci engaged
in the development of SQLite, including without limitation the
SQLite Architect.

<h3>1.2 SQLite Architect</h3>
The "SQLite Architect" is the SQLite Developer with ultimate
responsibility and authority over changes
 and maintenance of the
SQLite code. The current SQLite Architect is the original designer
and developer of SQLite, D. Richard Hipp. Hwaci may change the
SQLite Architect from time to time upon approval by Company.

<h3>1.3 Consortium Member</h3>
A "Consortium Member" is a company or organization, including
but not limited to Company, which has entered into an agreement
with Hwaci which is substantially similar to this Agreement.

<h2>2.0 Agreement<h2>

<h3>2.1 Responsibilities And Obligations Of SQLite Developers</h3>

<h4>2.1.1 General Support</h4>
The SQLite Developers shall provide, without limit,
timely and accurate answers, advice, and instruction
in response to questions and comments from Company about SQLite
submitted by email or by telephone at any time day or night.

<h4>2.1.2 Debugging Support</h4>
The SQLite Developers shall at Company's request provide
Company with direct assistance
in debugging applications that are built upon or use SQLite.
The combined
time for Debugging Support and Custom
Development for Company is limited to 330 hours per year.

<h4>2.1.3 Custom Development</h4>
The SQLite Developers shall at the request of Company
write new extensions or enhancements
to SQLite according to Company's specifications. These extensions
and enhancements may be proprietary to Company or open source or
with the consent of both Company and the SQLite Architect may
be folded into the public domain SQLite source tree.
The time devoted to Custom Development for Company is limited 220 hours
per year.

<h4>2.1.4 Custom Builds</h4>
The SQLite Developers shall at Company's request provide Company
with specialized builds of SQLite according to Company's specifications.

<h4>2.1.5 Legacy Support</h4>
The SQLite Developers shall at Company's request provide support
and bug-fix patches for any historical version of SQLite.

<h4>2.1.6 Custom Testing</h4>
The SQLite Developers shall at Company's request set up and
run
acceptance tests according Company's specifications that are specifically
designed to exercise SQLite as configured and used by Company.
These acceptance tests shall be run and shall pass prior to any release
of SQLite.

<h4>2.1.7 Priority Bug Fixes</h4>
The SQLite Developers shall assign highest priority to fixing bugs
in SQLite that are reported by Company or in which Company has
expressed a specific interest.

<h4>2.1.8 Code Quality</h4>

The SQLite Developers shall at all times keep the SQLite source
code well commented and documented and clearly structured and
organized so that an experienced and competent programmer can
understand it and support it after no more than a few months of study.

<h4>2.1.9 Backwards Compatibility</h4>
The SQLite Developers recognize that Company uses SQLite
in mission-critical applications and therefore shall work diligently
to ensure continuing bug-free correct operation and backwards
compatibility with prior releases.

<h4>2.1.10
Test Coverage</h4>
The SQLite Developers shall maintain the SQLite test suite such
that no less than 95% source code coverage is provided.

<h4>2.1.11 Website</h4>
The SQLite Developers shall maintain the SQLite website at
http://www.sqlite.org/
in good working order and all SQLite source code shall
be made freely available at such website.

<h3>2.2 Responsibilities And Obligations Of The SQLite Architect</h3>

<h4>2.2.1 Private Briefings</h4>
The SQLite Architect shall, at the request of Company,
provide Company with private notification and briefings
of any new bugs or new features in SQLite that might
effect Company's products.

<h4>2.2.2 Direction</h4>
The SQLite Architect shall coordinate the activities of SQLite
Developers and shall publish from time to time a roadmap of
proposed future changes and enhancements to SQLite.

<h4>2.2.3 Oversight</h4>
The SQLite Architect shall personally
review all changes to
the SQLite Source Code and take responsibility for the quality
and correctness of those changes.

<h4>2.2.4 Continuity</h4>
The initial SQLite Architect shall be the original developer
of SQLite, D. Richard Hipp. The role of SQLite Architect shall
not be assigned to another during the term of this Agreement except
due to the disability of Dr. Hipp and with approval of Company.

<h3>2.3 Responsibilities And Obligations Of Hwaci</h3>

<h4>2.3.1 Employer</h4>
Hwaci shall act as the employer of the SQLite Developers and
SQLite Architect and shall make all tax and legal filings
and tax withholding required by employers. Hwaci shall provide
Company with W-9 information upon request.

<h4>2.3.2 Responsible Party</h4>
All obligations of the SQLite Developers set forth in this
agreement are deemed obligations of Hwaci. Hwaci shall recruit,
employ, and supervise SQLite Developers in such a way that the
responsibilities and obligations of the SQLite
 Developers set
forth in this agreement are upheld.

<h4>2.3.3 Multiple Developers</h4>
Hwaci shall recruit and employ as many SQLite Developers for as
many hours as can be reasonably achieved using the funds received
from Consortium Members under this agreement.
So that support for SQLite will not be interrupted by the
disability or withdrawal of any one SQLite Developer, Hwaci will
keep at least two knowledgeable and competent SQLite Developers
on staff.

<h4>2.3.4 Mentorship</h4>
Hwaci shall work to encourage independent
programmers from around the world
to become familiar with SQLite internals so that there will be a
pool of talent able to support SQLite in the future.

<h4>2.3.5 Audits</h4>
Hwaci shall keep and maintain complete and accurate records
of the use of development funds provided by Company
and shall allow Company, or its representative, a certified
public accountant mutually acceptable to Hwaci and Company,
during office hours and at reasonable

intervals, no more than
once every 12 months, to inspect and make extracts or copies
of such records solely for the purpose of ascertaining Hwaci's
compliance with the objectives and requirements of this agreement.

<h4>2.3.6 Disaster Planning</h4>
Hwaci shall maintain backup copies of all
SQLite source files and documentation, current and historical,
at at least two separate locations separated from each
other and from the primary on-line SQLite repository
by at least 400 kilometers.

<h4>2.3.7 Trademark</h4>
Hwaci shall maintain ownership of the SQLite trademark and
the sqlite.org domain name and shall purchase bandwidth and
server space for the
http://www.sqlite.org/ website.

<h4>2.3.8 No Take-overs or Buy-outs</h4>
Neither Hwaci nor the SQLite Architect shall relinquish development
control of SQLite during the term of this Agreement, by acquisition or merger
or by any other means,
except with the consent of Company.

<h4>2.3.9
New Consortium Members</h4>
New Consortium Members may be accepted into the consortium from
time to time under identical terms as this agreement, or under
substantially similar terms that have been approved by existing
Consortium Members.

<h4>2.3.10 Adequate Staff</h4>
Hwaci shall recruit and employ a sufficient number of qualified
SQLite Developers to easily cover all custom development,
debugging, and general support service obligations for all
Consortium Members while still providing ample time for
the SQLite Developers to engage in general maintenance
and extension of SQLite.

<h4>2.3.11 Use Of Funds</h4>
Hwaci shall use the funds provided hereunder
solely for the development and maintenance of SQLite as set forth in
this Agreement.

Interest on funds received in advance and held in trust will
be reinvested and used for the same purposes as the principal.

<h3>2.4 Responsibilities And Obligations Of Company</h3>

<h4>2.4.1 Funding</h4>
Company
shall provide funding for the ongoing support and
maintenance of SQLite as set forth in section 3.0 "Fees".

<h4>2.4.2 Copyright Disclaimer</h4>
Company acknowledges that SQLite source code and documentation
published on the SQLite website
is in the public domain and that nothing in this agreement shall change
that fact.

<h2>3.0 Fees</h2>

In consideration of the performance
by Hwaci, the SQLite Developers, and the SQLite Architect
of the obligations described herein,
Company shall pay Hwaci at least US $75,000 per year in advance
either annually, quarterly, or monthly, at Company's discretion.

<h2>4.0 Confidentiality</h2>

<h3>4.1 Definition of Confidential Information</h3>

"Confidential Information" means any Company proprietary information,
technical data, trade secrets or know-how, including, but not limited to,
research, product plans, products, services, customers, customer lists,
markets, software, developments,
inventions, processes, formulas,
technology, designs, drawings, engineering, hardware configuration
information, marketing, finances or other business information
disclosed by Company either directly or indirectly in writing,
orally or by drawings or inspection of parts or equipment.

<h3>4.2 Non-Use and Non-Disclosure.</h3>

Hwaci shall not, during or subsequent to the term of this Agreement,
use Company's Confidential Information for any purpose whatsoever
other than the performance of the Services or disclose
Company's Confidential Information to any third party. The parties
acknowledge that Confidential Information will remain the sole

property of Company. Hwaci shall take all reasonable precautions
to prevent any unauthorized disclosure of Confidential Information
including, but not limited to, having each employee or
consultant of Hwaci, if any, with access to any
Confidential Information, execute a nondisclosure agreement
containing provisions in Company's
 favor substantially similar
to this Agreement. Confidential Information does not include
information that: (i) is known to Hwaci at the time of
disclosure to Hwaci by Company as evidenced by written
records of Hwaci; (ii) has become publicly known and made
generally available through no wrongful act of Hwaci; or
(iii) has been received by Hwaci from a third party who is
authorized to make such disclosure.

<h4>4.2.1 Disclosure Required by Law</h4>
In the event any Confidential Information is required to be disclosed
by Hwaci under the terms of a valid and effective subpoena or order
issued by a court of competent jurisdiction, or by a demand or
information request from an executive or administrative agency
or other governmental authority, Hwaci shall, unless prohibited
by the terms of a subpoena, order, or demand, promptly notify
Company of the existence, terms and circumstances surrounding
such demand or request, shall consult with Company on the
advisability of
 taking legally available steps to resist
or narrow such demand or request, and, if disclosure of
such Confidential Information is required, shall exercise
its reasonable best efforts to narrow the scope of disclosure
and obtain an order or other reliable assurance that
confidential treatment will be accorded to such
Confidential Information. To the extent that Hwaci
is prohibited from notifying Company of a subpoena,
order or demand, by the terms of same, Hwaci shall exercise
its reasonable efforts to narrow the scope of disclosure.

<h3>4.3 Return of Materials.</h3>

Upon the termination of this Agreement, or upon Company's
earlier request, Hwaci shall deliver to Company all of
Company's property or Confidential Information that Hwaci
may have in Hwaci's possession or control.

<h2>5.0 Intellectual Property</h2>

<h3>5.1 No Assignment</h3>

Company acknowledges that all copyrightable material, notes,

records, drawings, designs, inventions, improvements, developments,

discoveries and trade secrets made, generated, conceived, or
reduced to practice by Hwaci related to SQLite
will remain the property of Hwaci. Nothing in this Agreement
will be construed to transfer any intellectual property right
of Hwaci to Company.

<h3>5.2 Availability and Public Domain Dedication</h3>

The SQLite Developers and Hwaci shall,
subject to their discretion as to the quality
and suitability of the SQLite source code and documentation
for public release, make
the SQLite source code and documentation
publicly available as downloadable files
and make a public statement ceding all intellectual
property rights, including but not limited to copyright
and patent rights, in the SQLite source code and documentation
to the public domain.
To the extent that the SQLite Developers and Hwaci
elect not to release the SQLite
source code and documentation
publicly, they shall provide copies thereof to
Company and hereby grants to Company, under all of the
SQLite
 Developers' and Hwaci's
rights
including but not limited to copyright and patent rights,
in and to the SQLite source code and documentation,
perpetual, irrevocable,
worldwide, non-exclusive, sublicenseable license to use,
copy, prepare derivative works of, publicly perform and
display the SQLite source code and documentation
and derivative works thereof.

<h3>5.3 Trademark</h3>

Hwaci shall use the name "SQLite" only to apply to the
publicly available project known by such name as of the
Effective Date. Hwaci may in its discretion file such
trademark applications or registrations as it deems
appropriate to protect or record its rights therein,
and may set such policies as it deems appropriate for
licensing the use of the trademark.

<h2>6.0 Representations And Warranties</h3>

<h3>6.1 Intellectual Property Clearances.</h3>

Hwaci hereby represents and warrants that Hwaci shall
enter into agreements with the SQLite Developers sufficient
to enable Hwaci to
undertake the obligations of Section 5.

<h3>6.2 Disclaimer.</h3>

THE WORK PRODUCT AND ALL MATERIAL PROVIDED BY HWACI AND
COMPANY ARE PROVIDED "AS IS." NEITHER PARTY MAKES ANY
REPRESENTATIONS OR WARRANTIES OF ANY KIND, WHETHER ORAL
OR WRITTEN, WHETHER EXPRESS, IMPLIED, OR ARISING BY STATUTE,
CUSTOM, COURSE OF DEALING OR TRADE USAGE, WITH RESPECT TO
THE SUBJECT MATTER HEREOF, IN CONNECTION WITH THIS AGREEMENT.
EACH PARTY SPECIFICALLY DISCLAIMS ANY AND ALL IMPLIED
WARRANTIES OR CONDITIONS OF TITLE, MERCHANTABILITY,
FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT.

<h2>7.0 Term And Termination</h2>

<h3>7.1 Term.</h3>

This Agreement will commence on the Effective Date and
will continue until 12 months after the Effective Date.
Thereafter, the parties may by mutual consent renew
this Agreement subject to agreement on fees to be paid by
Company for sponsorship for additional periods.

<h3>7.2 Termination.</h3>

If either party materially defaults in
the performance
of any of its material obligations hereunder and if any
such default is not corrected within 30 days after notice
in writing, then the non-defaulting party, at its option,
may, in addition to any other remedies it may have, thereupon
terminate this Agreement by giving written notice of
termination to the defaulting party.

<h3>7.3 Survival.</h3>

Upon such termination all rights and duties of the
parties toward each other will cease except:
Sections 4 (Confidentiality), 5 (Intellectual Property),
and 8 (Miscellaneous) will survive termination of this Agreement.

<h2>8. Miscellaneous</h2>

<h3>8.1 Nonassignment/Binding Agreement.</h3>

The parties acknowledge that the unique nature of Hwaci's services are substantial consideration for the parties' entering into this Agreement. Neither this Agreement nor any rights under this Agreement may be assigned or otherwise transferred by Hwaci, in whole or in part, whether voluntarily or by operation of law, without the prior written consent of Company, which consent will not be unreasonably withheld. Subject to the foregoing, this Agreement will be binding upon and will inure to the benefit of the parties and their respective successors and assigns. Any assignment in violation of the foregoing will be null and void.

<h3>8.2 Notices.</h3>

Any notice required or permitted under the terms of this Agreement or required by law must be in writing and must be: (a) delivered in person; (b) sent by first class registered mail, or air mail, as appropriate; or (c) sent by overnight air courier, in each case properly posted and fully prepaid to the appropriate address set forth in the preamble to this Agreement. Either party may change its address for notice by notice to the other party given in accordance with this Section. Notices will be considered to have been given at the time of actual delivery in person, three business days after deposit in the mail as set forth above, or one day after delivery to an overnight air courier service.

<h3>8.3 Waiver.</h3>

Any waiver of the provisions of this Agreement or of a party's rights or remedies under this Agreement must be in writing to be effective. Failure, neglect, or delay by a party to enforce the provisions of this Agreement or its rights or remedies at any time, will not be construed as a waiver of such party's rights under this Agreement and will not in any way affect the validity of the whole or any part of this Agreement or prejudice such party's right to take subsequent action. No exercise or enforcement by either party of any right or remedy under this Agreement will preclude the enforcement by such party of any other right or remedy

under this Agreement or that such party is entitled by
law to enforce.

<h3>8.4 Severability.</h3>

If any term, condition, or provision in this Agreement
is found to be invalid, unlawful or unenforceable to
any extent, the parties
shall endeavor in good faith
to agree to such amendments that will preserve, as far
as possible, the intentions expressed in this Agreement.
If the parties fail to agree on such an amendment,
such invalid term, condition or provision will be
severed from the remaining terms, conditions and
provisions, which will continue to be valid and
enforceable to the fullest extent permitted by law.

<h3>8.5 Integration.</h3>

This Agreement contains the entire agreement of the
parties with respect to the subject matter of this
Agreement and supersedes all previous communications,
representations, understandings and agreements,
either oral or written, between the parties with
respect to said subject matter. This Agreement
may not be amended, except by a writing signed by both parties.

<h3>8.6 Counterparts.</h3>

This Agreement may be executed in counterparts,
each of which so executed will be deemed to be an
original and such counterparts together will constitute
one
and the same agreement.

<h3>8.7 Governing Law.</h3>

This Agreement will be interpreted and construed in
accordance with the laws of the State of North Carolina
and the United States of America, without regard to
conflict of law principles. All disputes arising out
of this Agreement will be subject to the exclusive
jurisdiction of the state and federal courts located in
North Carolina, and each party hereby consents to the
personal jurisdiction thereof.

<h3>8.8 Independent Contractors.</h3>

It is the intention of the parties that Hwaci is an
independent contractor. Nothing in this Agreement will
in any way be construed to constitute Hwaci or any of
its employees as an agent, employee or representative
of Company.

<h2>9.0 Signatures</h2>

The parties have executed this Agreement below to
indicate their acceptance of its terms.

<table width="100%" border="0">
<tr><td valign="top">
HWACI
By:<hr>

Print Name:<hr>

Title:<hr>

</td><td
 width="10%"></td>
<td valign="top">
COMPANY
By:<hr>

Print Name:<hr>

Title:<hr>

</td></tr></table>

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/consortium_agreement-20071201.html
No license file was found, but licenses were detected in source scan.

public domain. No claim of ownership is made

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/faq.html
No license file was found, but licenses were detected in source scan.

<dd> The psow query parameter works with the default windows and unix VFSes but might be a no-op for other proprietary or non-standard VFSes.
<dd> One might, for example, want to query all objects that overlap with the 35th parallel: SELECT id FROM demo_index WHERE maxY>=35.0 AND minY<=35.0; But, generally speaking, the more constraints that the R*Tree module has to work with, and the smaller the bounding box, the faster the results will come back. 3.4. Roundoff Error By default, coordinates are stored in an R*Tree using 32-bit floating point values. When a

coordinate cannot be exactly represented by a 32-bit floating point number, the lower-bound coordinates are rounded down and the upper-bound coordinates are rounded up. Thus, bounding boxes might be slightly larger than specified, but will never be any smaller. This is exactly what is desired for doing the more common "overlapping" queries where the application

wants to find every entry in the R*Tree that overlaps a query bounding box. Rounding the entry bounding boxes outward might cause a few extra entries to appears in an overlapping query if the edge of the entry bounding box corresponds to an edge of the query bounding box. But the overlapping query will never miss a valid table entry. However, for a "contained-within" style query, rounding the bounding boxes outward might cause some entries to be excluded from the result set if the edge of the entry bounding box corresponds to the edge of the query bounding box. To guard against this, applications should expand their contained-within query boxes slightly (by 0.000012%) by rounding down the lower coordinates and rounding up the top coordinates, in each dimension. 4. Using R*Trees Effectively For SQLite versions prior to 3.24.0 (2018-06-04), the only information that an R*Tree index stores about an object is its integer ID and its bounding box. Additional information needs to be stored

in separate tables and related to the R*Tree index using the primary key. For the example above, one might create an auxiliary table as follows: CREATE TABLE demo_data(id INTEGER PRIMARY KEY, -- primary key objname TEXT, -- name of the object objtype TEXT, -- object type boundary BLOB -- detailed boundary of object); In this example, the demo_data.boundary field is intended to hold some kind of binary representation of the precise boundaries of the object. The R*Tree index only holds an axis-aligned rectangular boundary for the object. The R*Tree boundary is just an approximation of the true object boundary. So what typically happens is that the R*Tree index is used to narrow a search down to a list of candidate objects and then more detailed and expensive computations are done on each candidate to find if the candidate truly meets the search criteria. Key Point: An R*Tree index does not normally provide the exact answer but merely reduces the set of potential answers from millions to

dozens. Suppose the demo_data.boundary field holds some proprietary data description of a complex two-dimensional boundary for an object and suppose that the application has used the sqlite3_create_function() interface to created application-defined functions "contained_in" and "overlaps" accepting two demo_data.boundary objects and return true or false. One may assume that "contained_in" and "overlaps" are relatively slow functions that we do not want to invoke too frequently. Then an efficient way to find the name of all objects located within the North Carolina 12th District, one may be to run a query like this: SELECT objname FROM demo_data, demo_index WHERE demo_data.id=demo_index.id AND contained_in(demo_data.boundary, :boundary) AND minX>=-81.0 AND maxX<=-79.6 AND minY>=35.0 AND maxY>=36.2; In the query above, one would presumably bind the binary BLOB description of the precise boundary of the 12th district to the ":boundary" parameter. Notice how the query above works: The R*Tree

index runs in the outer loop to find entries that are contained within the bounding box of longitude -81..-79.6 and latitude 35.0..36.2. For each object identifier found, SQLite looks up the corresponding entry in the demo_data table. It then uses the boundary field from the demo_data table as a parameter to the contained_in() function and if that function returns true, the objname field from the demo_data table is returned as the next row of query result. One would get the same answer without the use of the R*Tree index using the following simpler query: SELECT objname FROM demo_data WHERE contained_in(demo_data.boundary, :boundary); The problem with this latter query is that it must apply the contained_in() function to millions of entries in the demo_data table. The use of the R*Tree in the penultimate query reduces the number of calls to contained_in() function to a small subset of the entire table. The R*Tree index did not find the exact answer itself, it merely limited the search

space. 4.1. Auxiliary Columns Beginning with SQLite version 3.24.0 (2018-06-04), r-tree tables can have auxiliary columns that store arbitrary data. Auxiliary columns can be used in place of secondary tables such as "demo_data". Auxiliary columns are marked with a "+" symbol before the column name. Auxiliary columns must come after all of the coordinate boundary columns. There is a limit of no more than 100 auxiliary columns. The following example shows an r-tree table with auxiliary columns that is equivalent to the two tables "demo_index" and "demo_data" above: CREATE VIRTUAL TABLE demo_index2 USING rtree(id, -- Integer primary key minX, maxX, --

Minimum and maximum X coordinate minY, maxY, -- Minimum and maximum Y coordinate +objname TEXT, -- name of the object +objtype TEXT, -- object type +boundary BLOB -- detailed boundary of object);

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/requirements.html
No license file was found, but licenses were detected in source scan.

SQLite is high-quality, public domain software. The goal of
members can also request their own private, proprietary extensions

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/consortium.html
No license file was found, but licenses were detected in source scan.

is free to use SQLite from multiple threads, but it must make sure

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/custombuild.html
No license file was found, but licenses were detected in source scan.

Suppose the demo_data.boundary field holds some proprietary data description

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/rtree.html
No license file was found, but licenses were detected in source scan.

SQLite core and like the SQLite core are in the public domain. The
The TH3 test harness is a set of proprietary tests, written in

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* /sqlite3-3-27-2-orig-www-1-tar-xz/www/testing.html
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without a shared lock, other processes are free to modify the database

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/atomiccommit.html
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 Public domain source code
public domain and is thus free for

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/about.html
No license file was found, but licenses were detected in source scan.

public domain.

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/changes.html
No license file was found, but licenses were detected in source scan.

<h2>Proprietary SQLite Extensions</h2>
public domain. But there also exist
proprietary, licensed extensions to SQLite.

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/support.html
No license file was found, but licenses were detected in source scan.

other proprietary or non-standard VFSes.

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/uri.html
No license file was found, but licenses were detected in source scan.

If N>0 then the connection is free to use more of the WAL file beyond

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/walformat.html
No license file was found, but licenses were detected in source scan.

<html>
<body bgcolor="white">
FOR IMMEDIATE RELEASE:

<h2 align="center">SQLite Consortium Launches With Mozilla And Symbian As Charter Members</h2>

<h3 align="center">Ensures independent technical direction for world's
most deployed SQL database engine</h3>

Charlotte, North Carolina - December 12, 2007 - The SQLite Consortium,
a new membership association dedicated to maintaining SQLite as a fully open
and independent product, was formally announced today. Mozilla and Symbian Ltd.
have joined the SQLite Consortium as charter members.

SQLite is a compact, high efficiency, high reliability, embeddable SQL database
engine. The source code to SQLite is in the public domain and is available with
no associated fees. SQLite is the most deployed SQL database engine in the world
and is currently used in a wide range of commercial software products and electronic
devices from leading manufacturers.
 SQLite is found today in many mobile phones,
MP3 players, set-top boxes, and PCs.

The mission of the SQLite Consortium is to continue developing and enhancing

SQLite as a product that anyone may use without paying royalties or licensing fees.
Members of the SQLite Consortium provide funding to enable this mission and in
return receive enterprise-level technical support. Technical control and direction
of SQLite remains entirely with the SQLite developers.

Mozilla, developer of the popular open-source Firefox web browser, and Symbian,
the market-leading open operating system for advanced data-enabled smartphones,
both deploy the SQLite database engine in their products. As charter members of
the Consortium, Mozilla and Symbian are ensuring the development and support of
SQLite as a freely accessible and public domain software asset.

"SQLite has become a popular embedded database because it is lightweight, fast,
and open source," said Michael Schroepfer,
Vice President of Engineering, Mozilla.
"As a charter member of the SQLite Consortium, Mozilla is excited to help ensure
SQLite remains a vibrant and open technology, in line with our mission to promote
choice and innovation on the Internet."

"The SQLite Consortium will help set the standards for database management
which are essential in smartphone functionality and will also help create a pool
of developers, highly-skilled in SQLite for future mobile phone development, "
said Bruce Carney, Director, Developer Programmes & Services, Symbian.
"Our involvement with the SQL Consortium not only demonstrates Symbian's commitment
to open standards in the industry, but as mobile phones become increasingly powerful
and smartphones become increasingly popular, we are focused on ensuring that
desktop developers, who move to the mobile space, have the easiest and most
productive experience possible."

SQLite is a winner of the 2005 Google/O'Reilly Open Source Award. Additional
information
regarding the SQLite Consortium is available at the SQLite website,
http://www.sqlite.org/.

# # #

About SQLite

SQLite is a software library that implements a self-contained, embeddable,
serverless, zero-configuration, transactional SQL database engine. The code for
SQLite is in the public domain and is free for any use, commercial or private.
SQLite is currently found in countless software titles and electronic devices.

SQLite was originally developed and released 2000 by Dr. D. Richard Hipp.
The code continues to be maintained and enhanced by an international team
of developers under Hipp's direction.

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About Mozilla

Mozilla is a global community dedicated to building free, open source products

and technologies that improve the online experience for people everywhere.
Mozilla works in the open with a highly disciplined, transparent and cooperative
development process, under the umbrella of the non-profit Mozilla Foundation.
As a wholly owned subsidiary, the Mozilla Corporation organizes the development
and marketing of Mozilla products. This unique structure has enabled Mozilla to
financially support and cultivate competitive, viable community innovation.
For more information, visit www.mozilla.com.

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About Symbian Limited

Symbian is a software licensing company that develops and licenses Symbian OS,
the market-leading open operating system for advanced, data-enabled mobile phones
known as smartphones.

Symbian licenses Symbian OS to the world's leading handset manufacturers
and has built close co-operative business
relationships with leading companies
across the mobile industry. During Q3 2007, 20.4 million Symbian smartphones
were sold worldwide to over 250 major network operators, bringing the total
number of Symbian smartphones shipped up to 30 September 2007 to 165 million.

Symbian has its headquarters in London, United Kingdom, with offices in the
United States, United Kingdom, Asia (India, P.R. China, and Korea) and Japan.
For more information, please visit www.symbian.com.

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</body></html>

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/pressrelease-20071212.html
No license file was found, but licenses were detected in source scan.

```
#!/usr/bin/tclsh.docsrc
#### Import of wapp.tcl
# Copyright (c) 2017 D. Richard Hipp
#
# This program is free software; you can redistribute it and/or
# modify it under the terms of the Simplified BSD License (also
# known as the "2-Clause License" or "FreeBSD License".)
#
# This program is distributed in the hope that it will be useful,
# but without any warranty; without even the implied warranty of
# merchantability or fitness for a particular purpose.
#
#-------------------------------------------------------------------------
#
# Design rules:
#
#   (1)  All identifiers in the global namespace begin with "wapp"
#
#   (2)  Indentifiers intended for internal use only begin with "wappInt"
#

# Add text to the end of the HTTP reply.  No interpretation or transformation
# of the text is performs.  The argument should be enclosed within {...}
#
proc wapp {txt} {
 global wapp
 dict append wapp .reply $txt
}

# Add
 text to the page under construction.  Do no escaping on the text.
#
# Though "unsafe" in general, there are uses for this kind of thing.
# For example, if you want to return the complete, unmodified content of
# a file:
```

```
#
#       set fd [open content.html rb]
#       wapp-unsafe [read $fd]
#       close $fd
#
# You could do the same thing using ordinary "wapp" instead of "wapp-unsafe".
# The difference is that wapp-safety-check will complain about the misuse
# of "wapp", but it assumes that the person who write "wapp-unsafe" understands
# the risks.
#
# Though occasionally necessary, the use of this interface should be minimized.
#
proc wapp-unsafe {txt} {
 global wapp
 dict append wapp .reply $txt
}

# Add text to the end of the reply under construction.  The following
# substitutions are made:
#
#    %html(...)         Escape text for inclusion in HTML
#    %url(...)          Escape text for use as a URL
#    %qp(...)           Escape text for use as a URI query parameter
#
    %string(...)       Escape text for use within a JSON string
#    %unsafe(...)       No transformations of the text
#
# The substitutions above terminate at the first ")" character.  If the
# text of the TCL string in ... contains ")" characters itself, use instead:
#
#    %html%(...)%
#    %url%(...)%
#    %qp%(...)%
#    %string%(...)%
#    %unsafe%(...)%
#
# In other words, use "%(...)%" instead of "(...)" to include the TCL string
# to substitute.
#
# The %unsafe substitution should be avoided whenever possible, obviously.
# In addition to the substitutions above, the text also does backslash
# escapes.
#
proc wapp-subst {txt} {
 global wapp
 regsub -all {%(html|url|qp|string|unsafe){1,1}?(|%)\((.+)\)\2} $txt \
       {[wappInt-enc-\1 "\3"]} txt
 dict append wapp .reply [uplevel 1 [list subst -novariables $txt]]
```

```
}

# Works like wapp-subst, but also removes whitespace from the beginning
# of lines.
#
proc wapp-trim {txt} {
 global wapp
 regsub -all {\n\s+} [string
 trim $txt] \n txt
 regsub -all {%(html|url|qp|string|unsafe){1,1}?(|%)\((.+)\)\2} $txt \
       {[wappInt-enc-\1 "\3"]} txt
 dict append wapp .reply [uplevel 1 [list subst -novariables $txt]]
}

# There must be a wappInt-enc-NAME routine for each possible substitution
# in wapp-subst.  Thus there are routines for "html", "url", "qp", and "unsafe".
#
#    wappInt-enc-html          Escape text so that it is safe to use in the
#                              body of an HTML document.
#
#    wappInt-enc-url           Escape text so that it is safe to pass as an
#                              argument to href= and src= attributes in HTML.
#
#    wappInt-enc-qp            Escape text so that it is safe to use as the
#                              value of a query parameter in a URL or in
#                              post data or in a cookie.
#
#    wappInt-enc-string        Escape ", ', \, and < for using inside of a
#                              javascript string literal.
  The < character
#                              is escaped to prevent "</script>" from causing
#                              problems in embedded javascript.
#
#    wappInt-enc-unsafe        Perform no encoding at all.  Unsafe.
#
proc wappInt-enc-html {txt} {
 return [string map {& &amp; < &lt; > &gt; \" &quot; \\ &#92;} $txt]
}
proc wappInt-enc-unsafe {txt} {
 return $txt
}
proc wappInt-enc-url {s} {
 if {[regsub -all {[^-{}@~?=#_.:/a-zA-Z0-9]} $s {[wappInt-%HHchar {&}]} s]} {
   set s [subst -novar -noback $s]
 }
 if {[regsub -all {[{}]} $s {[wappInt-%HHchar \\&]} s]} {
   set s [subst -novar -noback $s]
 }
```

```
 return $s
}
proc wappInt-enc-qp {s} {
 if {[regsub -all {[^-{}_.a-zA-Z0-9]} $s {[wappInt-%HHchar {&}]} s]} {
   set s [subst -novar -noback $s]
 }
 if {[regsub -all {[{}]} $s {[wappInt-%HHchar \\&]} s]} {
   set s [subst -novar -noback $s]
 }
 return $s
}
proc wappInt-enc-string {s} {
 return [string map {\\ \\\\ \" \\\" ' \\' < \\u003c} $s]
}

# This is a
 helper routine for wappInt-enc-url and wappInt-enc-qp.  It returns
# an appropriate %HH encoding for the single character c.  If c is a unicode
# character, then this routine might return multiple bytes:  %HH%HH%HH
#
proc wappInt-%HHchar {c} {
 if {$c==" "} {return +}
 return [regsub -all .. [binary encode hex [encoding convertto utf-8 $c]] {%&}]
}



# Undo the www-url-encoded format.
#
# HT: This code stolen from ncgi.tcl
#
proc wappInt-decode-url {str} {
 set str [string map [list + { } "\\" "\\\\" \[ \\\[ \] \\\]] $str]
 regsub -all -- \
     {%([Ee][A-Fa-f0-9])%([89ABab][A-Fa-f0-9])%([89ABab][A-Fa-f0-9])} \
     $str {[encoding convertfrom utf-8 [binary decode hex \1\2\3]]} str
 regsub -all -- \
     {%([CDcd][A-Fa-f0-9])%([89ABab][A-Fa-f0-9])}                    \
     $str {[encoding convertfrom utf-8 [binary decode hex \1\2]]} str
 regsub -all -- {%([0-7][A-Fa-f0-9])} $str {\\u00\1} str
 return [subst -novar $str]
}

# Reset the document back to an empty string.
#
proc
 wapp-reset {} {
 global wapp
 dict set wapp .reply {}
```

```
}

# Change the mime-type of the result document.
#
proc wapp-mimetype {x} {
 global wapp
 dict set wapp .mimetype $x
}

# Change the reply code.
#
proc wapp-reply-code {x} {
 global wapp
 dict set wapp .reply-code $x
}

# Set a cookie
#
proc wapp-set-cookie {name value} {
 global wapp
 dict lappend wapp .new-cookies $name $value
}

# Unset a cookie
#
proc wapp-clear-cookie {name} {
 wapp-set-cookie $name {}
}

# Add extra entries to the reply header
#
proc wapp-reply-extra {name value} {
 global wapp
 dict lappend wapp .reply-extra $name $value
}

# Specifies how the web-page under construction should be cached.
# The argument should be one of:
#
#    no-cache
#    max-age=N            (for some integer number of seconds, N)
#    private,max-age=N
#
proc wapp-cache-control {x} {
 wapp-reply-extra Cache-Control $x
}

# Redirect to a different web page
```

```
#
proc wapp-redirect {uri} {
 wapp-reply-code {307 Redirect}
 wapp-reply-extra
 Location $uri
}

# Return the value of a wapp parameter
#
proc wapp-param {name {dflt {}}} {
 global wapp
 if {![dict exists $wapp $name]} {return $dflt}
 return [dict get $wapp $name]
}

# Return true if a and only if the wapp parameter $name exists
#
proc wapp-param-exists {name} {
 global wapp
 return [dict exists $wapp $name]
}

# Set the value of a wapp parameter
#
proc wapp-set-param {name value} {
 global wapp
 dict set wapp $name $value
}

# Return all parameter names that match the GLOB pattern, or all
# names if the GLOB pattern is omitted.
#
proc wapp-param-list {{glob {*}}} {
 global wapp
 return [dict keys $wapp $glob]
}

# By default, Wapp does not decode query parameters and POST parameters
# for cross-origin requests.  This is a security restriction, designed to
# help prevent cross-site request forgery (CSRF) attacks.
#
# As a consequence of this restriction, URLs for sites generated by Wapp
# that contain query parameters will not work as URLs
 found in other
# websites.  You cannot create a link from a second website into a Wapp
# website if the link contains query planner, by default.
#
# Of course, it is sometimes desirable to allow query parameters on external
```

```
# links.  For URLs for which this is safe, the application should invoke
# wapp-allow-xorigin-params.  This procedure tells Wapp that it is safe to
# go ahead and decode the query parameters even for cross-site requests.
#
# In other words, for Wapp security is the default setting.  Individual pages
# need to actively disable the cross-site request security if those pages
# are safe for cross-site access.
#
proc wapp-allow-xorigin-params {} {
 global wapp
 if {![dict exists $wapp .qp] && ![dict get $wapp SAME_ORIGIN]} {
   wappInt-decode-query-params
 }
}

# Set the content-security-policy.
#
# The default content-security-policy is very strict:  "default-src 'self'"
# The default policy prohibits the use of in-line javascript or CSS.
#
# Provide an alternative
 CSP as the argument.  Or use "off" to disable
# the CSP completely.
#
proc wapp-content-security-policy {val} {
 global wapp
 if {$val=="off"} {
   dict unset wapp .csp
 } else {
   dict set wapp .csp $val
 }
}

# Examine the bodys of all procedures in this program looking for
# unsafe calls to various Wapp interfaces.  Return a text string
# containing warnings. Return an empty string if all is ok.
#
# This routine is advisory only.  It misses some constructs that are
# dangerous and flags others that are safe.
#
proc wapp-safety-check {} {
 set res {}
 foreach p [info procs] {
   set ln 0
   foreach x [split [info body $p] \n] {
     incr ln
     if {[regexp {^[ \t]*wapp[ \t]+([^\n]+)} $x all tail]
      && [string index $tail 0]!="\173"
```

```
     && [regexp {[[$]} $tail]
    } {
      append res "$p:$ln: unsafe \"wapp\" call: \"[string trim $x]\"\n"
    }
    if {[regexp {^[ \t]*wapp-(subst|trim)[ \t]+[^\173]} $x all cx]} {
      append res "$p:$ln: unsafe \"wapp-$cx\"
 call: \"[string trim $x]\"\n"
    }
  }
 }
 return $res
}

# Return a string that descripts the current environment.  Applications
# might find this useful for debugging.
#
proc wapp-debug-env {} {
 global wapp
 set out {}
 foreach var [lsort [dict keys $wapp]] {
  if {[string index $var 0]=="."} continue
  append out "$var = [list [dict get $wapp $var]]\n"
 }
 append out "\[pwd\] = [list [pwd]]\n"
 return $out
}

# Tracing function for each HTTP request.  This is overridden by wapp-start
# if tracing is enabled.
#
proc wappInt-trace {} {}

# Start up a listening socket.  Arrange to invoke wappInt-new-connection
# for each inbound HTTP connection.
#
#    port           Listen on this TCP port.  0 means to select a port
#                   that is not currently in use
#
#    wappmode       One of "scgi", "server", or "local".
#
proc wappInt-start-listener {port wappmode} {
 if {$wappmode=="scgi"} {
  set type SCGI
  set server [list wappInt-new-connection
 wappInt-scgi-readable $wappmode]
 } else {
  set type HTTP
  set server [list wappInt-new-connection wappInt-http-readable $wappmode]
```

```
 }
 if {$wappmode=="local"} {
   set x [socket -server $server -myaddr 127.0.0.1 $port]
 } else {
   set x [socket -server $server $port]
 }
 set coninfo [chan configure $x -sockname]
 set port [lindex $coninfo 2]
 if {$wappmode=="local"} {
   wappInt-start-browser http://127.0.0.1:$port/
 } else {
   puts "Listening for $type requests on TCP port $port"
 }
}

# Start a web-browser and point it at $URL
#
proc wappInt-start-browser {url} {
 global tcl_platform
 if {$tcl_platform(platform)=="windows"} {
   exec cmd /c start $url &
 } elseif {$tcl_platform(os)=="Darwin"} {
   exec open $url &
 } elseif {[catch {exec xdg-open $url}]} {
   exec firefox $url &
 }
}

# This routine is a "socket -server" callback.  The $chan, $ip, and $port
# arguments are added by the socket command.
#
# Arrange to invoke $callback when content is available
 on the new socket.
# The $callback will process inbound HTTP or SCGI content.
#
proc wappInt-new-connection {callback wappmode chan ip port} {
 upvar #0 wappInt-$chan W
 set W [dict create REMOTE_ADDR $ip REMOTE_PORT $port WAPP_MODE $wappmode \
        .header {}]
 fconfigure $chan -blocking 0 -translation binary
 fileevent $chan readable [list $callback $chan]
}

# Close an input channel
#
proc wappInt-close-channel {chan} {
 if {$chan=="stdout"} {
   # This happens after completing a CGI request
```

```
  exit 0
 } else {
  unset ::wappInt-$chan
  close $chan
 }
}

# Process new text received on an inbound HTTP request
#
proc wappInt-http-readable {chan} {
 if {[catch [list wappInt-http-readable-unsafe $chan] msg]} {
  puts stderr "$msg\n$::errorInfo"
  wappInt-close-channel $chan
 }
}
proc wappInt-http-readable-unsafe {chan} {
 upvar #0 wappInt-$chan W wapp wapp
 if {![dict exists $W .toread]} {
  # If the .toread key is not set, that means we are still reading
   # the header
  set line [string trimright [gets $chan]]
  set n [string length $line]
  if {$n>0} {
    if {[dict get $W .header]=="" || [regexp {^\s+} $line]} {
      dict append W .header $line
    } else {
      dict append W .header \n$line
    }
    if {[string length [dict get $W .header]]>100000} {
      error "HTTP request header too big - possible DOS attack"
    }
  } elseif {$n==0} {
    # We have reached the blank line that terminates the header.
    global argv0
    set a0 [file normalize $argv0]
    dict set W SCRIPT_FILENAME $a0
    dict set W DOCUMENT_ROOT [file dir $a0]
    if {[wappInt-parse-header $chan]} {
      catch {close $chan}
      return
    }
    set len 0
    if {[dict exists $W CONTENT_LENGTH]} {
      set len [dict get $W CONTENT_LENGTH]
    }
    if {$len>0} {
      # Still need to read the query content
      dict set W .toread $len
```

```
    } else {
      # There is no query content, so handle
 the request immediately
      set wapp $W
      wappInt-handle-request $chan 0
    }
  }
 } else {
  # If .toread is set, that means we are reading the query content.
  # Continue reading until .toread reaches zero.
  set got [read $chan [dict get $W .toread]]
  dict append W CONTENT $got
  dict set W .toread [expr {[dict get $W .toread]-[string length $got]}]
  if {[dict get $W .toread]<=0} {
    # Handle the request as soon as all the query content is received
    set wapp $W
    wappInt-handle-request $chan 0
  }
 }
}

# Decode the HTTP request header.
#
# This routine is always running inside of a [catch], so if
# any problems arise, simply raise an error.
#
proc wappInt-parse-header {chan} {
 upvar #0 wappInt-$chan W
 set hdr [split [dict get $W .header] \n]
 if {$hdr==""} {return 1}
 set req [lindex $hdr 0]
 dict set W REQUEST_METHOD [set method [lindex $req 0]]
 if {[lsearch {GET HEAD POST} $method]<0} {
  error "unsupported request method:
 \"[dict get $W REQUEST_METHOD]\""
 }
 set uri [lindex $req 1]
 set split_uri [split $uri ?]
 set uri0 [lindex $split_uri 0]
 if {![regexp {^/[-.a-z0-9_/]*$} $uri0]} {
  error "invalid request uri: \"$uri0\""
 }
 dict set W REQUEST_URI $uri0
 dict set W PATH_INFO $uri0
 set uri1 [lindex $split_uri 1]
 dict set W QUERY_STRING $uri1
 set n [llength $hdr]
 for {set i 1} {$i<$n} {incr i} {
```

```
  set x [lindex $hdr $i]
  if {![regexp {^(.+): +(.*)$} $x all name value]} {
    error "invalid header line: \"$x\""
  }
  set name [string toupper $name]
  switch -- $name {
    REFERER {set name HTTP_REFERER}
    USER-AGENT {set name HTTP_USER_AGENT}
    CONTENT-LENGTH {set name CONTENT_LENGTH}
    CONTENT-TYPE {set name CONTENT_TYPE}
    HOST {set name HTTP_HOST}
    COOKIE {set name HTTP_COOKIE}
    ACCEPT-ENCODING {set name HTTP_ACCEPT_ENCODING}
    default {set name .hdr:$name}
  }
  dict set W $name $value
 }
 return 0
}

# Decode the QUERY_STRING
 parameters from a GET request or the
# application/x-www-form-urlencoded CONTENT from a POST request.
#
# This routine sets the ".qp" element of the ::wapp dict as a signal
# that query parameters have already been decoded.
#
proc wappInt-decode-query-params {} {
 global wapp
 dict set wapp .qp 1
 if {[dict exists $wapp QUERY_STRING]} {
   foreach qterm [split [dict get $wapp QUERY_STRING] &] {
     set qsplit [split $qterm =]
     set nm [lindex $qsplit 0]
     if {[regexp {^[a-z][a-z0-9]*$} $nm]} {
       dict set wapp $nm [wappInt-decode-url [lindex $qsplit 1]]
     }
   }
 }
 if {[dict exists $wapp CONTENT_TYPE] && [dict exists $wapp CONTENT]} {
   set ctype [dict get $wapp CONTENT_TYPE]
   if {$ctype=="application/x-www-form-urlencoded"} {
     foreach qterm [split [string trim [dict get $wapp CONTENT]] &] {
       set qsplit [split $qterm =]
       set nm [lindex $qsplit 0]
       if {[regexp {^[a-z][-a-z0-9_]*$} $nm]} {
         dict set wapp $nm [wappInt-decode-url
```

```
[lindex $qsplit 1]]
      }
    }
  } elseif {[string match multipart/form-data* $ctype]} {
    regexp {^(.*?)\r\n(.*)$} [dict get $wapp CONTENT] all divider body
    set ndiv [string length $divider]
    while {[string length $body]} {
      set idx [string first $divider $body]
      set unit [string range $body 0 [expr {$idx-3}]]
      set body [string range $body [expr {$idx+$ndiv+2}] end]
      if {[regexp {^Content-Disposition: form-data; (.*?)\r\n\r\n(.*)$} \
           $unit unit hdr content] &&
          [regexp {name="(.*)"; filename="(.*)"\r\nContent-Type: (.*?)$}\
            $hdr hr name filename mimetype]} {
        dict set wapp $name.filename \
          [string map [list \\\" \" \\\\ \\] $filename]
        dict set wapp $name.mimetype $mimetype
        dict set wapp $name.content $content
      }
    }
  }
 }
}

# Invoke application-supplied methods to generate a reply to
# a single HTTP request.
#
# This routine always
 runs within [catch], so handle exceptions by
# invoking [error].
#
proc wappInt-handle-request {chan useCgi} {
 global wapp
 dict set wapp .reply {}
 dict set wapp .mimetype {text/html; charset=utf-8}
 dict set wapp .reply-code {200 Ok}
 dict set wapp .csp {default-src 'self'}

 # Set up additional CGI environment values
 #
 if {![dict exists $wapp HTTP_HOST]} {
   dict set wapp BASE_URL {}
 } elseif {[dict exists $wapp HTTPS]} {
   dict set wapp BASE_URL https://[dict get $wapp HTTP_HOST]
 } else {
   dict set wapp BASE_URL http://[dict get $wapp HTTP_HOST]
 }
 if {![dict exists $wapp REQUEST_URI]} {
```

```
  dict set wapp REQUEST_URI /
} elseif {[regsub {\?.*} [dict get $wapp REQUEST_URI] {} newR]} {
  # Some servers (ex: nginx) append the query parameters to REQUEST_URI.
  # These need to be stripped off
  dict set wapp REQUEST_URI $newR
}
if {[dict exists $wapp SCRIPT_NAME]} {
  dict append wapp BASE_URL [dict get $wapp SCRIPT_NAME]
} else {
  dict set wapp
SCRIPT_NAME {}
}
if {![dict exists $wapp PATH_INFO]} {
  # If PATH_INFO is missing (ex: nginx) the construct it
  set URI [dict get $wapp REQUEST_URI]
  set skip [string length [dict get $wapp SCRIPT_NAME]]
  dict set wapp PATH_INFO [string range $URI $skip end]
}
if {[regexp {^/([^/]+)(.*)$} [dict get $wapp PATH_INFO] all head tail]} {
  dict set wapp PATH_HEAD $head
  dict set wapp PATH_TAIL [string trimleft $tail /]
} else {
  dict set wapp PATH_INFO {}
  dict set wapp PATH_HEAD {}
  dict set wapp PATH_TAIL {}
}
dict set wapp SELF_URL [dict get $wapp BASE_URL]/[dict get $wapp PATH_HEAD]

# Parse query parameters from the query string, the cookies, and
# POST data
#
if {[dict exists $wapp HTTP_COOKIE]} {
  foreach qterm [split [dict get $wapp HTTP_COOKIE] {;}] {
    set qsplit [split [string trim $qterm] =]
    set nm [lindex $qsplit 0]
    if {[regexp {^[a-z][-a-z0-9_]*$} $nm]} {
      dict set wapp $nm [wappInt-decode-url [lindex
$qsplit 1]]
    }
  }
}
set same_origin 0
if {[dict exists $wapp HTTP_REFERER]} {
  set referer [dict get $wapp HTTP_REFERER]
  set base [dict get $wapp BASE_URL]
  if {$referer==$base || [string match $base/* $referer]} {
    set same_origin 1
  }
```

```
}
dict set wapp SAME_ORIGIN $same_origin
if {$same_origin} {
  wappInt-decode-query-params
}

# Invoke the application-defined handler procedure for this page
# request.  If an error occurs while running that procedure, generate
# an HTTP reply that contains the error message.
#
wapp-before-dispatch-hook
wappInt-trace
set mname [dict get $wapp PATH_HEAD]
if {[catch {
  if {$mname!="" && [llength [info proc wapp-page-$mname]]>0} {
    wapp-page-$mname
  } else {
    wapp-default
  }
} msg]} {
  if {[wapp-param WAPP_MODE]=="local" || [wapp-param WAPP_MODE]=="server"} {
    puts "ERROR: $::errorInfo"
  }
  wapp-reset
  wapp-reply-code "500 Internal Server Error"
  wapp-mimetype
text/html
  wapp-trim {
    <h1>Wapp Application Error</h1>
    <pre>%html($::errorInfo)</pre>
  }
  dict unset wapp .new-cookies
}

# Transmit the HTTP reply
#
if {$chan=="stdout"} {
  puts $chan "Status: [dict get $wapp .reply-code]\r"
} else {
  puts $chan "HTTP/1.1 [dict get $wapp .reply-code]\r"
  puts $chan "Server: wapp\r"
  puts $chan "Connection: close\r"
}
if {[dict exists $wapp .reply-extra]} {
  foreach {name value} [dict get $wapp .reply-extra] {
    puts $chan "$name: $value\r"
  }
}
```

```
 if {[dict exists $wapp .csp]} {
  puts $chan "Content-Security-Policy: [dict get $wapp .csp]\r"
 }
 set mimetype [dict get $wapp .mimetype]
 puts $chan "Content-Type: $mimetype\r"
 if {[dict exists $wapp .new-cookies]} {
  foreach {nm val} [dict get $wapp .new-cookies] {
    if {[regexp {^[a-z][-a-z0-9_]*$} $nm]} {
      if {$val==""} {
        puts $chan "Set-Cookie: $nm=; HttpOnly; Path=/; Max-Age=1\r"
      } else {
        set
 val [wappInt-enc-url $val]
        puts $chan "Set-Cookie: $nm=$val; HttpOnly; Path=/\r"
      }
    }
  }
 }
 if {[string match text/* $mimetype]} {
  set reply [encoding convertto utf-8 [dict get $wapp .reply]]
  if {[regexp {\ygzip\y} [wapp-param HTTP_ACCEPT_ENCODING]]} {
    catch {
      set x [zlib gzip $reply]
      set reply $x
      puts $chan "Content-Encoding: gzip\r"
    }
  }
 } else {
  set reply [dict get $wapp .reply]
 }
 puts $chan "Content-Length: [string length $reply]\r"
 puts $chan \r
 puts $chan $reply
 flush $chan
 wappInt-close-channel $chan
}

# This routine runs just prior to request-handler dispatch.  The
# default implementation is a no-op, but applications can override
# to do additional transformations or checks.
#
proc wapp-before-dispatch-hook {} {return}

# Process a single CGI request
#
proc wappInt-handle-cgi-request {} {
 global wapp env
 foreach key {
```

```
  CONTENT_LENGTH
  CONTENT_TYPE
  DOCUMENT_ROOT
  HTTP_ACCEPT_ENCODING
   HTTP_COOKIE
  HTTP_HOST
  HTTP_REFERER
  HTTP_USER_AGENT
  HTTPS
  PATH_INFO
  QUERY_STRING
  REMOTE_ADDR
  REQUEST_METHOD
  REQUEST_URI
  REMOTE_USER
  SCRIPT_FILENAME
  SCRIPT_NAME
  SERVER_NAME
  SERVER_PORT
  SERVER_PROTOCOL
 } {
  if {[info exists env($key)]} {
    dict set wapp $key $env($key)
  }
 }
 set len 0
 if {[dict exists $wapp CONTENT_LENGTH]} {
  set len [dict get $wapp CONTENT_LENGTH]
 }
 if {$len>0} {
  fconfigure stdin -translation binary
  dict set wapp CONTENT [read stdin $len]
 }
 dict set wapp WAPP_MODE cgi
 fconfigure stdout -translation binary
 wappInt-handle-request stdout 1
}

# Process new text received on an inbound SCGI request
#
proc wappInt-scgi-readable {chan} {
 if {[catch [list wappInt-scgi-readable-unsafe $chan] msg]} {
  puts stderr "$msg\n$::errorInfo"
  wappInt-close-channel $chan
 }
}
proc wappInt-scgi-readable-unsafe {chan} {
 upvar #0 wappInt-$chan W wapp wapp
```

```
if
{![dict exists $W .toread]} {
  # If the .toread key is not set, that means we are still reading
  # the header.
  #
  # An SGI header is short.  This implementation assumes the entire
  # header is available all at once.
  #
  set req [read $chan 15]
  set n [string length $req]
  scan $req %d:%s len hdr
  incr len [string length "$len:,"]
  append hdr [read $chan [expr {$len-15}]]
  foreach {nm val} [split $hdr \000] {
    if {$nm==","} break
    dict set W $nm $val
  }
  set len 0
  if {[dict exists $W CONTENT_LENGTH]} {
    set len [dict get $W CONTENT_LENGTH]
  }
  if {$len>0} {
    # Still need to read the query content
    dict set W .toread $len
  } else {
    # There is no query content, so handle the request immediately
    set wapp $W
    wappInt-handle-request $chan 0
  }
 } else {
  # If .toread is set, that means we are reading the query content.
  # Continue reading until .toread reaches zero.
  set got [read
 $chan [dict get $W .toread]]
  dict append W CONTENT $got
  dict set W .toread [expr {[dict get $W .toread]-[string length $got]}]
  if {[dict get $W .toread]<=0} {
    # Handle the request as soon as all the query content is received
    set wapp $W
    wappInt-handle-request $chan 0
  }
 }
}

# Start up the wapp framework.  Parameters are a list passed as the
# single argument.
#
#    -server $PORT         Listen for HTTP requests on this TCP port $PORT
```

```
#
#    -local $PORT         Listen for HTTP requests on 127.0.0.1:$PORT
#
#    -scgi $PORT          Listen for SCGI requests on TCP port $PORT
#
#    -cgi                 Handle a single CGI request
#
# With no arguments, the behavior is called "auto".  In "auto" mode,
# if the GATEWAY_INTERFACE environment variable indicates CGI, then run
# as CGI.  Otherwise, start an HTTP server bound to the loopback address
# only, on an arbitrary TCP port, and automatically launch a web browser
# on that TCP port.
#
# Additional
 options:
#
#    -trace               "puts" each request URL as it is handled, for
#                         debugging
#
#    -lint                Run wapp-safety-check on the application instead
#                         of running the application itself
#
#    -Dvar=value          Set TCL global variable "var" to "value"
#
#
proc wapp-start {arglist} {
 global env
 set mode auto
 set port 0
 set n [llength $arglist]
 for {set i 0} {$i<$n} {incr i} {
   set term [lindex $arglist $i]
   if {[string match --* $term]} {set term [string range $term 1 end]}
   switch -glob -- $term {
     -server {
       incr i;
       set mode "server"
       set port [lindex $arglist $i]
     }
     -local {
       incr i;
       set mode "local"
       set port [lindex $arglist $i]
     }
     -scgi {
       incr i;
       set mode "scgi"
       set port [lindex $arglist $i]
```

```
    }
    -cgi {
      set mode "cgi"
    }
    -trace {
      proc wappInt-trace {} {

    set q [wapp-param QUERY_STRING]
        set uri [wapp-param BASE_URL][wapp-param PATH_INFO]
        if {$q!=""} {append uri ?$q}
        puts $uri
      }
    }
    -lint {
      set res [wapp-safety-check]
      if {$res!=""} {
        puts "Potential problems in this code:"
        puts $res
        exit 1
      } else {
        exit
      }
    }
    -D*=* {
      if {[regexp {^.D([^=]+)=(.*)$} $term all var val]} {
        set ::$var $val
      }
    }
    default {
      error "unknown option: $term"
    }
  }
}
if {($mode=="auto"
     && [info exists env(GATEWAY_INTERFACE)]
     && [string match CGI/1.* $env(GATEWAY_INTERFACE)])
  || $mode=="cgi"
} {
  wappInt-handle-cgi-request
  return
}
if {$mode=="scgi"} {
  wappInt-start-listener $port scgi
} elseif {$mode=="server"} {
  wappInt-start-listener $port server
} else {
  wappInt-start-listener $port local
}
```

```
 vwait ::forever
}

# Call this version
 1.0
package provide wapp 1.0

#### End of wapp.tcl

# Generate all header content for the output document
#
proc search_header {} {
 wapp-trim {
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01//EN" "http://www.w3.org/TR/html4/strict.dtd">
<html><head>
<meta name="viewport" content="width=device-width, initial-scale=1.0">
<meta http-equiv="content-type" content="text/html; charset=UTF-8">
<link href="../sqlite.css" rel="stylesheet">
<title>Search SQLite Stats</title>
<!-- path=../ -->
</head>
<body>
<div class=nosearch>
<a href="../index.html">
<img class="logo" src="../images/sqlite370_banner.gif" alt="SQLite" border="0">
</a>
<div><!-- IE hack to prevent disappearing logo --></div>
<div class="tagline desktoponly">
Small. Fast. Reliable.<br>Choose any three.
</div>
<div class="menu mainmenu">
<ul>
<li><a href="../index.html">Home</a>
<li class='mobileonly'><a href="javascript:void(0)" onclick='toggle_div("submenu")'>Menu</a>
<li class='wideonly'><a href='../about.html'>About</a>
<li class='desktoponly'><a
 href="../docs.html">Documentation</a>
<li class='desktoponly'><a href="../download.html">Download</a>
<li class='wideonly'><a href='../copyright.html'>License</a>
<li class='desktoponly'><a href="../support.html">Support</a>
<li class='desktoponly'><a href="../prosupport.html">Purchase</a>
<li class='search' id='search_menubutton'>
<a href="javascript:void(0)" onclick='toggle_search()'>Search</a>
</ul>
</div>
<div class="menu submenu" id="submenu">
<ul>
<li><a href='../about.html'>About</a>
```

```
<li><a href='../docs.html'>Documentation</a>
<li><a href='../download.html'>Download</a>
<li><a href='../support.html'>Support</a>
<li><a href='../prosupport.html'>Purchase</a>
</ul>
</div>
<div class="searchmenu" id="searchmenu">
<form method="GET" action="../search">
<select name="s" id="searchtype">
<option value="d">Search Documentation</option>
<option value="c">Search Changelog</option>
</select>
<input type="text" name="q" id="searchbox" value="">
<input type="submit" value="Go">
</form>
</div>
</div>
<script>
function
 toggle_div(nm) {
var w = document.getElementById(nm);
if( w.style.display=="block" ){
w.style.display = "none";
}else{
w.style.display = "block";
}
}
function toggle_search() {
var w = document.getElementById("searchmenu");
if( w.style.display=="block" ){
w.style.display = "none";
} else {
w.style.display = "block";
setTimeout(function(){
document.getElementById("searchbox").focus()
}, 30);
}
}
function div_off(nm){document.getElementById(nm).style.display="none";}
window.onbeforeunload = function(e){div_off("submenu");}
/* Disable the Search feature if we are not operating from CGI, since */
/* Search is accomplished using CGI and will not work without it. */
if( !location.origin.match || !location.origin.match(/http/) ){
document.getElementById("search_menubutton").style.display = "none";
}
/* Used by the Hide/Show button beside syntax diagrams, to toggle the */
function hideorshow(btn,obj){
var x = document.getElementById(obj);
```

```
var b
 = document.getElementById(btn);
if( x.style.display!='none' ){
x.style.display = 'none';
b.innerHTML='show';
}else{
x.style.display = '';
b.innerHTML='hide';
}
return false;
}
</script>
</div>
 }
}

proc wapp-default {} {
 # When running using the built-in webserver in Wapp (in other words,
 # when not running as CGI) any filename that contains a "." loads
 # directly from the filesystem.
 if {[wapp-param WAPP_MODE]!="cgi"]
  && [string match *.* [wapp-param PATH_INFO]]
 } {
  set altfile [file dir [wapp-param SCRIPT_FILENAME]]/../[wapp-param PATH_INFO]
  set fd [open $altfile rb]
  fconfigure $fd -translation binary
  wapp-unsafe [read $fd]
  close $fd
  switch -glob -- $altfile {
    *.html {
      wapp-mimetype text/html
    }
    *.css {
      wapp-mimetype text/css
    }
    *.gif {
      wapp-mimetype image/gif
    }
  }
  return
 }
 wapp-page-admin
}
proc wapp-page-admin {} {
 wapp-allow-xorigin-params
 wapp-content-security-policy off
  if {[wapp-param-exists env]} {
   search_header
```

```
  wapp-trim {
    <h1>Environment</h1>
    <pre>%html([wapp-debug-env])</pre>
  }
  return
}
sqlite3 db2 [file dir [wapp-param SCRIPT_FILENAME]]/searchlog.db
set where ""
set res ""

set ipfilter ""
set ipaddr [wapp-param ip]
if {$ipaddr!=""} {
  set where {WHERE ip = $ipaddr}
  set ipfilter $ipaddr
}

set checked ""
set isUnique [expr {[wapp-param unique 0]+0}]
if {$isUnique} {
  set checked "checked"
}

set limit [wapp-param limit 10]
set s10 ""
set s100 ""
set s1000 ""
if {$limit==10} {set s10 selected}
if {$limit==100} {set s100 selected}
if {$limit==1000} {set s1000 selected}

search_header
set self [wapp-param PATH_HEAD]
wapp-trim {
  <div style="margin:2em">
  <center>
  <form action='%url($self)' method='GET'>
    Results: <select name=limit onChange="this.form.submit()">
      <option %html($s10) value="10">10</option>
      <option %html($s100) value="100">100</option>
       <option %html($s1000) value="1000">1000</option>
    </select>
    IP: <input type=input name=ip value="%html($ipfilter)">
    Unique: <input
      type=checkbox name=unique value=1
      $checked
      onChange="this.form.submit()">
    <input type=submit>
```

```
  </form>
  </center>
  </div>
  <table border=1 cellpadding=10 align=center>
  <tr><td><th>IP <th>Query <th> Results <th> Timestamp
}

set i 0
db2 eval "
  SELECT rowid, ip, query, nres, timestamp FROM log $where
  ORDER BY rowid DESC
" {

  if {$isUnique} {
    if {[info exists seen($query)]} continue
    set seen($query) 1
  }

  wapp-trim {
    <tr><td>%html($rowid)
        <td><a href='%url($self)?ip=%qp($ip)'>%html($ip)</a>
        <td><a href='../search?q=%qp($query)&donotlog=1'>%html($query)</a>
        <td>%html($nres)<td>%html($timestamp)
  }
  incr i
  if {$i >= $limit} break
}
wapp-subst {</table\n}
db2 close
}
wapp-start $argv

Found
 in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/search.d/admin
No license file was found, but licenses were detected in source scan.

<html>
<title>SQLite Copyright Release Template</title>
<body bgcolor="white">
<h1 align="center">
Copyright Release for<br>
Contributions To SQLite
</h1>

<p>
SQLite is software that implements an embeddable SQL database engine.
SQLite is available for free download from http://www.sqlite.org/.
```

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<table width="100%" cellpadding="0" cellspacing="0">
<tr>
<td width="60%" valign="top">
Signature:

</td><td valign="top" align="left">
Date:
</td></tr>
<td colspan=2>

Name
(printed):
</td>
</tr>
</table>
</body>
</html>

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/copyright-release.html
No license file was found, but licenses were detected in source scan.

application code is free to use these routines as well, if desired.

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/34to35.html
No license file was found, but licenses were detected in source scan.

application is free to use the same database connection or the

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/capi3ref.html
No license file was found, but licenses were detected in source scan.

SQLite is open source, and is available in the public domain

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/books.html
No license file was found, but licenses were detected in source scan.

application is free to use the same database connection or the

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/c3ref/c_config_covering_index_scan.html
No license file was found, but licenses were detected in source scan.

data, so do not send the ".fullschema" output of a proprietary database

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/cli.html
No license file was found, but licenses were detected in source scan.

<p>SQLite itself is in the public domain and
can be used for any purpose. But TH3 is proprietary and requires a license.

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/th3.html

No license file was found, but licenses were detected in source scan.

Sources are in the public domain.
or some proprietary format into

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/features.html
No license file was found, but licenses were detected in source scan.

```
#!/usr/bin/tclsh.docsrc
#### Import of wapp.tcl
# Copyright (c) 2017 D. Richard Hipp
#
# This program is free software; you can redistribute it and/or
# modify it under the terms of the Simplified BSD License (also
# known as the "2-Clause License" or "FreeBSD License".)
#
# This program is distributed in the hope that it will be useful,
# but without any warranty; without even the implied warranty of
# merchantability or fitness for a particular purpose.
#
#-------------------------------------------------------------------------
#
# Design rules:
#
#   (1)  All identifiers in the global namespace begin with "wapp"
#
#   (2)  Indentifiers intended for internal use only begin with "wappInt"
#

# Add text to the end of the HTTP reply.  No interpretation or transformation
# of the text is performs.  The argument should be enclosed within {...}
#
proc wapp {txt} {
 global wapp
 dict append wapp .reply $txt
}

# Add
 text to the page under construction.  Do no escaping on the text.
#
# Though "unsafe" in general, there are uses for this kind of thing.
# For example, if you want to return the complete, unmodified content of
# a file:
#
#       set fd [open content.html rb]
#       wapp-unsafe [read $fd]
#       close $fd
```

```
#
# You could do the same thing using ordinary "wapp" instead of "wapp-unsafe".
# The difference is that wapp-safety-check will complain about the misuse
# of "wapp", but it assumes that the person who write "wapp-unsafe" understands
# the risks.
#
# Though occasionally necessary, the use of this interface should be minimized.
#
proc wapp-unsafe {txt} {
 global wapp
 dict append wapp .reply $txt
}

# Add text to the end of the reply under construction.  The following
# substitutions are made:
#
#     %html(...)         Escape text for inclusion in HTML
#     %url(...)          Escape text for use as a URL
#     %qp(...)           Escape text for use as a URI query parameter
#
     %string(...)       Escape text for use within a JSON string
#     %unsafe(...)       No transformations of the text
#
# The substitutions above terminate at the first ")" character.  If the
# text of the TCL string in ... contains ")" characters itself, use instead:
#
#     %html%(...)%
#     %url%(...)%
#     %qp%(...)%
#     %string%(...)%
#     %unsafe%(...)%
#
# In other words, use "%(...)%" instead of "(...)" to include the TCL string
# to substitute.
#
# The %unsafe substitution should be avoided whenever possible, obviously.
# In addition to the substitutions above, the text also does backslash
# escapes.
#
proc wapp-subst {txt} {
 global wapp
 regsub -all {%(html|url|qp|string|unsafe){1,1}?(|%)\((.+)\)\2} $txt \
       {[wappInt-enc-\1 "\3"]} txt
 dict append wapp .reply [uplevel 1 [list subst -novariables $txt]]
}

# Works like wapp-subst, but also removes whitespace from the beginning
# of lines.
```

```
#
proc wapp-trim {txt} {
 global wapp
 regsub -all {\n\s+} [string
 trim $txt] \n txt
 regsub -all {%(html|url|qp|string|unsafe){1,1}?(|%)\((.+)\)\2} $txt \
       {[wappInt-enc-\1 "\3"]} txt
 dict append wapp .reply [uplevel 1 [list subst -novariables $txt]]
}

# There must be a wappInt-enc-NAME routine for each possible substitution
# in wapp-subst.  Thus there are routines for "html", "url", "qp", and "unsafe".
#
#    wappInt-enc-html          Escape text so that it is safe to use in the
#                              body of an HTML document.
#
#    wappInt-enc-url           Escape text so that it is safe to pass as an
#                              argument to href= and src= attributes in HTML.
#
#    wappInt-enc-qp            Escape text so that it is safe to use as the
#                              value of a query parameter in a URL or in
#                              post data or in a cookie.
#
#    wappInt-enc-string        Escape ", ', \, and < for using inside of a
#                              javascript string literal.
  The < character
#                              is escaped to prevent "</script>" from causing
#                              problems in embedded javascript.
#
#    wappInt-enc-unsafe        Perform no encoding at all.  Unsafe.
#
proc wappInt-enc-html {txt} {
 return [string map {& &amp; < &lt; > &gt; \" &quot; \\ &#92;} $txt]
}
proc wappInt-enc-unsafe {txt} {
 return $txt
}
proc wappInt-enc-url {s} {
 if {[regsub -all {[^-{}@~?=#_.:/a-zA-Z0-9]} $s {[wappInt-%HHchar {&}]} s]} {
   set s [subst -novar -noback $s]
 }
 if {[regsub -all {[{}]} $s {[wappInt-%HHchar \\&]} s]} {
   set s [subst -novar -noback $s]
 }
 return $s
}
proc wappInt-enc-qp {s} {
 if {[regsub -all {[^-{}_.a-zA-Z0-9]} $s {[wappInt-%HHchar {&}]} s]} {
```

```
  set s [subst -novar -noback $s]
 }
 if {[regsub -all {[{}]} $s {[wappInt-%HHchar \\&]} s]} {
  set s [subst -novar -noback $s]
 }
 return $s
}
proc wappInt-enc-string {s} {
 return [string map {\\ \\\\ \" \\\" ' \\' < \\u003c} $s]
}

# This is a
 helper routine for wappInt-enc-url and wappInt-enc-qp.  It returns
# an appropriate %HH encoding for the single character c.  If c is a unicode
# character, then this routine might return multiple bytes:  %HH%HH%HH
#
proc wappInt-%HHchar {c} {
 if {$c==" "} {return +}
 return [regsub -all .. [binary encode hex [encoding convertto utf-8 $c]] {%&}]
}



# Undo the www-url-encoded format.
#
# HT: This code stolen from ncgi.tcl
#
proc wappInt-decode-url {str} {
 set str [string map [list + { } "\\" "\\\\" \[ \\\[ \] \\\]] $str]
 regsub -all -- \
    {%([Ee][A-Fa-f0-9])%([89ABab][A-Fa-f0-9])%([89ABab][A-Fa-f0-9])} \
    $str {[encoding convertfrom utf-8 [binary decode hex \1\2\3]]} str
 regsub -all -- \
    {%([CDcd][A-Fa-f0-9])%([89ABab][A-Fa-f0-9])}                    \
    $str {[encoding convertfrom utf-8 [binary decode hex \1\2]]} str
 regsub -all -- {%([0-7][A-Fa-f0-9])} $str {\\u00\1} str
 return [subst -novar $str]
}

# Reset the document back to an empty string.
#
proc
 wapp-reset {} {
 global wapp
 dict set wapp .reply {}
}

# Change the mime-type of the result document.
#
```

```
proc wapp-mimetype {x} {
 global wapp
 dict set wapp .mimetype $x
}

# Change the reply code.
#
proc wapp-reply-code {x} {
 global wapp
 dict set wapp .reply-code $x
}

# Set a cookie
#
proc wapp-set-cookie {name value} {
 global wapp
 dict lappend wapp .new-cookies $name $value
}

# Unset a cookie
#
proc wapp-clear-cookie {name} {
 wapp-set-cookie $name {}
}

# Add extra entries to the reply header
#
proc wapp-reply-extra {name value} {
 global wapp
 dict lappend wapp .reply-extra $name $value
}

# Specifies how the web-page under construction should be cached.
# The argument should be one of:
#
#    no-cache
#    max-age=N            (for some integer number of seconds, N)
#    private,max-age=N
#
proc wapp-cache-control {x} {
 wapp-reply-extra Cache-Control $x
}

# Redirect to a different web page
#
proc wapp-redirect {uri} {
 wapp-reply-code {307 Redirect}
 wapp-reply-extra
```

```
 Location $uri
}

# Return the value of a wapp parameter
#
proc wapp-param {name {dflt {}}} {
 global wapp
 if {![dict exists $wapp $name]} {return $dflt}
 return [dict get $wapp $name]
}

# Return true if a and only if the wapp parameter $name exists
#
proc wapp-param-exists {name} {
 global wapp
 return [dict exists $wapp $name]
}

# Set the value of a wapp parameter
#
proc wapp-set-param {name value} {
 global wapp
 dict set wapp $name $value
}

# Return all parameter names that match the GLOB pattern, or all
# names if the GLOB pattern is omitted.
#
proc wapp-param-list {{glob {*}}} {
 global wapp
 return [dict keys $wapp $glob]
}

# By default, Wapp does not decode query parameters and POST parameters
# for cross-origin requests.  This is a security restriction, designed to
# help prevent cross-site request forgery (CSRF) attacks.
#
# As a consequence of this restriction, URLs for sites generated by Wapp
# that contain query parameters will not work as URLs
 found in other
# websites.  You cannot create a link from a second website into a Wapp
# website if the link contains query planner, by default.
#
# Of course, it is sometimes desirable to allow query parameters on external
# links.  For URLs for which this is safe, the application should invoke
# wapp-allow-xorigin-params.  This procedure tells Wapp that it is safe to
# go ahead and decode the query parameters even for cross-site requests.
#
```

```
# In other words, for Wapp security is the default setting.  Individual pages
# need to actively disable the cross-site request security if those pages
# are safe for cross-site access.
#
proc wapp-allow-xorigin-params {} {
 global wapp
 if {![dict exists $wapp .qp] && ![dict get $wapp SAME_ORIGIN]} {
   wappInt-decode-query-params
 }
}

# Set the content-security-policy.
#
# The default content-security-policy is very strict:  "default-src 'self'"
# The default policy prohibits the use of in-line javascript or CSS.
#
# Provide an alternative
 CSP as the argument.  Or use "off" to disable
# the CSP completely.
#
proc wapp-content-security-policy {val} {
 global wapp
 if {$val=="off"} {
   dict unset wapp .csp
 } else {
   dict set wapp .csp $val
 }
}

# Examine the bodys of all procedures in this program looking for
# unsafe calls to various Wapp interfaces.  Return a text string
# containing warnings. Return an empty string if all is ok.
#
# This routine is advisory only.  It misses some constructs that are
# dangerous and flags others that are safe.
#
proc wapp-safety-check {} {
 set res {}
 foreach p [info procs] {
   set ln 0
   foreach x [split [info body $p] \n] {
     incr ln
     if {[regexp {^[ \t]*wapp[ \t]+([^\n]+)} $x all tail]
      && [string index $tail 0]!="\173"
      && [regexp {[[$]} $tail]
     } {
       append res "$p:$ln: unsafe \"wapp\" call: \"[string trim $x]\"\n"
     }
```

```
    if {[regexp {^[ \t]*wapp-(subst|trim)[ \t]+[^\173]} $x all cx]} {
      append res "$p:$ln: unsafe \"wapp-$cx\"
 call: \"[string trim $x]\"\n"
    }
  }
 }
 return $res
}

# Return a string that descripts the current environment.  Applications
# might find this useful for debugging.
#
proc wapp-debug-env {} {
 global wapp
 set out {}
 foreach var [lsort [dict keys $wapp]] {
  if {[string index $var 0]=="."} continue
  append out "$var = [list [dict get $wapp $var]]\n"
 }
 append out "\[pwd\] = [list [pwd]]\n"
 return $out
}

# Tracing function for each HTTP request.  This is overridden by wapp-start
# if tracing is enabled.
#
proc wappInt-trace {} {}

# Start up a listening socket.  Arrange to invoke wappInt-new-connection
# for each inbound HTTP connection.
#
#    port           Listen on this TCP port.  0 means to select a port
#                   that is not currently in use
#
#    wappmode       One of "scgi", "server", or "local".
#
proc wappInt-start-listener {port wappmode} {
 if {$wappmode=="scgi"} {
  set type SCGI
  set server [list wappInt-new-connection
 wappInt-scgi-readable $wappmode]
 } else {
  set type HTTP
  set server [list wappInt-new-connection wappInt-http-readable $wappmode]
 }
 if {$wappmode=="local"} {
  set x [socket -server $server -myaddr 127.0.0.1 $port]
 } else {
```

```
  set x [socket -server $server $port]
 }
 set coninfo [chan configure $x -sockname]
 set port [lindex $coninfo 2]
 if {$wappmode=="local"} {
  wappInt-start-browser http://127.0.0.1:$port/
 } else {
  puts "Listening for $type requests on TCP port $port"
 }
}

# Start a web-browser and point it at $URL
#
proc wappInt-start-browser {url} {
 global tcl_platform
 if {$tcl_platform(platform)=="windows"} {
  exec cmd /c start $url &
 } elseif {$tcl_platform(os)=="Darwin"} {
  exec open $url &
 } elseif {[catch {exec xdg-open $url}]} {
  exec firefox $url &
 }
}

# This routine is a "socket -server" callback.  The $chan, $ip, and $port
# arguments are added by the socket command.
#
# Arrange to invoke $callback when content is available
 on the new socket.
# The $callback will process inbound HTTP or SCGI content.
#
proc wappInt-new-connection {callback wappmode chan ip port} {
 upvar #0 wappInt-$chan W
 set W [dict create REMOTE_ADDR $ip REMOTE_PORT $port WAPP_MODE $wappmode \
       .header {}]
 fconfigure $chan -blocking 0 -translation binary
 fileevent $chan readable [list $callback $chan]
}

# Close an input channel
#
proc wappInt-close-channel {chan} {
 if {$chan=="stdout"} {
  # This happens after completing a CGI request
  exit 0
 } else {
  unset ::wappInt-$chan
  close $chan
```

```
 }
}

# Process new text received on an inbound HTTP request
#
proc wappInt-http-readable {chan} {
 if {[catch [list wappInt-http-readable-unsafe $chan] msg]} {
   puts stderr "$msg\n$::errorInfo"
   wappInt-close-channel $chan
 }
}
proc wappInt-http-readable-unsafe {chan} {
 upvar #0 wappInt-$chan W wapp wapp
 if {![dict exists $W .toread]} {
   # If the .toread key is not set, that means we are still reading
    # the header
   set line [string trimright [gets $chan]]
   set n [string length $line]
   if {$n>0} {
     if {[dict get $W .header]=="" || [regexp {^\s+} $line]} {
       dict append W .header $line
     } else {
       dict append W .header \n$line
     }
     if {[string length [dict get $W .header]]>100000} {
       error "HTTP request header too big - possible DOS attack"
     }
   } elseif {$n==0} {
     # We have reached the blank line that terminates the header.
     global argv0
     set a0 [file normalize $argv0]
     dict set W SCRIPT_FILENAME $a0
     dict set W DOCUMENT_ROOT [file dir $a0]
     if {[wappInt-parse-header $chan]} {
       catch {close $chan}
       return
     }
     set len 0
     if {[dict exists $W CONTENT_LENGTH]} {
       set len [dict get $W CONTENT_LENGTH]
     }
     if {$len>0} {
       # Still need to read the query content
       dict set W .toread $len
     } else {
       # There is no query content, so handle
 the request immediately
       set wapp $W
```

```
      wappInt-handle-request $chan 0
    }
  }
 } else {
  # If .toread is set, that means we are reading the query content.
  # Continue reading until .toread reaches zero.
  set got [read $chan [dict get $W .toread]]
  dict append W CONTENT $got
  dict set W .toread [expr {[dict get $W .toread]-[string length $got]}]
  if {[dict get $W .toread]<=0} {
    # Handle the request as soon as all the query content is received
    set wapp $W
    wappInt-handle-request $chan 0
  }
 }
}

# Decode the HTTP request header.
#
# This routine is always running inside of a [catch], so if
# any problems arise, simply raise an error.
#
proc wappInt-parse-header {chan} {
 upvar #0 wappInt-$chan W
 set hdr [split [dict get $W .header] \n]
 if {$hdr==""} {return 1}
 set req [lindex $hdr 0]
 dict set W REQUEST_METHOD [set method [lindex $req 0]]
 if {[lsearch {GET HEAD POST} $method]<0} {
  error "unsupported request method:
 \"[dict get $W REQUEST_METHOD]\""
 }
 set uri [lindex $req 1]
 set split_uri [split $uri ?]
 set uri0 [lindex $split_uri 0]
 if {![regexp {^/[-.a-z0-9_/]*$} $uri0]} {
  error "invalid request uri: \"$uri0\""
 }
 dict set W REQUEST_URI $uri0
 dict set W PATH_INFO $uri0
 set uri1 [lindex $split_uri 1]
 dict set W QUERY_STRING $uri1
 set n [llength $hdr]
 for {set i 1} {$i<$n} {incr i} {
  set x [lindex $hdr $i]
  if {![regexp {^(.+): +(.*)$} $x all name value]} {
    error "invalid header line: \"$x\""
  }
```

```
  set name [string toupper $name]
  switch -- $name {
    REFERER {set name HTTP_REFERER}
    USER-AGENT {set name HTTP_USER_AGENT}
    CONTENT-LENGTH {set name CONTENT_LENGTH}
    CONTENT-TYPE {set name CONTENT_TYPE}
    HOST {set name HTTP_HOST}
    COOKIE {set name HTTP_COOKIE}
    ACCEPT-ENCODING {set name HTTP_ACCEPT_ENCODING}
    default {set name .hdr:$name}
  }
  dict set W $name $value
 }
 return 0
}

# Decode the QUERY_STRING
 parameters from a GET request or the
# application/x-www-form-urlencoded CONTENT from a POST request.
#
# This routine sets the ".qp" element of the ::wapp dict as a signal
# that query parameters have already been decoded.
#
proc wappInt-decode-query-params {} {
 global wapp
 dict set wapp .qp 1
 if {[dict exists $wapp QUERY_STRING]} {
  foreach qterm [split [dict get $wapp QUERY_STRING] &] {
    set qsplit [split $qterm =]
    set nm [lindex $qsplit 0]
    if {[regexp {^[a-z][a-z0-9]*$} $nm]} {
      dict set wapp $nm [wappInt-decode-url [lindex $qsplit 1]]
    }
  }
 }
 if {[dict exists $wapp CONTENT_TYPE] && [dict exists $wapp CONTENT]} {
  set ctype [dict get $wapp CONTENT_TYPE]
  if {$ctype=="application/x-www-form-urlencoded"} {
    foreach qterm [split [string trim [dict get $wapp CONTENT]] &] {
      set qsplit [split $qterm =]
      set nm [lindex $qsplit 0]
      if {[regexp {^[a-z][-a-z0-9_]*$} $nm]} {
        dict set wapp $nm [wappInt-decode-url
[lindex $qsplit 1]]
      }
    }
  } elseif {[string match multipart/form-data* $ctype]} {
    regexp {^(.*?)\r\n(.*)$} [dict get $wapp CONTENT] all divider body
```

```
    set ndiv [string length $divider]
    while {[string length $body]} {
      set idx [string first $divider $body]
      set unit [string range $body 0 [expr {$idx-3}]]
      set body [string range $body [expr {$idx+$ndiv+2}] end]
      if {[regexp {^Content-Disposition: form-data; (.*?)\r\n\r\n(.*)$} \
          $unit unit hdr content] &&
         [regexp {name="(.*)"; filename="(.*)"\r\nContent-Type: (.*?)$}\
           $hdr hr name filename mimetype]} {
        dict set wapp $name.filename \
         [string map [list \\\" \" \\\\ \\] $filename]
        dict set wapp $name.mimetype $mimetype
        dict set wapp $name.content $content
      }
    }
  }
 }
}

# Invoke application-supplied methods to generate a reply to
# a single HTTP request.
#
# This routine always
 runs within [catch], so handle exceptions by
# invoking [error].
#
proc wappInt-handle-request {chan useCgi} {
 global wapp
 dict set wapp .reply {}
 dict set wapp .mimetype {text/html; charset=utf-8}
 dict set wapp .reply-code {200 Ok}
 dict set wapp .csp {default-src 'self'}

 # Set up additional CGI environment values
 #
 if {![dict exists $wapp HTTP_HOST]} {
  dict set wapp BASE_URL {}
 } elseif {[dict exists $wapp HTTPS]} {
  dict set wapp BASE_URL https://[dict get $wapp HTTP_HOST]
 } else {
  dict set wapp BASE_URL http://[dict get $wapp HTTP_HOST]
 }
 if {![dict exists $wapp REQUEST_URI]} {
  dict set wapp REQUEST_URI /
 } elseif {[regsub {\?.*} [dict get $wapp REQUEST_URI] {} newR]} {
  # Some servers (ex: nginx) append the query parameters to REQUEST_URI.
  # These need to be stripped off
  dict set wapp REQUEST_URI $newR
```

```
}
if {[dict exists $wapp SCRIPT_NAME]} {
  dict append wapp BASE_URL [dict get $wapp SCRIPT_NAME]
} else {
  dict set wapp
SCRIPT_NAME {}
}
if {![dict exists $wapp PATH_INFO]} {
  # If PATH_INFO is missing (ex: nginx) the construct it
  set URI [dict get $wapp REQUEST_URI]
  set skip [string length [dict get $wapp SCRIPT_NAME]]
  dict set wapp PATH_INFO [string range $URI $skip end]
}
if {[regexp {^/([^/]+)(.*)$} [dict get $wapp PATH_INFO] all head tail]} {
  dict set wapp PATH_HEAD $head
  dict set wapp PATH_TAIL [string trimleft $tail /]
} else {
  dict set wapp PATH_INFO {}
  dict set wapp PATH_HEAD {}
  dict set wapp PATH_TAIL {}
}
dict set wapp SELF_URL [dict get $wapp BASE_URL]/[dict get $wapp PATH_HEAD]

# Parse query parameters from the query string, the cookies, and
# POST data
#
if {[dict exists $wapp HTTP_COOKIE]} {
  foreach qterm [split [dict get $wapp HTTP_COOKIE] {;}] {
    set qsplit [split [string trim $qterm] =]
    set nm [lindex $qsplit 0]
    if {[regexp {^[a-z][-a-z0-9_]*$} $nm]} {
      dict set wapp $nm [wappInt-decode-url [lindex
$qsplit 1]]
    }
  }
}
set same_origin 0
if {[dict exists $wapp HTTP_REFERER]} {
  set referer [dict get $wapp HTTP_REFERER]
  set base [dict get $wapp BASE_URL]
  if {$referer==$base || [string match $base/* $referer]} {
    set same_origin 1
  }
}
dict set wapp SAME_ORIGIN $same_origin
if {$same_origin} {
  wappInt-decode-query-params
}
```

```
# Invoke the application-defined handler procedure for this page
# request.  If an error occurs while running that procedure, generate
# an HTTP reply that contains the error message.
#
wapp-before-dispatch-hook
wappInt-trace
set mname [dict get $wapp PATH_HEAD]
if {[catch {
  if {$mname!="" && [llength [info proc wapp-page-$mname]]>0} {
    wapp-page-$mname
  } else {
    wapp-default
  }
} msg]} {
  if {[wapp-param WAPP_MODE]=="local" || [wapp-param WAPP_MODE]=="server"} {
    puts "ERROR: $::errorInfo"
  }
  wapp-reset
  wapp-reply-code "500 Internal Server Error"
  wapp-mimetype
text/html
  wapp-trim {
    <h1>Wapp Application Error</h1>
    <pre>%html($::errorInfo)</pre>
  }
  dict unset wapp .new-cookies
}

# Transmit the HTTP reply
#
if {$chan=="stdout"} {
  puts $chan "Status: [dict get $wapp .reply-code]\r"
} else {
  puts $chan "HTTP/1.1 [dict get $wapp .reply-code]\r"
  puts $chan "Server: wapp\r"
  puts $chan "Connection: close\r"
}
if {[dict exists $wapp .reply-extra]} {
  foreach {name value} [dict get $wapp .reply-extra] {
    puts $chan "$name: $value\r"
  }
}
if {[dict exists $wapp .csp]} {
  puts $chan "Content-Security-Policy: [dict get $wapp .csp]\r"
}
set mimetype [dict get $wapp .mimetype]
puts $chan "Content-Type: $mimetype\r"
```

```
 if {[dict exists $wapp .new-cookies]} {
   foreach {nm val} [dict get $wapp .new-cookies] {
     if {[regexp {^[a-z][-a-z0-9_]*$} $nm]} {
       if {$val==""} {
         puts $chan "Set-Cookie: $nm=; HttpOnly; Path=/; Max-Age=1\r"
       } else {
         set
 val [wappInt-enc-url $val]
         puts $chan "Set-Cookie: $nm=$val; HttpOnly; Path=/\r"
       }
     }
   }
 }
 if {[string match text/* $mimetype]} {
   set reply [encoding convertto utf-8 [dict get $wapp .reply]]
   if {[regexp {\ygzip\y} [wapp-param HTTP_ACCEPT_ENCODING]]} {
     catch {
       set x [zlib gzip $reply]
       set reply $x
       puts $chan "Content-Encoding: gzip\r"
     }
   }
 } else {
   set reply [dict get $wapp .reply]
 }
 puts $chan "Content-Length: [string length $reply]\r"
 puts $chan \r
 puts $chan $reply
 flush $chan
 wappInt-close-channel $chan
}

# This routine runs just prior to request-handler dispatch.  The
# default implementation is a no-op, but applications can override
# to do additional transformations or checks.
#
proc wapp-before-dispatch-hook {} {return}

# Process a single CGI request
#
proc wappInt-handle-cgi-request {} {
 global wapp env
 foreach key {
   CONTENT_LENGTH
   CONTENT_TYPE
   DOCUMENT_ROOT
   HTTP_ACCEPT_ENCODING
```

```
   HTTP_COOKIE
  HTTP_HOST
  HTTP_REFERER
  HTTP_USER_AGENT
  HTTPS
  PATH_INFO
  QUERY_STRING
  REMOTE_ADDR
  REQUEST_METHOD
  REQUEST_URI
  REMOTE_USER
  SCRIPT_FILENAME
  SCRIPT_NAME
  SERVER_NAME
  SERVER_PORT
  SERVER_PROTOCOL
 } {
  if {[info exists env($key)]} {
    dict set wapp $key $env($key)
  }
 }
 set len 0
 if {[dict exists $wapp CONTENT_LENGTH]} {
  set len [dict get $wapp CONTENT_LENGTH]
 }
 if {$len>0} {
  fconfigure stdin -translation binary
  dict set wapp CONTENT [read stdin $len]
 }
 dict set wapp WAPP_MODE cgi
 fconfigure stdout -translation binary
 wappInt-handle-request stdout 1
}

# Process new text received on an inbound SCGI request
#
proc wappInt-scgi-readable {chan} {
 if {[catch [list wappInt-scgi-readable-unsafe $chan] msg]} {
  puts stderr "$msg\n$::errorInfo"
  wappInt-close-channel $chan
 }
}
proc wappInt-scgi-readable-unsafe {chan} {
 upvar #0 wappInt-$chan W wapp wapp
 if
 {![dict exists $W .toread]} {
  # If the .toread key is not set, that means we are still reading
  # the header.
```

```
  #
  # An SGI header is short.  This implementation assumes the entire
  # header is available all at once.
  #
  set req [read $chan 15]
  set n [string length $req]
  scan $req %d:%s len hdr
  incr len [string length "$len:,"]
  append hdr [read $chan [expr {$len-15}]]
  foreach {nm val} [split $hdr \000] {
    if {$nm==""} break
    dict set W $nm $val
  }
  set len 0
  if {[dict exists $W CONTENT_LENGTH]} {
    set len [dict get $W CONTENT_LENGTH]
  }
  if {$len>0} {
    # Still need to read the query content
    dict set W .toread $len
  } else {
    # There is no query content, so handle the request immediately
    set wapp $W
    wappInt-handle-request $chan 0
  }
 } else {
  # If .toread is set, that means we are reading the query content.
  # Continue reading until .toread reaches zero.
  set got [read
 $chan [dict get $W .toread]]
  dict append W CONTENT $got
  dict set W .toread [expr {[dict get $W .toread]-[string length $got]}]
  if {[dict get $W .toread]<=0} {
    # Handle the request as soon as all the query content is received
    set wapp $W
    wappInt-handle-request $chan 0
  }
 }
}

# Start up the wapp framework.  Parameters are a list passed as the
# single argument.
#
#    -server $PORT         Listen for HTTP requests on this TCP port $PORT
#
#    -local $PORT          Listen for HTTP requests on 127.0.0.1:$PORT
#
#    -scgi $PORT           Listen for SCGI requests on TCP port $PORT
```

```
#
#    -cgi                Handle a single CGI request
#
# With no arguments, the behavior is called "auto".  In "auto" mode,
# if the GATEWAY_INTERFACE environment variable indicates CGI, then run
# as CGI.  Otherwise, start an HTTP server bound to the loopback address
# only, on an arbitrary TCP port, and automatically launch a web browser
# on that TCP port.
#
# Additional
 options:
#
#    -trace              "puts" each request URL as it is handled, for
#                        debugging
#
#    -lint               Run wapp-safety-check on the application instead
#                        of running the application itself
#
#    -Dvar=value         Set TCL global variable "var" to "value"
#
#
proc wapp-start {arglist} {
 global env
 set mode auto
 set port 0
 set n [llength $arglist]
 for {set i 0} {$i<$n} {incr i} {
  set term [lindex $arglist $i]
  if {[string match --* $term]} {set term [string range $term 1 end]}
  switch -glob -- $term {
    -server {
      incr i;
      set mode "server"
      set port [lindex $arglist $i]
    }
    -local {
      incr i;
      set mode "local"
      set port [lindex $arglist $i]
    }
    -scgi {
      incr i;
      set mode "scgi"
      set port [lindex $arglist $i]
    }
    -cgi {
      set mode "cgi"
    }
```

```
    -trace {
      proc wappInt-trace {} {

    set q [wapp-param QUERY_STRING]
        set uri [wapp-param BASE_URL][wapp-param PATH_INFO]
        if {$q!=""} {append uri ?$q}
        puts $uri
      }
    }
    -lint {
      set res [wapp-safety-check]
      if {$res!=""} {
        puts "Potential problems in this code:"
        puts $res
        exit 1
      } else {
        exit
      }
    }
    -D*=* {
      if {[regexp {^.D([^=]+)=(.*)$} $term all var val]} {
        set ::$var $val
      }
    }
    default {
      error "unknown option: $term"
    }
  }
}
if {($mode=="auto"
     && [info exists env(GATEWAY_INTERFACE)]
     && [string match CGI/1.* $env(GATEWAY_INTERFACE)])
  || $mode=="cgi"
} {
  wappInt-handle-cgi-request
  return
}
if {$mode=="scgi"} {
  wappInt-start-listener $port scgi
} elseif {$mode=="server"} {
  wappInt-start-listener $port server
} else {
  wappInt-start-listener $port local
}
vwait ::forever
}

# Call this version
```

```
 1.0
package provide wapp 1.0

#### End of wapp.tcl

# Generate all header content for the output document
#
proc search_header {} {
 wapp-trim {
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01//EN" "http://www.w3.org/TR/html4/strict.dtd">
<html><head>
<meta name="viewport" content="width=device-width, initial-scale=1.0">
<meta http-equiv="content-type" content="text/html; charset=UTF-8">
<link href="sqlite.css" rel="stylesheet">
<title>Search SQLite Documentation</title>
<!-- path= -->
</head>
<body>
<div class=nosearch>
<a href="index.html">
<img class="logo" src="images/sqlite370_banner.gif" alt="SQLite" border="0">
</a>
<div><!-- IE hack to prevent disappearing logo --></div>
<div class="tagline desktoponly">
Small. Fast. Reliable.<br>Choose any three.
</div>
<div class="menu mainmenu">
<ul>
<li><a href="index.html">Home</a>
<li class='mobileonly'><a href="javascript:void(0)" onclick='toggle_div("submenu")'>Menu</a>
<li class='wideonly'><a href='about.html'>About</a>
<li class='desktoponly'><a
 href="docs.html">Documentation</a>
<li class='desktoponly'><a href="download.html">Download</a>
<li class='wideonly'><a href='copyright.html'>License</a>
<li class='desktoponly'><a href="support.html">Support</a>
<li class='desktoponly'><a href="prosupport.html">Purchase</a>
<li class='search' id='search_menubutton'>
<a href="javascript:void(0)" onclick='toggle_search()'>Search</a>
</ul>
</div>
<div class="menu submenu" id="submenu">
<ul>
<li><a href='about.html'>About</a>
<li><a href='docs.html'>Documentation</a>
<li><a href='download.html'>Download</a>
<li><a href='support.html'>Support</a>
<li><a href='prosupport.html'>Purchase</a>
```

```
</ul>
</div>
<div class="searchmenu" id="searchmenu">
<form method="GET" action="search">
<select name="s" id="searchtype">
<option value="d">Search Documentation</option>
<option value="c">Search Changelog</option>
</select>
<input type="text" name="q" id="searchbox" value="">
<input type="submit" value="Go">
</form>
</div>
</div>
<script>
function
 toggle_div(nm) {
var w = document.getElementById(nm);
if( w.style.display=="block" ){
w.style.display = "none";
}else{
w.style.display = "block";
}
}
function toggle_search() {
var w = document.getElementById("searchmenu");
if( w.style.display=="block" ){
w.style.display = "none";
} else {
w.style.display = "block";
setTimeout(function(){
document.getElementById("searchbox").focus()
}, 30);
}
}
function div_off(nm){document.getElementById(nm).style.display="none";}
window.onbeforeunload = function(e){div_off("submenu");}
/* Disable the Search feature if we are not operating from CGI, since */
/* Search is accomplished using CGI and will not work without it. */
if( !location.origin.match || !location.origin.match(/http/) ){
document.getElementById("search_menubutton").style.display = "none";
}
/* Used by the Hide/Show button beside syntax diagrams, to toggle the */
function hideorshow(btn,obj){
var x = document.getElementById(obj);
var b = document.getElementById(btn);
if( x.style.display!='none'
 ){
x.style.display = 'none';
```

```
b.innerHTML='show';
}else{
x.style.display = '';
b.innerHTML='hide';
}
return false;
}
</script>
</div>
 }
}

#--------------------------------------------------------------------------
# Add an entry to the log database for the current query. Which
# returns $nRes results.
#
proc search_add_log_entry {nRes} {
 if {[wapp-param-exists donotlog]} return
 sqlite3 db2 [file dir [wapp-param SCRIPT_FILENAME]]/search.d/searchlog.db
 db2 timeout 10000
 set ip [wapp-param REMOTE_ADDR]
 set query [wapp-param q]
 db2 eval {
   PRAGMA synchronous=OFF;
   PRAGMA journal_mode=OFF;
   BEGIN;
     CREATE TABLE IF NOT EXISTS log(
       ip,                -- IP query was made from
       query,               -- Fts5 query string
       nres,               -- Number of results
       timestamp DEFAULT CURRENT_TIMESTAMP
     );
     INSERT INTO log(ip, query, nres) VALUES($ip, $query, $nRes);
   COMMIT;
 }
 db2 close
}

#--------------------------------------------------------------------------
#
 This command is similar to the builtin Tcl [time] command, except that
# it only ever runs the supplied script once. Also, instead of returning
# a string like "xxx microseconds per iteration", it returns "x.yy ms" or
# "x.yy s", depending on the magnitude of the time spent running the
# command. For example:
#
#   % ttime {after 1500}
#   1.50 s
```

```
#   % ttime {after 45}
#   45.02 ms
#
proc ttime {script} {
 set t [lindex [time [list uplevel $script]] 0]
 if {$t>1000000} { return [format "%.2f s" [expr {$t/1000000.0}]] }
 return [format "%.2f ms" [expr {$t/1000.0}]]
}

#-------------------------------------------------------------------------
# Do a search of the change log
#
proc searchchanges {} {
 set q [wapp-param q]
 if {$q==""} {return {}}
 set open {<span style="background-color:#d9f2e6">}
 set close {</span>}
 set query {
   SELECT url, version, idx, highlight(change, 3, $open, $close) AS text
   FROM change($q)
 ORDER BY rowid ASC
 }
 wapp-trim {
   <p>Change log entries mentioning: <b>%html($q)</b>
   <table border=0>
 }
 set s2 "style=\"margin-top:0\""
 set s1 "style=\"font-size:larger; text-align:left\" class=nounderline"
 set prev ""
 db eval $query {
   if {$prev!=$version} {
     wapp-trim {
       <tr> <td %unsafe($s1) valign=top> <a href='%url($url)'>%html($version)</a>
       <td> <ul %unsafe($s2)>
     }
     set prev $version
   }
   wapp-subst {<li value=%html($idx)> (%html($idx)) %unsafe($text)\n}
 }
 wapp-trim {
   </table>
   <center><p>You can also see the <a href=changes.html>entire
   changelog as a single page</a> if you wish.</center>
 }
}

#-------------------------------------------------------------------------
# Do a search over all documentation other than the change log
```

```
#
proc searchresults {} {
 set q [wapp-param q]
 if {$q==""} {return ""}

 # Count the "" characters in $::A(q). If there is an odd number of
 # occurences, add a " to the
 end of the query so that fts5 can parse
 # it without error.
 if {[regexp -all \x22 $q] % 2} { append q \x22 }

 # Set iStart to the index of the first result to display. Results are
 # indexed starting at zero from most to least relevant.
 #
 set iStart 0
 catch {set iStart [expr {[wapp-param i 0]*10}]}

 # Grab a list of rowid results.
 #
 set sql {
  SELECT rowid FROM page WHERE page MATCH $q
  ORDER BY srank(page) DESC,
  rank * COALESCE(
    (SELECT percent FROM weight WHERE id=page.rowid), 100
  );
 }
 if {[catch { set lRowid [db eval $sql] }]} {
  set x ""
  foreach word [split $q " "] {
    append x " \"[string map [list "\"" "\"\""] $word]\""
  }
  set q [string trim $x]
  set lRowid [db eval $sql]
 }

 set lRes [list]
 foreach rowid $lRowid {
  if {$rowid > 1000} {
    set parent [expr $rowid / 1000]
    lappend subsections($parent) $rowid
  } else {
    lappend lRes $rowid
  }
 }

 set nRes [llength $lRes]
 set lRes [lrange
```

```
$lRes $iStart [expr $iStart+9]]

# Add an entry to the log database.
#
search_add_log_entry $nRes

# If there are no results, return a message to that effect.
#
if {[llength $lRes] == 0} {
  wapp-subst {<p>No Results for: <b>%html($q)</b>\n}
}

# HTML markup used to highlight keywords within FTS5 generated snippets.
#
set open {<span style="background-color:#d9f2e6">}
set close {</span>}
set ellipsis {<b> ... </b>}

# Grab the required data
#
db eval [string map [list %LIST% [join $lRowid ,]] {
  SELECT
    rowid AS parentid,
    snippet(page, 0, $open, $close, $ellipsis, 6)  AS s_apis,
    snippet(page, 2, $open, $close, '', 40)        AS s_title1,
    snippet(page, 3, $open, $close, $ellipsis, 40) AS s_title2,
    snippet(page, 4, $open, $close, $ellipsis, 40) AS s_content,
    url, rank
  FROM page($q)
  WHERE rowid IN (%LIST%)
}] X {
  foreach k [array names X] { set data($X(parentid),$k) [set X($k)] }
}

set
i1 [expr {$iStart+1}]
set i2 [expr {($nRes < $iStart+10) ? $nRes : $iStart+10}]
wapp-trim {
  <table border=0>
  <p>Search results %html($i1)..%html($i2) of %html($nRes) for: <b>%html($q)</b>
}

foreach rowid $lRes {

  foreach a {parentid s_apis s_title1 s_content url rank} {
    set $a $data($rowid,$a)
  }
```

```
 if {[info exists subsections($parentid)]} {
  set childid [lindex $subsections($parentid) 0]
  set link $data($childid,url)
  set hdr $data($childid,s_title2)

  if {$hdr==""} {
   set s_content ""
  } else {
   set s_content [subst {
    <b><a style=color:#044a64 href=$link>$hdr</a></b>
   }]
  }

  append s_content " $data($childid,s_content)"
 }

 wapp-trim {<tr>
  <td valign=top style="line-height:150%">
   <div style="white-space:wrap;font-size:larger" class=nounderline>
    <a href="%url($url)">%unsafe($s_title1)</a>
    <div style="float:right;font-size:smaller;color:#BBB">(%url($url))</div>
   </div>
    <div style="margin-left: 10ex; font:larger monospace">%unsafe($s_apis)</div>
   <div style="margin-left: 4ex; margin-bottom:1.5em">
    %unsafe($s_content)
   </div>
  </td>
 }
}
wapp-subst {</table>\n}


# If the query returned more than 10 results, add up to 10 links to
# each set of 10 results (first link to results 1-10, second to 11-20,
# third to 21-30, as required).
#
if {$nRes>10} {
 set s(0) {border:solid #044a64 1px;padding:1ex;margin:1ex;line-height:300%;}
 set s(1) "$s(0);background:#044a64;color:white"
 wapp-subst {<center><p>\n}
 for {set i 0} {$i < 10 && ($i*10)<$nRes} {incr i} {
  set style $s([expr {($iStart/10)==$i}])
  wapp-trim {
   <a style="%html($style)"
    href="search?q=%qp($q)&i=%qp($i)">%html([expr $i+1])</a>
  }
 }
 wapp-subst {</center>\n}
```

```
 }
}

# This is the main entry point into the search result page generator
#
proc wapp-default
 {} {
 wapp-content-security-policy {default-src 'self' 'unsafe-inline'}
 wapp-allow-xorigin-params
 if {[wapp-param-exists env]} {
  search_header
  wapp-trim {
   <h1>Environment Dump For Debugging</h1>
   <pre>%html([wapp-debug-env])</pre>
  }
  return
 }

 # When running using the built-in webserver in Wapp (in other words,
 # when not running as CGI) any filename that contains a "." loads
 # directly from the filesystem.
 if {[wapp-param WAPP_MODE]!="cgi"
  && [string match *.* [wapp-param PATH_INFO]]
 } {
  set altfile [file dir [wapp-param SCRIPT_FILENAME]][wapp-param PATH_INFO]
  set fd [open $altfile rb]
  fconfigure $fd -translation binary
  wapp-unsafe [read $fd]
  close $fd
  switch -glob -- $altfile {
   *.html {
    wapp-mimetype text/html
   }
   *.css {
    wapp-mimetype text/css
   }
   *.gif {
    wapp-mimetype image/gif
   }
  }
  return
 }

 search_header
 sqlite3 db [file dir [wapp-param SCRIPT_FILENAME]]/search.d/search.db
  set searchType [wapp-param s d]
 if {$searchType=="c"} {
  set cmd searchchanges
```

```
 } else {
   set cmd searchresults
 }
 db transaction {
   set t [ttime {$cmd}]
 }
 wapp-trim {
   <center>
   <p>Page generated by <a href='fts5.html'>FTS5</a> in about %html($t).
   </center>
   <script>
     window.addEventListener('load', function() {
       var w = document.getElementById("searchmenu");
       w.style.display = "block";
       w = document.getElementById("searchtype");
       w.value = "%string($searchType)"
       setTimeout(function(){
         var s = document.getElementById("searchbox");
         s.value = "%string([wapp-param q])"
         s.focus();
         s.select();
       }, 30);
     });
   </script>
 }
}
wapp-start $argv
```

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/search
No license file was found, but licenses were detected in source scan.

```
<h2>SQLite Is Public Domain</h2>
<a href="http://en.wikipedia.org/wiki/Public_Domain">Public Domain</a>
<a href="http://en.wikipedia.org/wiki/Public_Domain">public domain</a>
the public domain and originals of
author, and all of those authors have public domain dedications
domain and ensure that the code does not become contaminated with proprietary
SQLite is in the public domain and does not require a license.
the public domain.  </li>
have the legal right to dedicate the SQLite to the public domain, and
```

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/copyright.html
No license file was found, but licenses were detected in source scan.

```
<p><b>Public domain</b></p>
The source code for SQLite is in the public domain.  No claim of copyright
```

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/different.html
No license file was found, but licenses were detected in source scan.

proprietary. The TH3 code is only accessible to SQLite developers.

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/qmplan.html
No license file was found, but licenses were detected in source scan.

public domain and so most

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/famous.html
No license file was found, but licenses were detected in source scan.

SQLite is in the public domain. This document describes what that means

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/docs.html
No license file was found, but licenses were detected in source scan.

access to all proprietary extensions and test suites.
access to all proprietary extensions and test suites.
public domain,

Found in path(s):
* /sqlite3-3-27-2-orig-www-1-tar-xz/www/prosupport.html

1.284 log4j-api 2.13.3

1.284.1 Available under license :

Apache Log4j 1.x Compatibility API
Copyright 1999-2020 The Apache Software Foundation

This product includes software developed at
The Apache Software Foundation (http://www.apache.org/).

Apache License
Version 2.0, January 2004
http://www.apache.org/licenses/

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1. Definitions.

"License" shall mean the terms and conditions for use, reproduction,
and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by
the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all
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1.287 freerdp 2.1.2

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1.288 luxon 1.25.1

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1.289 rrule 2.6.8

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python-dateutil - Extensions to the standard Python datetime module.
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1.290 react-zoom-pan-pinch 1.6.1

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1.291 react-day-picker 7.4.8

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1.292 open-ldap 2.4.58

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1.294 runc 1.0.0-rc9

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1.295 berkeley-db 4.4.20

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1.296 importlib-metadata 0.18

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1.297 urllib3 1.25.3

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Contributions to the urllib3 project

Creator & Maintainer

* Andrey Petrov <andrey.petrov@shazow.net>

Contributors

In chronological order:

* victor.vde <http://code.google.com/u/victor.vde/>
 * HTTPS patch (which inspired HTTPSConnectionPool)

* erikcederstrand <http://code.google.com/u/erikcederstrand/>
 * NTLM-authenticated HTTPSConnectionPool
 * Basic-authenticated HTTPSConnectionPool (merged into make_headers)

* niphlod <niphlod@gmail.com>
 * Client-verified SSL certificates for HTTPSConnectionPool
 * Response gzip and deflate encoding support
 * Better unicode support for filepost using StringIO buffers

* btoconnor <brian@btoconnor.net>
 * Non-multipart encoding for POST requests

* p.dobrogost <http://code.google.com/u/@WBRSRlBZDhBFXQB6/>
 * Code review, PEP8 compliance, benchmark fix

* kennethreitz <me@kennethreitz.com>
 * Bugfixes, suggestions, Requests integration

* georgemarshall <https://github.com/georgemarshall>
 * Bugfixes, Improvements and Test
 coverage

* Thomas Kluyver <thomas@kluyver.me.uk>
 * Python 3 support

* brandon-rhodes <http://rhodesmill.org/brandon>
 * Design review, bugfixes, test coverage.

* studer <theo.studer@gmail.com>
 * IPv6 url support and test coverage

* Shivaram Lingamneni <slingamn@cs.stanford.edu>
 * Support for explicitly closing pooled connections

* hartator <hartator@gmail.com>
 * Corrected multipart behavior for params

* Thomas Weischuh <thomas@t-8ch.de>
 * Support for TLS SNI
 * API unification of ssl_version/cert_reqs
 * SSL fingerprint and alternative hostname verification
 * Bugfixes in testsuite

* Sune Kirkeby <mig@ibofobi.dk>
 * Optional SNI-support for Python 2 via PyOpenSSL.

* Marc Schlaich <marc.schlaich@gmail.com>
 * Various bugfixes and test improvements.

* Bryce Boe <bbzbryce@gmail.com>
 * Correct six.moves conflict
 * Fixed pickle support of some exceptions

* Boris Figovsky <boris.figovsky@ravellosystems.com>
 * Allowed to skip SSL hostname verification

* Cory Benfield
 <https://lukasa.co.uk/about/>
 * Stream method for Response objects.
 * Return native strings in header values.
 * Generate 'Host' header when using proxies.

* Jason Robinson <jaywink@basshero.org>
 * Add missing WrappedSocket.fileno method in PyOpenSSL

* Audrius Butkevicius <audrius.butkevicius@elastichosts.com>
 * Fixed a race condition

* Stanislav Vitkovskiy <stas.vitkovsky@gmail.com>
 * Added HTTPS (CONNECT) proxy support

* Stephen Holsapple <sholsapp@gmail.com>
 * Added abstraction for granular control of request fields

* Martin von Gagern <Martin.vGagern@gmx.net>
 * Support for non-ASCII header parameters

* Kevin Burke <kev@inburke.com> and Pavel Kirichenko <juanych@yandex-team.ru>
 * Support for separate connect and request timeouts

* Peter Waller <p@pwaller.net>
 * HTTPResponse.tell() for determining amount received over the wire

* Nipunn Koorapati <nipunn1313@gmail.com>
 * Ignore default ports when comparing hosts for equality

* Danilo @dbrgn <https://dbrgn.ch/>
  * Disabled TLS compression by default on Python 3.2+
 * Disabled TLS compression in pyopenssl contrib module
 * Configurable cipher suites in pyopenssl contrib module

* Roman Bogorodskiy <roman.bogorodskiy@ericsson.com>
 * Account retries on proxy errors

* Nicolas Delaby <nicolas.delaby@ezeep.com>
 * Use the platform-specific CA certificate locations

* Josh Schneier <https://github.com/jschneier>
 * HTTPHeaderDict and associated tests and docs
 * Bugfixes, docs, test coverage

* Tahia Khan <http://tahia.tk/>
 * Added Timeout examples in docs

* Arthur Grunseid <https://grunseid.com>
 * source_address support and tests (with https://github.com/bui)

* Ian Cordasco <graffatcolmingov@gmail.com>
 * PEP8 Compliance and Linting
 * Add ability to pass socket options to an HTTP Connection

* Erik Tollerud <erik.tollerud@gmail.com>
 * Support for standard library io module.

* Krishna Prasad <kprasad.iitd@gmail.com>
 * Google App Engine documentation

* Aaron Meurer
 <asmeurer@gmail.com>
 * Added Url.url, which unparses a Url

* Evgeny Kapun <abacabadabacaba@gmail.com>
 * Bugfixes

* Benjamen Meyer <bm_witness@yahoo.com>
 * Security Warning Documentation update for proper capture

* Shivan Sornarajah <github@sornars.com>
 * Support for using ConnectionPool and PoolManager as context managers.

* Alex Gaynor <alex.gaynor@gmail.com>
 * Updates to the default SSL configuration

* Tomas Tomecek <ttomecek@redhat.com>
 * Implemented generator for getting chunks from chunked responses.

* tlynn <https://github.com/tlynn>
 * Respect the warning preferences at import.

* David D. Riddle <ddriddle@illinois.edu>
 * IPv6 bugfixes in testsuite

* Thea Flowers <magicalgirl@google.com>
 * App Engine environment tests.
 * Documentation re-write.

* John Krauss <https://github.com/talos>
 * Clues to debugging problems with `cryptography` dependency in docs

* Disassem <https://github.com/Disassem>
 * Fix pool-default headers not applying for url-encoded
 requests like GET.

* James Atherfold <jlatherfold@hotmail.com>
 * Bugfixes relating to cleanup of connections during errors.

* Christian Pedersen <https://github.com/chripede>
 * IPv6 HTTPS proxy bugfix

* Jordan Moldow <https://github.com/jmoldow>
 * Fix low-level exceptions leaking from ``HTTPResponse.stream()``.
 * Bugfix for ``ConnectionPool.urlopen(release_conn=False)``.
 * Creation of ``HTTPConnectionPool.ResponseCls``.

* Predrag Gruevski <https://github.com/obi1kenobi>
 * Made cert digest comparison use a constant-time algorithm.

* Adam Talsma <https://github.com/a-tal>
 * Bugfix to ca_cert file paths.

* Evan Meagher <https://evanmeagher.net>
 * Bugfix related to `memoryview` usage in PyOpenSSL adapter

* John Vandenberg <jayvdb@gmail.com>
 * Python 2.6 fixes; pyflakes and pep8 compliance

* Andy Caldwell <andy.m.caldwell@googlemail.com>
 * Bugfix related to reusing connections in indeterminate states.

* Ville Skytt <ville.skytta@iki.fi>
 * Logging efficiency
 improvements, spelling fixes, Travis config.

* Shige Takeda <smtakeda@gmail.com>
 * Started Recipes documentation and added a recipe about handling concatenated gzip data in HTTP response

* Jess Shapiro <jesse@jesseshapiro.net>
 * Various character-encoding fixes/tweaks
 * Disabling IPv6 DNS when IPv6 connections not supported

* David Foster <http://dafoster.net/>
 * Ensure order of request and response headers are preserved.

* Jeremy Cline <jeremy@jcline.org>
 * Added connection pool keys by scheme

* Aviv Palivoda <palaviv@gmail.com>
 * History list to Retry object.
 * HTTPResponse contains the last Retry object.

* Nate Prewitt <nate.prewitt@gmail.com>
 * Ensure timeouts are not booleans and greater than zero.
 * Fixed infinite loop in ``stream`` when amt=None.
 * Added length_remaining to determine remaining data to be read.
 * Added enforce_content_length to raise exception when incorrect content-length received.

* Seth Michael Larson <sethmichaellarson@protonmail.com>
  * Created selectors backport that supports PEP 475.

* Alexandre Dias <alex.dias@smarkets.com>
 * Don't retry on timeout if method not in whitelist

* Moinuddin Quadri <moin18@gmail.com>
 * Lazily load idna package

* Tom White <s6yg1ez3@mail2tor.com>
 * Made SOCKS handler differentiate socks5h from socks5 and socks4a from socks4.

* Tim Burke <tim.burke@gmail.com>
 * Stop buffering entire deflate-encoded responses.

* Tuukka Mustonen <tuukka.mustonen@gmail.com>
 * Add counter for status_forcelist retries.

* Erik Rose <erik@mozilla.com>
 * Bugfix to pyopenssl vendoring

* Wolfgang Richter <wolfgang.richter@gmail.com>
 * Bugfix related to loading full certificate chains with PyOpenSSL backend.

* Mike Miller <github@mikeage.net>
 * Logging improvements to include the HTTP(S) port when opening a new connection

* Ioannis Tziakos <mail@itziakos.gr>

* Fix ``util.selectors._fileobj_to_fd`` to accept ``long``.
* Update appveyor tox setup to use the 64bit python.

* Akamai
(through Jess Shapiro) <jshapiro@akamai.com>
* Ongoing maintenance; 2017-2018

* Dominique Leuenberger <dimstar@opensuse.org>
* Minor fixes in the test suite

* Will Bond <will@wbond.net>
* Add Python 2.6 support to ``contrib.securetransport``

* Aleksei Alekseev <alekseev.yeskela@gmail.com>
* using auth info for socks proxy

* Chris Wilcox <git@crwilcox.com>
* Improve contribution guide
* Add ``HTTPResponse.geturl`` method to provide ``urllib2.urlopen().geturl()`` behavior

* Bruce Merry <https://www.brucemerry.org.za>
* Fix leaking exceptions when system calls are interrupted with zero timeout

* Hugo van Kemenade <https://github.com/hugovk>
* Drop support for EOL Python 2.6

* Tim Bell <https://github.com/timb07>
* Bugfix for responses with Content-Type: message/* logging warnings

* Justin Bramley <https://github.com/jbramleycl>
* Add ability to handle multiple Content-Encodings

* Katsuhiko YOSHIDA <https://github.com/kyoshidajp>
* Remove Authorization header
regardless of case when redirecting to cross-site

* [Your name or handle] <[email or website]>
* [Brief summary of your changes]

1.298 python-requests 2.22.0

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1.299 attrs 19.1.0

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1.300 swagger 2.1.9

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Found in path(s):
* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/security/SecuritySchemes.java
* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/headers/Header.java
* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/responses/ApiResponse.java
* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/media/Encoding.java
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 /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/Hidden.java
* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/security/OAuthScope.java
* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/media/Schema.java
* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/media/DiscriminatorMapping.java
* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/security/SecurityRequirement.java
* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/links/Link.java
* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/ExternalDocumentation.java
* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/servers/Servers.java
* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/security/OAuthFlow.java
* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/servers/Server.java
*
 /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/media/ExampleObject.java
* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/callbacks/Callbacks.java
* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/security/SecurityRequirements.java
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* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/info/Info.java
* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/Operation.java
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* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/Parameters.java
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* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/info/License.java
* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/tags/Tag.java
* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/parameters/RequestBody.java
* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/callbacks/Callback.java
* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/links/LinkParameter.java

* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/extensions/Extensions.java
* /swagger-annotations-2-1-9-sources-jar/io/swagger/v3/oas/annotations/servers/ServerVariable.java

1.301 swagger-integration 2.1.9

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Manifest-Version: 1.0
Bundle-Description: swagger-integration
Automatic-Module-Name: io.swagger.v3.oas.integration
Bundle-License: "Apache License 2.0";link="http://www.apache.org/licen
ses/LICENSE-2.0.html"
package: io.swagger
Bundle-SymbolicName: io.swagger.core.v3.swagger-integration
implementation-version: 2.1.9
Built-By: runner
Bundle-ManifestVersion: 2
Bundle-DocURL: https://github.com/swagger-api/swagger-core/modules/swa
gger-integration
Import-Package: com.fasterxml.jackson.annotation;version="[2.12,3)",co
m.fasterxml.jackson.databind;version="[2.12,3)",com.fasterxml.jackson
.databind.annotation;version="[2.12,3)",io.github.classgraph;version=
"[4.8,5)",io.swagger.v3.core.converter;version="[2.1,3)",io.swagger.v
3.core.jackson;version="[2.1,3)",io.swagger.v3.core.util;version="[2.
1,3)",io.swagger.v3.oas.annotations;version="[2.1,3)",io.swagger.v3.o
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)",org.apache.commons.lang3;version="[3.7,4)",org.apache.commons.lang
3.tuple;version="[3.7,4)",org.slf4j;version="[1.7,2)"
Require-Capability: osgi.ee;filter:="(&(osgi.ee=JavaSE)(version=1.8))"
Bundle-Developers: fehguy;email="fehguy@gmail.com";name="Tony Tam",web
ron;email="webron@gmail.com";name="Ron Ratovsky"
url: https://github.com/swagger-api/swagger-core/modules/swagger-integ
ration
mode: development
Export-Package: io.swagger.v3.oas.integration;uses:="com.fasterxml.jac
kson.databind,io.swagger.v3.core.converter,io.swagger.v3.core.util,io
.swagger.v3.oas.integration.api,io.swagger.v3.oas.models,org.apache.c
ommons.lang3.tuple,org.slf4j";version="2.1.9",io.swagger.v3.oas.integ
ration.api;uses:="com.fasterxml.jackson.databind,io.swagger.v3.core.c
onverter,io.swagger.v3.oas.integration,io.swagger.v3.oas.models";vers
ion="2.1.9"
Bundle-Name: swagger-integration
Bundle-Version:
2.1.9
Bundle-SCM: url="https://github.com/swagger-api/swagger-core/modules/s

wagger-integration",connection="scm:git:git@github.com:swagger-api/sw
agger-core.git/modules/swagger-integration",developer-connection="scm
:git:git@github.com:swagger-api/swagger-core.git/modules/swagger-inte
gration",tag=HEAD
Created-By: Apache Maven 3.6.3
Build-Jdk: 1.8.0_282

Found in path(s):
* /swagger-integration-2-1-9-jar/META-INF/MANIFEST.MF

1.302 swagger-models 2.1.9

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Found in path(s):
* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/security/Scopes.java
* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/media/ByteArraySchema.java
* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/security/OAuthFlows.java
* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/Paths.java
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* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/media/DateTimeSchema.java
* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/tags/Tag.java
* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/media/EncodingProperty.java
* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/parameters/CookieParameter.java
* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/security/SecurityScheme.java
* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/servers/ServerVariable.java
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* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/Operation.java
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* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/servers/ServerVariables.java
* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/parameters/PathParameter.java
* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/info/Contact.java
* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/responses/ApiResponse.java
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* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/links/Link.java
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* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/media/BinarySchema.java
* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/headers/Header.java
* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/media/Encoding.java
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* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/links/LinkParameter.java
* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/media/BooleanSchema.java
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* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/Components.java
* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/OpenAPI.java
* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/media/ObjectSchema.java
* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/PathItem.java
* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/media/IntegerSchema.java
* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/media/Schema.java
* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/parameters/QueryParameter.java
* /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/media/ArraySchema.java
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 /swagger-models-2-1-9-sources-jar/io/swagger/v3/oas/models/security/SecurityRequirement.java

1.303 lz4 1.8.3-1+deb10u1

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procfs provides functions to retrieve system, kernel and process
metrics from the pseudo-filesystem proc.

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past and future changes. (new: src/libgcrypt.pc.in,
src/Makefile.am, src/secmem.c, mpi/hppa1.1/mpih-mul3.S,
mpi/hppa1.1/udiv-qrnnd.S, mpi/hppa1.1/mpih-mul2.S,
mpi/hppa1.1/mpih-mul1.S, mpi/Makefile.am, tests/prime.c,
tests/register.c, tests/ac.c, tests/basic.c, tests/tsexp.c,
tests/keygen.c, tests/pubkey.c, configure.ac, acinclude.m4)

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added SHA-224, changed cipher/sha256.c, added HMAC tests.)

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1.318 gson 2.8.6

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* /gson-2-8-6-sources-1-jar/com/google/gson/internal/bind/SqlDateTypeAdapter.java
* /gson-2-8-6-sources-1-jar/com/google/gson/internal/ConstructorConstructor.java
* /gson-2-8-6-sources-1-jar/com/google/gson/internal/bind/TimeTypeAdapter.java
*
 /gson-2-8-6-sources-1-jar/com/google/gson/internal/bind/DateTypeAdapter.java
* /gson-2-8-6-sources-1-jar/com/google/gson/internal/UnsafeAllocator.java
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* /gson-2-8-6-sources-1-jar/com/google/gson/JsonPrimitive.java
* /gson-2-8-6-sources-1-jar/com/google/gson/ExclusionStrategy.java
* /gson-2-8-6-sources-1-jar/com/google/gson/JsonDeserializer.java
* /gson-2-8-6-sources-1-jar/com/google/gson/internal/$Gson$Preconditions.java
*
 /gson-2-8-6-sources-1-jar/com/google/gson/internal/Excluder.java
* /gson-2-8-6-sources-1-jar/com/google/gson/JsonSerializationContext.java
* /gson-2-8-6-sources-1-jar/com/google/gson/JsonArray.java
* /gson-2-8-6-sources-1-jar/com/google/gson/annotations/Since.java
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* /gson-2-8-6-sources-1-jar/com/google/gson/reflect/TypeToken.java
* /gson-2-8-6-sources-1-jar/com/google/gson/Gson.java
* /gson-2-8-6-sources-1-jar/com/google/gson/JsonIOException.java
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* /gson-2-8-6-sources-1-jar/com/google/gson/JsonDeserializationContext.java
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* /gson-2-8-6-sources-1-jar/com/google/gson/GsonBuilder.java
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/gson-2-8-6-sources-1-jar/com/google/gson/FieldNamingPolicy.java
* /gson-2-8-6-sources-1-jar/com/google/gson/FieldNamingStrategy.java
* /gson-2-8-6-sources-1-jar/com/google/gson/DefaultDateTypeAdapter.java
* /gson-2-8-6-sources-1-jar/com/google/gson/annotations/Until.java
* /gson-2-8-6-sources-1-jar/com/google/gson/annotations/SerializedName.java
* /gson-2-8-6-sources-1-jar/com/google/gson/annotations/Expose.java
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* /gson-2-8-6-sources-1-jar/com/google/gson/internal/reflect/ReflectionAccessor.java
* /gson-2-8-6-sources-1-jar/com/google/gson/internal/reflect/UnsafeReflectionAccessor.java
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*
 /gson-2-8-6-sources-1-jar/com/google/gson/internal/bind/ObjectTypeAdapter.java
* /gson-2-8-6-sources-1-jar/com/google/gson/internal/bind/MapTypeAdapterFactory.java
* /gson-2-8-6-sources-1-jar/com/google/gson/TypeAdapter.java
* /gson-2-8-6-sources-1-jar/com/google/gson/internal/JsonReaderInternalAccess.java
* /gson-2-8-6-sources-1-jar/com/google/gson/internal/bind/JsonTreeWriter.java
* /gson-2-8-6-sources-1-jar/com/google/gson/TypeAdapterFactory.java
* /gson-2-8-6-sources-1-jar/com/google/gson/internal/bind/ReflectiveTypeAdapterFactory.java
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1.323 gnutls 3.6.13-2ubuntu1.6

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version 0.1
##
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1.325 pcre 10.34-7

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Written by: Philip Hazel
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1.326 procps 3.2.8

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1.328 postgre-sql 12.4

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1.329 kerberos 1.17-6ubuntu4.1

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cmd/krb5/kadmin/server/ipropd_svc.c
cmd/krb5/kproplog/kproplog.c
cmd/krb5/slave/kpropd_rpc.c
lib/gss_mechs/mech_krb5/et/kdb5_err.c
lib/gss_mechs/mech_spnego/mech/gssapiP_spnego.h
lib/gss_mechs/mech_spnego/mech/spnego_mech.c
lib/krb5/kadm5/kadm_host_srv_names.c
lib/krb5/kdb/kdb_convert.c
lib/krb5/kdb/kdb_hdr.h
lib/krb5/kdb/kdb_log.c
lib/krb5/kdb/kdb_log.h
lib/libgss/g_accept_sec_context.c
lib/libgss/g_acquire_cred.c
lib/libgss/g_canon_name.c
lib/libgss/g_compare_name.c
lib/libgss/g_context_time.c
lib/libgss/g_delete_sec_context.c
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lib/libgss/g_dsp_status.c
lib/libgss/g_dup_name.c
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lib/libgss/g_process_context.c
lib/libgss/g_rel_buffer.c
lib/libgss/g_rel_cred.c
lib/libgss/g_rel_name.c
lib/libgss/g_rel_oid_set.c
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lib/libgss/g_utils.c
lib/libgss/g_verify.c
lib/libgss/gssd_pname_to_uid.c
uts/common/gssapi/include/gssapi_err_generic.h
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lib/gssapi/mechglue/g_accept_sec_context.c
lib/gssapi/mechglue/g_acquire_cred.c

lib/gssapi/mechglue/g_canon_name.c
lib/gssapi/mechglue/g_compare_name.c
lib/gssapi/mechglue/g_context_time.c
lib/gssapi/mechglue/g_delete_sec_context.c
lib/gssapi/mechglue/g_dsp_name.c
lib/gssapi/mechglue/g_dsp_status.c
lib/gssapi/mechglue/g_dup_name.c
lib/gssapi/mechglue/g_exp_sec_context.c
lib/gssapi/mechglue/g_export_name.c
lib/gssapi/mechglue/g_glue.c
lib/gssapi/mechglue/g_imp_name.c
lib/gssapi/mechglue/g_imp_sec_context.c
lib/gssapi/mechglue/g_init_sec_context.c
lib/gssapi/mechglue/g_initialize.c
lib/gssapi/mechglue/g_inquire_context.c
lib/gssapi/mechglue/g_inquire_cred.c
lib/gssapi/mechglue/g_inquire_names.c
lib/gssapi/mechglue/g_process_context.c
lib/gssapi/mechglue/g_rel_buffer.c
lib/gssapi/mechglue/g_rel_cred.c
lib/gssapi/mechglue/g_rel_name.c
lib/gssapi/mechglue/g_rel_oid_set.c
lib/gssapi/mechglue/g_seal.c
lib/gssapi/mechglue/g_sign.c
lib/gssapi/mechglue/g_store_cred.c
lib/gssapi/mechglue/g_unseal.c
lib/gssapi/mechglue/g_userok.c
lib/gssapi/mechglue/g_utils.c
lib/gssapi/mechglue/g_verify.c
lib/gssapi/mechglue/gssd_pname_to_uid.c
lib/gssapi/mechglue/mglueP.h
lib/gssapi/mechglue/oid_ops.c
lib/gssapi/spnego/gssapiP_spnego.h
lib/gssapi/spnego/spnego_mech.c

and the initial implementation of incremental propagation,
including
the following new or changed files:

include/iprop_hdr.h
kadmin/server/ipropd_svc.c
lib/kdb/iprop.x
lib/kdb/kdb_convert.c
lib/kdb/kdb_log.c
lib/kdb/kdb_log.h
lib/krb5/error_tables/kdb5_err.et
kprop/kpropd_rpc.c
kprop/kproplog.c

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1.331 activation 1.1

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1.332 curl 7.68.0-1ubuntu2.7

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==============

libcurl can be built to use a fair amount of various third party libraries,
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problems to some. This document attempts to describe what licenses libcurl and
the other libraries use and what possible dilemmas linking and mixing them all
can lead to for end users.

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particular problem
 was addressed when the [Modified BSD
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zlib

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1.333 libgcrypt 1.8.5-5ubuntu1.1

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1.334 pam 1.3.1-5ubuntu4.3

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1.335 urllib3 1.26.6-1.ph1

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1.336 pyjwt 2.3.0

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1.337 tdb 1.44.5

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Theodore Ts'o <tytso@mit.edu> on Sat Mar 15 15:33:37 EST 2003

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This is the Debian GNU/Linux prepackaged version of the static EXT2
file system consistency checker (e2fsck.static). The EXT2 utilities
were written by Theodore Ts'o <tytso@mit.edu> and Remy Card
<card@masi.ibp.fr>.

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#
This is a Makefile stub which handles the creation of BSD shared
libraries.
#
In order to use this stub, the following makefile variables must be defined.
#
BSDLIB_VERSION = 1.0

```
# BSDLIB_IMAGE = libce
# BSDLIB_MYDIR = et
# BSDLIB_INSTALL_DIR = $(SHLIBDIR)
#

all:: image

real-subdirs:: Makefile
 @echo " MKDIR pic"
 @mkdir -p pic

BSD_LIB = $(BSDLIB_IMAGE).so.$(BSDLIB_VERSION)
BSDLIB_PIC_FLAG = -fpic

image:  $(BSD_LIB)

$(BSD_LIB): $(OBJS)
 (cd pic; ld -Bshareable -o $(BSD_LIB) $(LDFLAGS_SHLIB) $(OBJS))
 $(MV) pic/$(BSD_LIB) .
 $(RM) -f ../$(BSD_LIB)
 (cd ..; $(LN) $(LINK_BUILD_FLAGS) \
  `echo $(my_dir) | sed -e 's;lib/;;'`/$(BSD_LIB) $(BSD_LIB))

install-shlibs install:: $(BSD_LIB)
 @echo " INSTALL_PROGRAM $(BSDLIB_INSTALL_DIR)/$(BSD_LIB)"
 @$(INSTALL_PROGRAM) $(BSD_LIB) \
  $(DESTDIR)$(BSDLIB_INSTALL_DIR)/$(BSD_LIB)
 @-$(LDCONFIG)

install-strip: install

install-shlibs-strip:: install-shlibs

uninstall-shlibs uninstall::
 $(RM) -f $(DESTDIR)$(BSDLIB_INSTALL_DIR)/$(BSD_LIB)

clean::
 $(RM)
 -rf pic
 $(RM) -f $(BSD_LIB)
 $(RM) -f ../$(BSD_LIB)
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written by Theodore Ts'o <tytso@mit.edu> and Remy Card
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Index: tdbsa/tdb.c
==========
--- tdbsa.orig/tdb.c
+++ tdbsa/tdb.c
@@ -4,11 +4,11 @@ Rev: 23371
Last Changed Date: 2007-06-06 20:14:06 -0400 (Wed, 06 Jun 2007)
*/
 /*
-   Unix SMB/CIFS implementation.
+   trivial database library - standalone version

-   trivial database library - private includes

-
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Gadi Oxman, August 1995

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    Theodore Ts'o
    23-June-2007

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That's all there is to it!
This is the Debian GNU/Linux prepackaged version of the EXT2 file
system utilities (e2fsck, mke2fs, etc.). The EXT2 utilities were
written by Theodore Ts'o <tytso@mit.edu> and Remy Card <card@masi.ibp.fr>.

Sources were obtained from http://sourceforge.net/projects/e2fsprogs

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This package was added to the e2fsprogs debian source package by
Theodore Ts'o <tytso@mit.edu> on Sat Mar 15 15:33:37 EST 2003

It is part of the main e2fsprogs distribution, which can be found at:

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1.338 tdb 1.45.5

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1.339 fastapi 0.68.2

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1.340 tzdata 2021e-0ubuntu0.20.04

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It was downloaded from https://www.iana.org/time-zones

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.

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Database section 7.

.

```
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1.341 nginx 1.18.0

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1.347 hd-parm 9.38

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1.349 ipmi-tool 1.8.18

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1.350 libpcap 1.2.1

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1.351 docker v19.03.5

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1.352 dmidecode 2.12

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procfs provides functions to retrieve system, kernel and process
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Protocol Buffers for Go with Gadgets

Go support for Protocol Buffers - Google's data interchange format

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1.354 kubernetes-apimachinery 1.8.11

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procfs provides functions to retrieve system, kernel and process
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1.355 kubernetes-api 1.8.11

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procfs provides functions to retrieve system, kernel and process
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1.356 icu 66.1-2ubuntu2.1

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Commands to generate dependency files
GEN_DEPS.c= $(CC) -E -MM $(DEFS) $(CPPFLAGS)
GEN_DEPS.cc= $(CXX) -E -MM $(DEFS) $(CPPFLAGS)

Flags for position independent code
SHAREDLIBCFLAGS = -fPIC
SHAREDLIBCXXFLAGS = -fPIC
SHAREDLIBCPPFLAGS = -DPIC

Additional flags when building libraries and with threads
THREADSCPPFLAGS = -D_REENTRANT
LIBCPPFLAGS =

```
## Compiler switch to embed a runtime search path
LD_RPATH=
LD_RPATH_PRE= -Wl,-rpath,

## Compiler switch to embed a library name
LD_SONAME = -Wl,-soname -Wl,$(notdir $(MIDDLE_SO_TARGET))

## Shared library options
LD_SOOPTIONS= -Wl,-Bsymbolic

## Shared object suffix
SO = so
## Non-shared intermediate object suffix
STATIC_O = ao

## Compilation
 rules
%.$(STATIC_O): $(srcdir)/%.c
 $(COMPILE.c) $(STATICCPPFLAGS) $(STATICCFLAGS) -o $@ $<
%.o: $(srcdir)/%.c
 $(COMPILE.c) $(DYNAMICCPPFLAGS) $(DYNAMICCFLAGS) -o $@ $<

%.$(STATIC_O): $(srcdir)/%.cpp
 $(COMPILE.cc) $(STATICCPPFLAGS) $(STATICCXXFLAGS) -o $@ $<
%.o: $(srcdir)/%.cpp
 $(COMPILE.cc) $(DYNAMICCPPFLAGS) $(DYNAMICCXXFLAGS) -o $@ $<


## Dependency rules
%.d: $(srcdir)/%.c
 @echo "generating dependency information for $<"
 @$(SHELL) -ec '$(GEN_DEPS.c) $< \
  | sed '\"s/\($*\)\.o[ :]*/\1.o $@ : /g'\" > $@; \
  [ -s $@ ] || rm -f $@'

%.d: $(srcdir)/%.cpp
 @echo "generating dependency information for $<"
 @$(SHELL) -ec '$(GEN_DEPS.cc) $< \
  | sed '\"s/\($*\)\.o[ :]*/\1.o $@ : /g'\" > $@; \
  [ -s $@ ] || rm -f $@'

## Versioned libraries rules

%.$(SO).$(SO_TARGET_VERSION_MAJOR): %.$(SO).$(SO_TARGET_VERSION)
 $(RM) $@ && ln -s ${<F} $@
%.$(SO): %.$(SO).$(SO_TARGET_VERSION_MAJOR)
 $(RM) $@ && ln -s ${*F}.$(SO).$(SO_TARGET_VERSION) $@
```

Bind internal references

LDflags that pkgdata will use
BIR_LDFLAGS= -Wl,-Bsymbolic

Dependencies [i.e. map files] for the final library
BIR_DEPS=

Remove shared library 's'
STATIC_PREFIX_WHEN_USED =
STATIC_PREFIX =

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procfs provides functions to retrieve system, kernel and process metrics from the pseudo-filesystem proc.

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1.361 @tensorflow/tfjs-core 3.11.0

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1.362 @tensorflow/tfjs-backend-wasm 3.11.0

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{"version":3,"file":"FusedDepthwiseConv2D.js","sourceRoot":"","sources":["../../src/kernels/FusedDepthwiseConv2D.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAAE,oBAAoB,EAA4F,MAAM,uBAAuB,CAAC;AAIpK,OAAO,EAAC,iBAAiB,EAAE,MAAM,EAAE,SAAS,EAAC,MAAM,cAAc,CAAC;AAElE,OAAO,EAAC,kBAAkB,EAAE,MAAM,EAAE,SAAS,EAAC,MAAM,cAAc,CAAC;AAEnE,OAAO,EAAC,oBAAoB,EAAC,MAAM,wBAAwB;QACpB,OAAO,EAAC,CAAC,EAAE,IAAI,EAAE,IAAI,EAAE,IAAI

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```
{BackendWasm} from '../backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet
wasmFusedDepthwiseConv2d:\n    (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n
filterId: number, filterHeight: number, filterWidth: number,\n     biasId: number, padTop: number, padRight:
number, padBottom: number,\n     padLeft: number, isSamePad: number, dilationHeight: number,\n
dilationWidth: number, strideHeight: number, strideWidth: number,\n     inputChannels: number, outputChannels:
number, activation: number,\n     preluActivationWeightsId:
 number, leakyreluAlpha: number, outId: number) =>\n         void;\n\nfunction setup(backend: BackendWasm) {\n
wasmFusedDepthwiseConv2d =\n      backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n
'number',  // xId\n         'number',  // batchSize\n         'number',  // inputHeight\n         'number',  // inputWidth\n
'number',  // filterId\n         'number',  // filterHeight\n         'number',  // filterWidth\n         'number',  // biasId\n
'number',  // padTop\n         'number',  // padRight\n         'number',  // padBottom\n         'number',  // padLeft\n
'number',  // isSamePad\n         'number',  // dilationHeight\n         'number',  // dilationWidth\n         'number',  //
strideHeight\n         'number',  // strideWidth\n         'number',  // inputChannels\n         'number',  // outputChannels\n
  'number',  // activation\n         'number',  // preluActivationWeightsId\n         'number',  // leakyreluAlpha\n
'number',
  // outId\n       ]);\n}\n\nfunction fusedDepthwiseConv2d(args: {\n  inputs: FusedDepthwiseConv2DInputs,\n
backend: BackendWasm,\n  attrs: FusedDepthwiseConv2DAttrs\n}) {\n  const {inputs, attrs, backend} = args;\n
const {x, filter, bias, preluActivationWeights} = inputs;\n  const {\n    strides,\n    pad,\n    dilations,\n
dataFormat,\n    dimRoundingMode,\n    activation,\n    leakyreluAlpha\n  } = attrs;\n\n  const convInfo =
backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n
pad, dimRoundingMode, true /* depthwise */);\n\n  const fusedActivation =\n      FusableActivation[activation as {}
as keyof typeof FusableActivation];\n  if (fusedActivation == null) {\n    throw new Error(\n        `${activation}
activation not yet supported for FusedDepthwiseConv2D ` +\n        `in the wasm backend.`);\n  }\n\n  const xId =
backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n
  const outputChannels = convInfo.outChannels;\n\n  let biasId = 0;\n  if (bias != null) {\n    const biasData =
backend.dataIdMap.get(bias.dataId);\n    if (biasData.shape.length !== 1) {\n      throw new Error(\n
`FusedDepthwiseConv2D only supports rank-1 bias but got ` +\n          `rank ${biasData.shape.length}.`);\n    }\n
if (biasData.shape[0] !== outputChannels) {\n      throw new Error(\n          `FusedDepthwiseConv2D bias shape
(${biasData.shape}) does not ` +\n          `match the number of output channels (${outputChannels})`);\n    }\n
biasId = biasData.id;\n  }\n\n  const filterHeight = convInfo.filterHeight;\n  const filterWidth =
convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const padRight = convInfo.padInfo.right;\n  const
padBottom = convInfo.padInfo.bottom;\n  const padLeft = convInfo.padInfo.left;\n  const dilationHeight =
convInfo.dilationHeight;\n  const dilationWidth = convInfo.dilationWidth;\n  const strideHeight =
convInfo.strideHeight;\n
  const strideWidth = convInfo.strideWidth;\n  const inputChannels = convInfo.inChannels;\n  const isSamePad =
convInfo.padInfo.type === 'SAME' ? 1 : 0;\n  const batchSize = convInfo.batchSize;\n  const inHeight =
convInfo.inHeight;\n  const inWidth = convInfo.inWidth;\n\n  if (dataFormat !== 'NHWC') {\n    throw new Error(\n
    `wasm backend FusedDepthwiseConv2D does not support dataFormat:` +\n        `${dataFormat}'. Please use
'NHWC'.`);\n  }\n\n  const out = backend.makeOutput(convInfo.outShape, 'float32');\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n  const preluActivationWeightsId = preluActivationWeights == null ?\n      0
:\n      backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n  wasmFusedDepthwiseConv2d(\n      xId,
batchSize, inHeight, inWidth, filterId, filterHeight, filterWidth,\n      biasId, padTop, padRight, padBottom, padLeft,
isSamePad, dilationHeight,\n      dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n
    fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n  return out;\n}\n\nexport const
fusedDepthwiseConv2DConfig: KernelConfig = {\n  kernelName: FusedDepthwiseConv2D,\n  backendName:
'wasm',\n  setupFunc: setup,\n  kernelFunc: fusedDepthwiseConv2d as {} as KernelFunc\n};\n"]}
```

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* /tfjs-backend-wasm-zip/tfjs-backend-wasm/starter/webpack/src/index.js
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BackendWasm): void {\n wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n   'number', // xId\n 'number', // dtype\n   'number',
  // indicesId\n   'number', // numSlices\n   'number', // sliceRank\n   'number', // sliceSize\n   'array',   // strides\n 'number'   // outId\n]);\n}\n\nfunction gatherNd(args: {backend: BackendWasm, inputs: GatherNdInputs}):\n TensorInfo {\n const {backend, inputs} = args;\n const {params, indices} = inputs;\n\n const [resultShape,
  numSlices, sliceSize, strides] =\n   gather_util.prepareAndValidate(params, indices);\n\n const out =
  backend.makeOutput(resultShape, params.dtype);\n if (numSlices === 0) {\n   return out;\n }\n\n const
  indicesShape = indices.shape;\n const sliceRank = indicesShape[indicesShape.length - 1];\n\n const xData =
  backend.dataIdMap.get(params.dataId);\n const xId = xData.id;\n const indicesData =
  backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const stridesBytes = new
  Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n
  wasmGatherNd(\n   xId,
  CppDType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n   stridesBytes, outId);\n\n return
  out;\n}\n\nexport const gatherNdConfig: KernelConfig = {\n kernelName: GatherNd,\n backendName: 'wasm',\n
  setupFunc: setup,\n kernelFunc: gatherNd\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/GatherNd.js.map
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==\n
*/\nimport {GreaterEqual, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig}
from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterEqualConfig: KernelConfig =\n
 createBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/GreaterEqual.js.map
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* /tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Maximum.cc
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*** */
/**
* @deprecated Use `setWasmPaths` instead.
* Sets the path to the `.wasm` file which will be fetched when the wasm
* backend is initialized. See
* https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers
* for more details.
* @param path wasm file path or url
* @param
 usePlatformFetch optional boolean to use platform fetch to download
*   the wasm file, default to false.
*
* @doc {heading: 'Environment', namespace: 'wasm'}
*/

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==\n
*/\nimport {Equal, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const equalConfig: KernelConfig =\n
createBinaryKernelConfig(Equal, supportsFullBroadcast, 'bool');\n"]}

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* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Equal.js.map
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==\n
*/\nimport {KernelConfig, Sub} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from
'./binary_kernel';\nconst supportsFullBroadcast = true;\nexport const subConfig: KernelConfig =\n
createBinaryKernelConfig(Sub, supportsFullBroadcast);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Sub.js.map
No license file was found, but licenses were detected in source scan.

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backend.disposeData(flattenIndex.dataId);\n\n // reshape\n out.shape = shapeInfo.outputShape;\n return out;\n}\n\nexport const gatherV2Config: KernelConfig = {\n kernelName: GatherV2,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherV2 as {} as KernelFunc\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/GatherV2.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"StridedSlice.js","sourceRoot":"","sources":["../../src/kernels/StridedSlice.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAA2B,UAAU,EAAE,YAAY,EAAqD,IAAI,EAAC,MAAM,uBAAuB,CAAC;AAGlJ,OAAO,EAAC,OAAO,EAAC,OAAO,EAAC,MAAM,WAAW,CAAC;AAClC,OAAO,EAAC,KAAK,EAAC,MAAM,SAAS,CAAC;AAEnD,SAAS,CAAC;AAE9B,IAAI,gBAAI8C,CAAC;AAEnD,SAAS,KAAK,CAAC,OAAOoB;IACjC,CAAC,gBAAgB,EAAE,gBAAgB,EAAE,OAAO,CAAC,CAAC,CAAC

* @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from './Reshape';\nimport {slice} from './Slice';\n\nlet wasmStridedSlice: (\n xId: number, xStridesBytes: Uint8Array, xRank: number,\n beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n outShapeBytes: Uint8Array, outStridesBytes: Uint8Array,\n outShapeLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n 'number', // xId\n 'array', // xStrides\n 'number', // xRank\n 'array', // beginBytes\n 'array', // endBytes\n 'array', // stridesBytes\n 'array', // outShapeBytes\n 'array', // outStridesBytes\n 'number', // outShapeLength\n 'number', // outId\n]);\n}\n\nexport function stridedSlice(args: {\n backend: BackendWasm,\n inputs: StridedSliceInputs,\n attrs: StridedSliceAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x} = inputs;\n\n const {\n begin,\n end,\n strides,\n beginMask,\n endMask,\n ellipsisMask,\n newAxisMask,\n shrinkAxisMask\n } = attrs;\n\n const {\n finalShapeSparse,\n finalShape,\n isIdentity,\n sliceDim0,\n isSimpleSlice,\n begin: $begin,\n end: $end,\n strides: $strides\n } =\n slice_util.sliceInfo(\n x.shape, begin, end, strides, beginMask, endMask, ellipsisMask,\n newAxisMask, shrinkAxisMask);\n\n let result;\n\n if (isIdentity) {\n // Optimization #1, slice is a no-op plus reshape\n result = reshape({inputs: {x}, backend, attrs: {shape: finalShape}});\n } else if (sliceDim0 || isSimpleSlice) {\n // Optimization #2, slice is memory contiguous (only occurs in dim 0)\n util.assert(\n x.shape.length >= 1,\n () => `Input must have rank at least 1, got: ${x.shape.length}`);\n\n const size = slice_util.computeOutShape($begin, $end, $strides);\n // To tolerate begin[0] > end[0] (a 0-output slice), we min(begin, end).\n const sliced = slice({inputs: {x}, backend, attrs: {begin: $begin, size}});\n result =\n reshape({inputs: {x: sliced}, backend, attrs: {shape: finalShape}});\n backend.disposeData(sliced.dataId);\n } else {\n const out = backend.makeOutput(finalShapeSparse, 'float32');\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const xStridesBytes =\n new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n const beginBytes = new Uint8Array(new Int32Array($begin).buffer);\n const endBytes = new Uint8Array(new Int32Array($end).buffer);\n const stridesBytes = new Uint8Array(new Int32Array($strides).buffer);\n\n const outputShapeBytes =\n new Uint8Array(new Int32Array(finalShapeSparse).buffer);\n const outStridesBytes = new Uint8Array(\n new Int32Array(util.computeStrides(finalShapeSparse)).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmStridedSlice(\n xId, xStridesBytes, x.shape.length, beginBytes, endBytes, stridesBytes,\n outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);\n\n result = reshape({inputs: {x: out}, backend, attrs: {shape: finalShape}});\n\n backend.disposeData(out.dataId);\n }\n\n return result;\n}\n\nexport const stridedSliceConfig: KernelConfig = {\n kernelName: StridedSlice,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: stridedSlice as {} as KernelFunc\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/StridedSlice.js.map
No license file was found, but licenses were detected in source scan.

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backend.dataIdMap.get(b.dataId).id;\n\n const outputType = dtype != null ? dtype : a.dtype;\n const newShape = backend_util.assertAndGetBroadcastShape(a.shape, b.shape);\n const out = backend.makeOutput(newShape, outputType);\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(newShape) === 0) {\n   return out;\n }\n\n const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const kernelFunc = () => wasmFunc(\n   aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n   CppDType[a.dtype], outId);\n\n // Currently only some float operations support full broadcast.\n if (supportsFullBroadcast && a.dtype === 'float32') {\n   kernelFunc();\n   return out;\n }\n\n const aBroadcastDims = backend_util.getBroadcastDims(a.shape, newShape);\n const bBroadcastDims = backend_util.getBroadcastDims(b.shape, newShape);\n const loopsOverAllOfA = aBroadcastDims.every((v, i) => v === i);\n const loopsOverAllOfB = bBroadcastDims.every((v, i) => v === i);\n if (loopsOverAllOfA && loopsOverAllOfB) {\n   kernelFunc();\n   return out;\n } else {\n   throw new Error(\n   `Broadcasting along outer dims is not yet ` +\n   `supported for ${a.dtype} ${kernelName}.`);\n }\n}\n\nreturn {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/binary_kernel.js.map
No license file was found, but licenses were detected in source scan.

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AC,GAAG,CAAC,EAAE;QACrC,OAAO,IAAI,CAAC;KACb;IAED,0CAA0C;IAC1C,IAAI,QAAQ,CAAC,UAAU,CAAC,MAAM,CAAC,EAAE;QAC/B,OAAO,IAAI,CAAC;KACb;IAED,OAAO,KAAK,CAAC;AACf,CAAC,CAAC;AACF,gBAAgB,CAAC,YAAY,EAAE,aAAa,CAAC,CAAC;AAE9C,0CAA0C;AAC1C,gDAAgD;AAChD,8CAA8C;AAC9C,OAAO,CAAC,kCAAkC,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\n// Import core for side effects (e.g. flag registration)\nimport '@tensorflow/tfjs-core';\n// tslint:disable-next-line:no-imports-from-dist\nimport '@tensorflow/tfjs-core/dist/public/chained_ops/register_all_chained_ops';\n// tslint:disable-next-line: no-imports-from-dist\nimport '@tensorflow/tfjs-core/dist/register_all_gradients';\n\n// tslint:disable-next-line: no-imports-from-dist\nimport {setTestEnvs, setupTestFilters, TestFilter} from '@tensorflow/tfjs-core/dist/jasmine_util';\n\nsetTestEnvs([{name: 'test-wasm', backendName: 'wasm', isDataSync: true}]);\n\n/**\n * Tests that have these substrings in their name will be included unless one\n * of the strings in excludes appears in the name.\n */\nconst TEST_FILTERS: TestFilter[] = [\n {\n   startsWith: 'tensor ',\n   excludes: [\n   'complex',   // Complex numbers not supported yet\n   'derivative', // Gradients not yet supported.\n   // Downcasting broken, see: https://github.com/tensorflow/tfjs/issues/2590\n   'Tensor2D float32 -> bool', 'Tensor2D int32 -> bool'\n   ]\n },\n {include: 'softmax'},\n {\n   include: 'pow',\n   excludes: [\n   'gradient', // zerosLike not defined yet.\n   'broadcasting same rank Tensors different shape', // Broadcasting along\n   // inner dims not\n   // supported yet.\n   ]\n },\n {\n   include: 'add ',\n   excludes: [\n   'gradient',   // Gradient is missing.\n   'upcasts when dtypes dont match', // Uses the 'complex' dtype.\n   'complex',   // Complex numbers not supported yet\n   ]\n },\n {include: 'depthToSpace'},\n {\n   include: 'avgPool',\n   excludes: [\n   'gradient',   // Not yet implemented.\n   'avgPool3d', // Not yet implemented.\n   ]\n },\n {\n   include: 'relu',\n   excludes: [\n   'derivative',   // Not yet implemented.\n   'gradient',   // Not yet implemented.\n   'valueAndGradients',   // Not yet implemented.\n   'broadcasted bias',   // Not yet implemented.\n   'fused A x B with 2d bias' // Fused matMul with 2D bias not yet\n   // supported.\n   ]\n },\n {\n   include: 'maxPool',\n   excludes: [\n   'maxPoolBackprop',   // Not yet implemented.\n   'maxPool3d',   // Not yet implemented.\n   'maxPool3dBackprop', // Not yet implemented.\n   'ignores NaNs',   // Actual != expected.\n   'maxPoolWithArgmax'   // Not yet implemented.\n\n   ]\n },\n {include: 'cropAndResize'},\n {\n   include: 'resizeBilinear',\n   excludes: [\n   'gradients', // Not yet implemented.\n   ]\n },\n {\n   include: 'matmul ',\n   excludes: [\n   'valueAndGradients',\n   // Gradients not defined yet\n   'gradient',   // Gradients not defined yet\n   'zero in its shape',\n   // Zero in shapes aren't supported yet\n   'matmul followed by mul', // mul not supported yet\n   'upcasts',\n   // Upcasting not supported yet.\n   'fused A x B with 2d bias', // Fused matMul with 2D bias not yet\n   // supported.\n   ]\n },\n {\n   include: 'depthwiseConv2D ',\n   excludes: [\n   'broadcasted bias', // Broadcasted bias not yet supported.\n   'gradient',   // Gradients not defined yet.\n   'NCHW',   // xnn pack does not support channels first.\n   ]\n },\n {\n   include: 'conv2d ',\n   excludes: [\n   'broadcasted bias', // Broadcasted bias not yet supported.\n   'gradient',   // Gradients not defined yet.\n   'backProp input x=[2,3,3,1] f=[2,2,1,1] s=1 p=0', // Gradients not\n   // defined.\n   'NCHW', // xnn pack does not support channels first.\n   // Issue: https://github.com/tensorflow/tfjs/issues/3104.\n   // Actual != expected.\n   'relu bias stride 2 x=[1,8,8,16] f=[3,3,16,1] s=[2,2] d=8 p=same',\n   'prelu bias stride 2 x=[1,8,8,16] f=[3,3,16,1] s=[2,2] d=8 p=same',\n   ]\n },\n {include: 'conv2dTranspose ', excludes: ['gradient']},\n {\n   include: 'prelu ',\n   excludes: [\n   'gradient', //

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Gradient is missing.\n      'derivative'  // Missing gradient.\n    ]\n  },\n  {\n    include: ' cast ',\n    excludes: [\n
'complex',  // Complex numbers not yet implemented.\n      'shallow slice an input that was cast'  // Slice is not
implemented.\n    ]\n  },\n  {\n    include: 'gather',\n    excludes: [\n      'gradient'  // Not yet implemented.\n    ]\n  },\n
{\n    include: 'sigmoid ',\n    excludes: [\n      'sigmoidCrossEntropy',  // Not yet implemented.\n      'gradient'
// Not
 yet implemented.\n    ]\n  },\n  {include: 'scatterND '},\n  {\n    include: 'abs ',\n    excludes: [\n      'gradient',  // Not
yet implemented.\n      'complex'    // Complex numbers not supported yet.\n    ]\n  },\n  {\n    include: 'sub ',\n
excludes: [\n      'complex',   // Complex numbers not yet implemented.\n      'gradient',  // Not yet implemented.\n
'upcasts',   // Upcasting not supported yet.\n    ]\n  },\n  {\n    include: 'mul ',\n    excludes: [\n      'complex',   //
Complex numbers not yet supported.\n      'gradient',  // Gradient not defined yet.\n    ]\n  },\n  {\n    include: 'div ',\n
 excludes: [\n      'gradient',  // Gradient not defined yet.\n      'upcasts',   // Cast not supported yet.\n      'divNoNan'   //
divNoNan not yet implemented.\n    ]\n  },\n  {\n    include: 'batchNorm',\n    excludes: [\n      'gradient'  // Gradient
is missing.\n    ]\n  },\n  {include: 'slice '},\n  {include: 'stridedSlice '},\n  {include: 'rotate '},\n  {include:
'rotateWithOffset'},\n
  {include: 'flipLeftRight '},\n  {include: 'square '},\n  {include: 'squaredDifference'},\n  {\n    startsWith: 'min ',\n
excludes: [\n      '2D, axis=0',  // Permuted axes requires transpose, which is not yet\n                    // implemented.\n
  'index corresponds to start of a non-initial window',  // argMin not yet\n                                                    //
implemented.,\n      'gradient'  // Gradients not yet implemented\n    ]\n  },\n  {\n    startsWith: 'max ',\n    excludes:
[\n      'gradient'  // Gradients not yet implemented\n    ]\n  },\n  {\n    include: 'concat',\n    excludes: [\n      'complex',
// Complex numbers not supported yet\n      'gradient'  // Split is not yet implemented\n    ]\n  },\n  {include:
'transpose'},\n  {include: 'oneHot'},\n  {include: 'split'},\n  {include: 'pad ', excludes: ['complex', 'zerosLike']},\n  {\n
 include: 'clip',\n    excludes: [\n      'gradient',\n      'propagates NaNs'  // clip
 delegates to XNNPACK which does not make\n                    // guarantees about behavior of nans.\n    ]\n  },\n
{include: 'addN'},\n  {include: 'nonMaxSuppression'},\n  {include: 'argmax', excludes: ['gradient']},\n  {include: 'exp
'},\n  {\n    include: 'elu',\n    excludes: [\n      'derivative',  // Not yet implemented.\n      'gradient',    // Not yet
implemented.\n      'selu'         // Not yet implemented.\n    ]\n  },\n  {include: 'unstack'},\n  {\n    include:
'minimum',\n    excludes: [\n      'gradient',                    // Not yet implemented.\n      'broadcasts 2x1
Tensor2D and 2x2 Tensor2D'  // Broadcasting along inner\n                                                    // dims not supported
yet.\n    ]\n  },\n  {\n    include: 'maximum',\n    excludes: [\n      'gradient',                    // Not yet
implemented.\n      'broadcasts 2x1 Tensor2D and 2x2 Tensor2D'  // Broadcasting along inner\n


                // dims not supported yet.\n    ]\n  },\n  {\n    include: 'log ',\n  },\n  {\n    startsWith: 'equal ',\n    excludes:
[\n      'broadcasting Tensor2D shapes',  // Broadcasting along outer dims not\n                                                    //
supported
yet.\n      'broadcasting Tensor3D shapes',  // Same as above.\n      'broadcasting Tensor4D shapes',  // Same as
above.\n      'string'\n    ]\n  },\n  {\n    include: 'greater ',\n    excludes: [\n      'broadcasting Tensor2D shapes',  //
Broadcasting along outer dims not\n                                                    // supported yet.\n      'broadcasting Tensor3D shapes',
// Same as above.\n      'broadcasting Tensor4D shapes',  // Same as above.\n      'string'\n    ]\n  },\n  {\n    include:
'greaterEqual',\n    excludes: [\n      'gradient',                    // Not yet implemented.\n      'broadcasting Tensor2D
shapes',  // Broadcasting along outer dims not\n                                                    // supported yet.\n
 'broadcasting Tensor3D shapes',  // Same as above.\n      'broadcasting Tensor4D shapes',  // Same as above.\n
'string'\n    ]\n  },\n  {\n    include: 'less ',\n    excludes: [\n      'broadcasting Tensor2D shapes',   // Broadcasting along
outer dims not\n                                                    // supported yet.\n      'broadcasting Tensor3D shapes',   // Same as above.\n
   'broadcasting Tensor3D float32',  // Same as above.\n      'broadcasting Tensor4D shapes',   // Same as above.\n
'string'\n    ]\n  },\n  {\n    include: 'lessEqual',\n    excludes: [\n      'gradient',                    // Not yet implemented.\n
   'broadcasting Tensor2D shapes',   // Broadcasting along outer dims not\n                                                    // supported
yet.\n      'broadcasting Tensor3D shapes',   // Same as above.\n      'broadcasting Tensor3D float32',  // Same as
above.\n      'broadcasting Tensor4D shapes',   // Same as above.\n      'string'\n    ]\n  },\n  {\n    include:
```

'notEqual',\n excludes: [\n 'broadcasting Tensor2D shapes', // Broadcasting along outer dims not\n // supported yet.\n 'broadcasting Tensor3D shapes', // Same as above.\n 'broadcasting Tensor4D shapes', // Same as above.\n 'string'\n]\n },\n {\n include: 'mean ',\n excludes: [\n 'axis=0', // Reduction not supported along inner dimensions.\n]\n },\n {startsWith: 'reverse'},\n {startsWith: 'sum '},\n {startsWith: 'cumsum'},\n {\n startsWith: 'logicalAnd ',\n excludes: [\n 'broadcasting Tensor2D shapes', // Broadcasting along outer dimensions\n // not yet supported.\n 'broadcasting Tensor3D shapes', // Same as above.\n 'broadcasting Tensor4D shapes', // Same as above.\n]\n },\n {\n startsWith: 'tile ',\n excludes: [\n 'gradient', // Gradient not yet implemented.\n 'string tensor' // String tensors not yet implemented.\n]\n },\n {startsWith: 'sin '},\n {\n startsWith: 'cos ',\n excludes: [\n 'gradient', // Gradient not yet implemented.\n]\n },\n {\n startsWith: 'cosh',\n excludes: [\n 'gradient' // Gradient not yet implemented.\n]\n },\n {\n startsWith: 'tan',\n excludes: ['gradient'] // Gradient not yet implemented.\n\n },\n {\n startsWith: 'tanh ',\n excludes: ['gradient'] // Gradient not yet implemented.\n },\n {\n startsWith: 'rsqrt ',\n excludes: ['gradient'] // Gradient not yet implemented.\n },\n {\n startsWith: 'sqrt ',\n excludes: ['gradient'] // Gradient not yet implemented.\n },\n {\n startsWith: 'where ',\n excludes: [\n '1D condition with higher rank a and b', // Fill not yet implemented.\n 'gradient' // Gradient not yet implemented.\n]\n },\n {\n startsWith: 'zerosLike',\n // Complex numbers not supported yet.\n excludes: ['complex'],\n },\n {\n startsWith: 'onesLike',\n // Complex numbers not supported yet.\n excludes: ['complex'],\n },\n {include: 'prod'},\n {include: 'floor'},\n {include: 'topk'},\n {include: 'expandDims'},\n {include: 'stack'},\n {\n include: 'round',\n // Pool is not supported yet.\n excludes: ['pool'],\n },\n {include: 'step kernel'},\n {include: 'ceil'},\n {include: 'mirrorPad'},\n {\n startsWith: 'all',\n excludes: [\n 'ignores NaNs' // Doesn't yet ignore NaN\n]\n },\n {\n startsWith: 'any',\n excludes: [\n 'ignores NaNs' // Doesn't yet ignore NaN\n]\n },\n {include: 'image.transform'},\n {include: 'batchToSpaceND'},\n {include: 'spaceToBatchND'},\n];\n\nconst customInclude = (testName: string) => {\n // Include all regular describe() tests.\n if (testName.indexOf('test-wasm') < 0) {\n return true;\n }\n\n // Include all of the wasm specific tests.\n if (testName.startsWith('wasm')) {\n return true;\n }\n\n return false;\n};\nsetupTestFilters(TEST_FILTERS, customInclude);\n\n// Import and run all the tests from core.\n// tslint:disable-next-line:no-imports-from-dist\n// tslint:disable-next-line:no-require-imports\nrequire('@tensorflow/tfjs-core/dist/tests');\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/setup_test.js.map
No license file was found, but licenses were detected in source scan.

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Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Unpack.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"BatchToSpaceND.js","sourceRoot":"","sources":["../../src/kernels/BatchToSpaceND.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAAE,cAAc,EAAE,MAAM,uBAAuB,CAAC;AAIxI,OAAO,EAAC,OAAO,EAAC,MAAM,WAAW,CAAC;AAClC,OAAO,EAAC,KAAK,EAAC,MAAM,SAAS,CAAC;AAC9B,OAAO,EAAC,aAAa,EAAC,MAAM,kBAAkB,CAAC;AAC/C,OAAO,EAAC,cAAc,EAAC,MAAM,mBAAmB,CAAC;AAEjD,MAAM,UAAU,eAAe,CAAC,IAAkB;IAChD,MAAM,EAAC,MAAM,EAAE,KAAK,EAAE,OAAO,EAAC,GAAG,IAAI,CAAC;IACtC,MAAM,EAAC,WAAW,EAAE,UAAU,EAAC,GAAG,KAAK,CAAC;IACxC,MAAM,EAAC,WAAW,EAAE,UAAU,EAAC,GAAG,OAAO,CAAC;IAE1C,MAAM,IAAI,GAAG,MAAM,CAAC,KAAK,CAAC,MAAM,CAAC;IACjC,MAAM,SAAS,GAAG,IAAI,KAAK,CAAC,IAAI,CAAC,CAAC;IACl

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util.sizeFromShape(reduceShape);\n let castedInput = input;\n if (input.dtype
 !== 'float32') {\n   castedInput =\n   cast({backend, inputs: {x: input}, attrs: {dtype: 'float32'}});\n   inputId =
backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(outShape, 'float32');\n if
(util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmMean(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed
tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n if (input.dtype
!== 'float32') {\n   backend.disposeData(castedInput.dataId);\n }\n\n return out;\n}\n\nexport const meanConfig:
KernelConfig = {\n kernelName: Mean,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: mean as {}
as KernelFunc\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Mean.js.map
No license file was found, but licenses were detected in source scan.

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* distributed under the License is distributed on an "AS IS" BASIS,
* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
* See the License for the specific language governing permissions and
* limitations under the License.
* ===
*/
/**
* @deprecated Use `setWasmPaths` instead.
* Sets the path to the `.wasm` file which will be fetched when the wasm
* backend is initialized. See
* https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers
 * for more details.
* @param path wasm file path or url
* @param usePlatformFetch optional boolean to use platform fetch to download
*   the wasm file, default to false.
*
* @doc {heading: 'Environment', namespace: 'wasm'}
*/

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/src/backend_wasm.ts
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/backend_wasm.d.ts
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/backend_wasm.js

No license file was found, but licenses were detected in source scan.

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AO,SAAS,CAAC,IAAI,CAAC,CAAC;QACzB,CAAC,CAAC,CAAC;QACH,MAAM,CAAC,MAAM,EAAE,CAAC,UAAU,CAAC,WAAW,CAAC,CAAC,CAAC,IAAI,CAAC,IAAI,CAAC,CAAC;QACpD,MAAM,UAAU,GAAG,IAAI,GAAG,CAAC;YACzB,WAAW,GAAG,wBAAwB;YACtC,WAAW,GAAG,6BAA6B;YAC3C,WAAW,GAAG,sCAAsC;SACrD,CAAC,CAAC;QACH,MAAM,CAAC,UAAU,CAAC,CAAC,CAAC,SAAS,CAAC,QAAQ,CAAC,CAAC,CAAC;QACzC,CAAC,CAAC,CAAC;QACH,IAEN,EAAE,CAAC,oEAAoE;QAChE,sBAAsB,EAAE,C1B,KAAK,IAAI,EAAE;QACT,MAAM,gBAAgB,GAAG,IAAI,CAAC;QAC9C,QAAC9B,EAAE,CAAC,iBAAiB,EAAE,CAAC,CAAC,CAAC

```
`env.specFilter` in `setup_test.ts` for details.\n */\ndescribeWithFlags('wasm read/write', ALL_ENVS, () => {\n it('write and read values', async () => {\n  const x = tf.tensor1d([1, 2, 3]);\n  test_util.expectArraysClose([1, 2, 3], await x.data());\n });\n\n it('allocate repetitively and confirm reuse of heap space', () => {\n  const backend = tf.backend() as BackendWasm;\n  const size = 100;\n  // Allocate for the first time, record the memory offset and dispose.\n  const t1 = tf.zeros([size]);\n  const memOffset1 = backend.getMemoryOffset(t1.dataId);\n t1.dispose();\n\n  // Allocate again and make sure the offset is the same (memory was reused).\n  const t2 = tf.zeros([size]);\n  const memOffset2 = backend.getMemoryOffset(t2.dataId);\n
  // This should fail in case of a memory leak.\n  expect(memOffset1).toBe(memOffset2);\n });\n\n it('allocates buffers with byteOffsets', async () => {\n  const data = [-0.5, 0.5, 3.14];\n  const buffer = new ArrayBuffer(32);\n  const view = new Float32Array(buffer, 8, data.length);\n\n  // Write values to buffer.\n  for (let i = 0; i < data.length; ++i) {\n   view[i] = data[i];\n  }\n\n  const t = tf.tensor(view);\n  // Tensor values should match.\n test_util.expectArraysClose(await t.data(), view);\n });\n});\n\ndescribeWithFlags('wasm init', BROWSER_ENVS, () => {\n beforeEach(() => {\n  registerBackend('wasm-test', async () => {\n   const {wasm} = await init();\n return new BackendWasm(wasm);\n  }, 100);\n\n  // Silences backend registration warnings.\n  spyOn(console, 'warn');\n  spyOn(console, 'log');\n });\n\n afterEach(() => {\n  resetWasmPath();\n  removeBackend('wasm-test');\n });\n\n it('backend init fails when the
 path is invalid', async () => {\n  setWasmPath('invalid/path');\n  let wasmPath: string;\n  const realFetch = fetch;\n  spyOn(self, 'fetch').and.callFake((path: string) => {\n   wasmPath = path;\n   return realFetch(path);\n });\n  expect(await tf.setBackend('wasm-test')).toBe(false);\n  expect(wasmPath).toBe('invalid/path');\n });\n\n it('backend init fails when setWasmPaths is called with ' +\n  'an invalid prefix',\n  async () => {\n setWasmPaths('invalid/prefix/');\n  let wasmPath: string;\n  const realFetch = fetch;\n  spyOn(self, 'fetch').and.callFake((path: string) => {\n  wasmPath = path;\n  return realFetch(path);\n  });\n expect(await tf.setBackend('wasm-test')).toBe(false);\n  expect(wasmPath).toContain('invalid/prefix');\n  });\n\n it('backend init fails when setWasmPaths is called with ' +\n  'an invalid fileMap',\n  async () => {\n setWasmPaths({\n  'tfjs-backend-wasm.wasm':
 'invalid/path',\n  'tfjs-backend-wasm-simd.wasm': 'invalid/path',\n  'tfjs-backend-wasm-threaded-simd.wasm': 'invalid/path'\n  });\n  let wasmPathPrefix: string;\n  const realFetch = fetch;\n  spyOn(self, 'fetch').and.callFake((path: string) => {\n  wasmPathPrefix = path;\n  return realFetch(path);\n  });\n expect(await tf.setBackend('wasm-test')).toBe(false);\n  expect(wasmPathPrefix).toBe('invalid/path');\n  });\n\n it('setWasmPaths throws error when called without specifying a path for ' +\n  'each binary',\n  async () => {\n
  expect(() => {\n  setWasmPaths({\n  'tfjs-backend-wasm.wasm': '/base/wasm-out/tfjs-backend-wasm.wasm'\n  });\n  }).toThrow();\n  });\n\n it('backend init works when the path is valid and use platform fetch',\n  async () => {\n  const usePlatformFetch = true;\n  const validPrefix = '/base/wasm-out/';\n
  setWasmPaths(validPrefix,
 usePlatformFetch);\n  let wasmPath: string;\n  const realFetch = util.fetch;\n  spyOn(util, 'fetch').and.callFake((path: string) => {\n  wasmPath = path;\n  return realFetch(path);\n  });\n expect(await tf.setBackend('wasm-test')).toBe(true);\n  const validPaths = new Set([\n  validPrefix + 'tfjs-backend-wasm.wasm',\n  validPrefix + 'tfjs-backend-wasm-simd.wasm',\n  validPrefix + 'tfjs-backend-wasm-threaded-simd.wasm',\n  ]);\n  expect(validPaths).toContain(wasmPath);\n  });\n\n it('backend init works when the wasm paths overrides map is valid and ' +\n  'using platform fetch',\n  async () => {\n const usePlatformFetch = true;\n  const validPrefix = '/base/wasm-out/';\n  setWasmPaths(\n  {\n 'tfjs-backend-wasm.wasm': '/base/wasm-out/tfjs-backend-wasm.wasm',\n  'tfjs-backend-wasm-simd.wasm':\n  '/base/wasm-out/tfjs-backend-wasm-simd.wasm',\n
  'tfjs-backend-wasm-threaded-simd.wasm':\n  '/base/wasm-out/tfjs-backend-wasm-threaded-simd.wasm'\n  },\n  usePlatformFetch);\n  let wasmPath: string;\n  const realFetch = util.fetch;\n spyOn(util, 'fetch').and.callFake((path: string) => {\n  wasmPath = path;\n  return realFetch(path);\n });\n  expect(await tf.setBackend('wasm-test')).toBe(true);\n  const validPaths = new Set([\n  validPrefix + 'tfjs-backend-wasm.wasm',\n  validPrefix + 'tfjs-backend-wasm-simd.wasm',\n  validPrefix + 'tfjs-backend-
```

wasm-threaded-simd.wasm',\n]);\n expect(validPaths).toContain(wasmPath);\n });\n\n it('backend init works when the path is valid and use platform fetch',\n async () => {\n const usePlatformFetch = true;\n const validPath = '/base/wasm-out/tfjs-backend-wasm.wasm';\n setWasmPath(validPath, usePlatformFetch);\n let wasmPath:
string;\n const realFetch = util.fetch;\n spyOn(util, 'fetch').and.callFake((path: string) => {\n wasmPath = path;\n return realFetch(path);\n });\n expect(await tf.setBackend('wasm-test')).toBe(true);\n expect(wasmPath).toBe(validPath);\n });\n\n // Disabling this test because it intermittently times out on CI.\n // tslint:disable-next-line: ban\n xit('backend init fails when the path is invalid and use platform fetch',\n async () => {\n const usePlatformFetch = true;\n setWasmPath('invalid/path', usePlatformFetch);\n let wasmPath: string;\n const realFetch = util.fetch;\n spyOn(util, 'fetch').and.callFake((path: string) => {\n wasmPath = path;\n return realFetch(path);\n });\n expect(await tf.setBackend('wasm-test')).toBe(false);\n expect(wasmPath).toBe('invalid/path');\n });\n\n it('backend init succeeds with default path', async () => {\n expect(await
tf.setBackend('wasm-test')).toBe(true);\n });\n\n it('setWasmPath called too late', async () => {\n // Set an invalid path.\n setWasmPath('invalid/path');\n await tf.setBackend('wasm-test');\n\n // Setting the path too late.\n expect(() => setWasmPath('too/late'))\n .toThrowError(/The WASM backend was already initialized. Make sure/);\n });\n});\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/index_test.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Fill.js","sourceRoot":"","sources":["../../src/kernels/Fill.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;GAeG;AAGH,OAAO,EAAC,IAAI,EAAY,MAAM,uBAAuB,CAAC;AAItD,MAAM,UAAU,IAAI,CAAC,A8C;IACjE,MAAM,EAAC,KAAK,EAAE,KAAK,EAAE,KAAK,EAAE,KAAK,EAAE,KAAK,EAAE,KAAK,EAAE,KAAK,EAAC,GAAG,IAAI,CAAC;IACrD,MAAM,GAAG,GAAG,IAAI,CAAC,aAAa,CAAC,KAAK,EAAE,KAAK,CAAC,CAAC;IAC7C,MAAM,OAAO,GAAG,IAAI,CAAC,kBAAkB,CAAC,GAAG,CAAC,CAAC;IAC7C,OAAO,GAAG,CAAC;AACb,CAAC;AAED,MAAM,CAAC,MAAM,QAAQ,GAAiB,CAAC,IAAI,EAAE,IAAI,EAAE,IAAI,EAAE

No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Sum.js","sourceRoot":"","sources":["../../src/kernels/Sum.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAA4B,GAAG,EAAmC,IAAI,EAAC,MAAM,uBAAuB,CAAC;AAIzH,OAAO,EAAC,uBAAuB,EAAC,MAAM,gBAAgB,CAAC;AACvD,OAAO,EAAC,QAAQ,EAAC,MAAM,SAAS,CAAC;AAEjC,OAAO,EAAC,IAAI,EAAC,MAAM,QAAQ,CAAC;AAE5B,OAAO,EAAC,KAAK,EAAC,MAAM,SAAS,CAAC;AAC9

axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n   const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   if (transposedId !== xId) {\n   // transpose was not a no-op. We will need to dispose of this\n   // once we are done.\n   input = transposed;\n   inputId = transposedId;\n   reductionAxes = backend_util.getInnerMostAxes(\n   reductionAxes.length, input.shape.length);\n   }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n   'sum', reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n   backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n   wasmSum(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n return out;\n}\n\nexport const sumConfig: KernelConfig = {\n kernelName: Sum,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sum as {} as KernelFunc\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Sum.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"ArgMax.js","sourceRoot":"","sources":["../../src/kernels/ArgMax.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,uBAAuB,EAAC,MAAM,EAAuD,IAAI,EAAC,MAAM,uBAAuB,CAAC;AAIxG,OAAO,EAAC,uBAAuB,EAAC,MAAM,gBAAgB,CAAC;AACvD,OAAO,EAAC,QAAQ,EAAC,MAAM,QAAQ,CAAC;AAChC,OAAO,EAAC,MAAM,EAAC,MAAM,UAAU,CAAC;AAEhC,OAAO,EAAC,IAAI,EAAC,MAAM,QAAQ,CAAC;AAC5B

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==========\n
*/\n\nimport {ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from
'./kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmFunc: (\n xId: number, dtype: number, outerSize:
number, innerSize: number,\n
  outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmFunc =
backend.wasm.cwrap(ArgMax, null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', //
outer_size\n 'number', // inner_size\n 'number' // out_id\n]);\n}\n\nfunction argmax(\n args: {inputs:
ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs}) {\n const {backend, inputs, attrs} = args;\n const
{axis} = attrs as {} as ArgMaxAttrs;\n const {x} = inputs as {} as ArgMaxInputs;\n const xId =
backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes,
inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n
const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose
was not a no-op. We will need to dispose of this\n // once we are done.\n input = transposed;\n inputId =
transposedId;\n }\n
 }\n\n const outShape = input.shape.slice(0, -1);\n const out = backend.makeOutput(outShape, 'int32');\n const
outId = backend.dataIdMap.get(out.dataId).id;\n const outerSize = util.sizeFromShape(out.shape);\n const
innerSize = input.shape[axes[0]];\n wasmFunc(inputId, CppDType[input.dtype], outerSize, innerSize, outId);\n\n if
(inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n
}\n\n return out;\n}\n\nexport const argMaxConfig: KernelConfig = {\n kernelName: ArgMax,\n backendName:
'wasm',\n kernelFunc: argmax as {} as KernelFunc,\n setupFunc: setup\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/ArgMax.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Elu.js","sourceRoot":"","sources":["../../src/kernels/Elu.ts"],"names":[],"mappings":"AAAA;;;;;;
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C","sourcesContent":["/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under
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License.\n
 * ==========\n
*/\nimport {Elu, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'./unary_kernel';\n\nexport const eluConfig: KernelConfig = createUnaryKernelConfig(Elu);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Elu.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"ExpandDims.js","sourceRoot":"","sources":["../../src/kernels/ExpandDims.ts"],"names":[],"map
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MAAM,EAAC,MAAM,EAAE,KAAK,EAAE,OAAO,EAAC,GAAG,IAAI,CAAC;IACtC,MAAM,EAAC,KAAK,EAAC,GAAG,MAAM,CAAC;IACvB,MAAM,EAAC,GAAG,EAAC,GAAG,KAAK,CAAC;IAEpB,MAAM,SAAS,,GAAG,KAAK,CAAC,KAAK,CAAC,MAAM,CAAC;IACrC,MAAM,QAAQ,GAAG,KAAK,CAAC,KAAK,CAAC,KAAK,CAAC,KAAK,,EAAE,CAAC;IACrC,IAAI,IAAI,GAAG,GAAG,CAAC;IACf,IAAI,GAAG,GAAG,CAAC,KAAK,,EAAE;QACX,mDAAmD;QACnD,IAAI,CAAC,MAAM,,CAAC,CAAC,CAAC,SAAS,,GAAG,CAAC,CAAC,IAAI,,GAAG,,EAAC,vB,GAAG,,EAAE,CAAC,iCAAiC,,EAAE,CAAC,SAAS,,GAAG,CAAC,CAAC,KAAK,CAAC,pD,SAAS,,GAAG,CAAC,CAAC,C;QACtG,IAAI,GAAG,SAAS,,GAAG,GAAG,GAAG,CAAC,CAAC,C;KAC5B;IACD,QAAQ,CAAC,MAAM,,CAAC,IAAI,,EAAE,CAAC,IAAI,,EAAE,CAAC,IAAI,,EAAE

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Exp.js.map
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```
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 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
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 * limitations under the License.
 * =============================================================================
 */
/**
 * @deprecated Use `setWasmPaths`
 instead.
 * Sets the path to the `.wasm` file which will be fetched when the wasm
 * backend is initialized. See
 * https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers
 * for more details.
 * @param path wasm file path or url
 * @param usePlatformFetch optional boolean to use platform fetch to download
 *     the wasm file, default to false.
 *
 * @doc {heading: 'Environment', namespace: 'wasm'}
 */
```

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/tf-backend-wasm.es2017.js
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Pow.js","sourceRoot":"","sources":["../../src/kernels/Pow.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;GAeG;AACH,OAAO,EAAE,GAAG,EAAE,MAAM,EAAE,uBAAuB,CAAC;AAExD,OAAO,EAAE,wBAAwB,EAAE,MAAM,EAAE,iBAAiB,CAAC;AACzD,OAAO,EAAE,qBAAqB,EAAE,KAAK,EAAE,CAAC;AACxC,OAAO,EAAE,MAAM,EAAE,MAAM,EAAE,SAAS,EAAE,MAAM,EAAE,MAAM,EAAE,MAAM

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and\n * limitations under the License.\n *
==========\n
*/\nimport {KernelConfig, Pow} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\nconst supportsFullBroadcast = false;\nexport const powConfig: KernelConfig =\n
createBinaryKernelConfig(Pow, supportsFullBroadcast);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Pow.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"index.js","sources":["../../src/kernels/types.ts","../../src/kernels/_FusedMatMul.ts","../../src/kernels/unary_kernel.ts","../../src/kernels/Abs.ts","../../src/kernels/binary_kernel.ts","../../src/kernels/Add.ts","../../src/kernels/AddN.ts","../../src/kernels/Identity.ts","../../src/kernels/Transpose.ts","../../src/kernels/kernel_utils.ts","../../src/kernels/All.ts","../../src/kernels/Any.ts","../../src/kernels/ArgMax.ts","../../src/kernels/AvgPool.ts","../../src/kernels/Reshape.ts","../../src/kernels/BatchMatMul.ts","../../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Concat_impl.js","../../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Range_impl.js","../../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Slice.js","../../src/kernels/Slice.ts","../../src/kernels/BatchToSpaceND.ts","../../src/kernels/Cast.ts","../../src/kernels/Ceil.ts","../../src/kernels/ClipByValue.ts","../../src/kernels/Concat.ts","../../src/kernels/Conv2D.ts","../../src/kernels/Conv2DBackpropInput.ts","../../src/kernels/Cos.ts","../../src/kernels/Cosh.ts","../../src/kernels/CropAndResize.ts","../../src/kernels/Cumsum.ts","../../src/kernels/DepthToSpace.ts","../../src/kernels/DepthwiseConv2dNative.ts","../../src/kernels/Elu.ts","../../src/kernels/Equal.ts","../../src/kernels/Exp.ts","../../src/kernels/ExpandDims.ts","../../src/kernels/Fill.ts","../../src/kernels/FlipLeftRight.ts","../../src/kernels/Floor.ts","../../src/kernels/FloorDiv.ts","../../src/kernels/FusedBatchNorm.ts","../../src/kernels/FusedConv2D.ts","../../src/kernels/FusedDepthwiseConv2D.ts","../../src/kernels/GatherNd.ts","../../src/kernels/GatherV2.ts","../../src/kernels/Greater.ts","../../src/kernels/GreaterEqual.ts","../../src/kernels/LeakyRelu.ts","../../src/kernels/Less.ts","../../src/kernels/LessEqual.ts","../../src/kernels/Log.ts","../../src/kernels/LogicalAnd.ts","../../src/kernels/Max.ts","../../src/kernels/Maximum.ts","../../src/kernels/MaxPool.ts","../../src/kernels/Mean.ts","../../src/kernels/Min.ts","../../src/kernels/Minimum.ts","../../src/kernels/MirrorPad.ts","../../src/kernels/Multiply.ts","../../src/kernels/Neg.ts","../../src/kernels/NonMaxSuppression_util.ts","../../src/kernels/NonMaxSuppressionV3.ts","../../src/kernels/NonMaxSuppressionV4.ts","../../src/kernels/NonMaxSuppressionV5.ts","../../src/kernels/NotEqual.ts","../../src/kernels/OneHot.ts","../../src/kernels/OnesLike.ts","../../src/kernels/Pack.ts","../../src/kernels/PadV2.ts","../../src/kernels/Pow.ts","../../src/kernels/Prelu.ts","../../src/kernels/Prod.ts","../../src/kernels/Range.ts","../../src/kernels/RealDiv.ts","../../src/kernels/Relu.ts","../../src/kernels/Relu6.ts","../../src/kernels/ResizeBilinear.ts","../../src/kernels/Reverse.ts","../../src/kernels/RotateWithOffset.ts","../../src/kernels/Round.ts","../../src/kernels/Rsqrt.ts","../../src/kernels/ScatterNd.ts","../../src/kernels/Select.ts","../../src/kernels/Sigmoid.ts","../../src/kernels/Sin.ts","../../src/kernels/Softmax.ts","../../src/kernels/SpaceToBatchND.ts","../../src/kernels/SplitV.ts","../../src/kernels/Sqrt.ts","../../src/kernels/Square.ts","../../src/kernels/SquaredDifference.ts","../../src/kernels/Step.ts","../../src/kernels/StridedSlice.ts","../../src/kernels/Sub.ts","../../src/kernels/Sum.ts","../../src/kernels/Tan.ts","../../src/kernels/Tanh.ts","../../src/kernels/Tile.ts","../../src/kernels/TopK.ts","../../src/kernels/Transform.ts","../../src/kernels/Unpack.ts","../../src/kernels/ZerosLike.ts","../../src/register_all_kernels.ts","../../src/flags_wasm.ts","../../wasm-out/tfjs-backend-wasm-threaded-simd.js","../../wasm-out/tfjs-backend-wasm-threaded-simd.worker.js","../../wasm-out/tfjs-backend-wasm.js","../../src/backend_wasm.ts","../../src/version.ts","../../src/base.ts"],"sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n *
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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\n// This enum must align with the enum defined in cc/backend.h.\nexport enum CppDType {\n float32 = 0,\n int32 = 1,\n bool = 2,\n string = 3,\n complex64 = 4\n}\n\n// Must match enum in cc/fusable_activations.h.\nexport enum FusableActivation {\n linear = 0,\n relu = 1,\n relu6 = 2,\n prelu = 3,\n leakyrelu = 4,\n sigmoid = 5,\n elu = 6\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n
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==========\n */\n\nimport {_FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet wasmFusedMatMul:\n   (aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n bShape: Uint8Array, bShapeSize:
 number, transposeA: boolean,\n   transposeB: boolean, activation: number, biasId: number,\n preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n   void;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedMatMul = backend.wasm.cwrap(_FusedMatMul, null /* void */, [\n   'number', // a_id\n   'array',   // a_shape\n   'number', // a_shape.length\n   'number', // b_id\n   'array',   // b_shape\n   'number', // b_shape.length\n   'number', // transpose_a\n   'number', // transpose_b\n   'number', // activation\n   'number', // biasId\n   'number', // preluActivationWeightsId\n   'number', // leakyreluAlpha\n   'number'   // out_id\n]);\n}\n\nfunction fusedBatchMatMul(args: {\n inputs: _FusedMatMulInputs,\n backend: BackendWasm,\n attrs: _FusedMatMulAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {a, b, bias, preluActivationWeights} = inputs;\n\n if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n   throw new Error(\n   `_FusedMatMul for non non-float32 tensors not yet supported.`);\n }\n\n const {transposeA, transposeB, activation, leakyreluAlpha} = attrs;\n const aId = backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n\n let biasId = 0;\n if (bias != null) {\n   const biasData = backend.dataIdMap.get(bias.dataId);\n   if (biasData.shape.length !== 1) {\n   throw new Error(\n   `_FusedMatMul only supports rank-1 bias but got ` +\n   `rank ${biasData.shape.length}.`);\n   }\n   biasId = biasData.id;\n }\n const preluActivationWeightsId = preluActivationWeights == null ?\n   0 :\n   backend.dataIdMap.get(preluActivationWeights.dataId).id;\n const fusedActivation =\n   FusableActivation[activation as {} as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n   throw new Error(\n   `${activation} activation not yet supported for FusedConv2D ` +\n   `in the wasm backend.`);\n }\n\n const leftDim = transposeA ? a.shape[2] : a.shape[1];\n const rightDim = transposeB ? b.shape[1] :
b.shape[2];\n const batchDim = a.shape[0];\n\n const out = backend.makeOutput([batchDim, leftDim, rightDim], a.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n\n wasmFusedMatMul(\n   aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n   transposeA, transposeB, fusedActivation, biasId, preluActivationWeightsId,\n   leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedMatMulConfig: KernelConfig = {\n kernelName: _FusedMatMul,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchMatMul as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may

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backend.wasm.cwrap(kernelName, null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // out_id\n]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: UnaryInputs}):\n TensorInfo {\n const {backend, inputs: {x}} = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(x.shape, outType || x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId, CppDType[x.dtype], outId);\n return out;\n }\n\n return {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n
*\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\nimport {Abs, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in
writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nexport function createBinaryKernelConfig(\n kernelName: string, supportsFullBroadcast: boolean,\n dtype?: DataType): KernelConfig {\n let wasmFunc:\n (aId: number, aShape: Uint8Array, aShapeLen: number, bId: number,\n bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) =>\n void;\n\n function setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(kernelName, null /* void
*/, [\n 'number', // a_id,\n 'array', // a_shape\n 'number', // a_shape.length\n 'number', // b_id\n 'array', // b_shape\n 'number', // b_shape.length\n 'number', // dtype\n 'number' // out_id\n]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: BinaryInputs}):\n TensorInfo {\n const {backend, inputs} = args;\n const {a, b} = inputs;\n const aId = backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n\n const outputType = dtype != null ? dtype : a.dtype;\n const newShape =

backend_util.assertAndGetBroadcastShape(a.shape, b.shape);\n const out = backend.makeOutput(newShape, outputType);\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(newShape) === 0) {\n   return out;\n }\n\n const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const kernelFunc = () => wasmFunc(\n   aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n   CppDType[a.dtype], outId);\n\n // Currently only some float operations support full broadcast.\n if (supportsFullBroadcast && a.dtype === 'float32') {\n   kernelFunc();\n   return out;\n }\n\n const aBroadcastDims = backend_util.getBroadcastDims(a.shape, newShape);\n const bBroadcastDims = backend_util.getBroadcastDims(b.shape, newShape);\n const loopsOverAllOfA = aBroadcastDims.every((v, i) => v === i);\n const loopsOverAllOfB = bBroadcastDims.every((v, i) => v === i);\n if (loopsOverAllOfA && loopsOverAllOfB) {\n   kernelFunc();\n   return out;\n } else {\n   throw new Error(\n   `Broadcasting along outer dims is not yet ` +\n   `supported for ${a.dtype} ${kernelName}.`);\n }\n};\n\nreturn {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {Add, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const addConfig: KernelConfig =\n createBinaryKernelConfig(Add, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {AddN, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmFunc:\n   (inputIds: Uint8Array, inputIdsLen: number, dtype: number, outId: number) =>\n   void;\n\nfunction setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(AddN, null /* void */, [\n   'array', // input_ids\n   'number', // input_ids.length\n   'number', // dtype\n   'number', // out_id\n]);\n}\n\nfunction addn(args: {inputs: TensorInfo[], backend: BackendWasm}) {\n const {inputs, backend} = args;\n const out = backend.makeOutput(inputs[0].shape, inputs[0].dtype);\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n   return out;\n }\n\n const inputIds = inputs.map(x => backend.dataIdMap.get(x.dataId).id);\n const inputIdsBytes = new Uint8Array(new Int32Array(inputIds).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmFunc(inputIdsBytes, inputIds.length, CppDType[out.dtype], outId);\n\n return out;\n}\n\nexport const addNConfig: KernelConfig = {\n kernelName: AddN,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: addn as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES

OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function identity(args: {inputs: IdentityInputs, backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const inVals = backend.typedArrayFromHeap(x);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const identityConfig: KernelConfig = {\n kernelName: Identity,\n backendName: 'wasm',\n kernelFunc: identity as {} as KernelFunc,\n};\n\n"/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {identity} from './Identity';\nimport {CppDType} from './types';\n\nlet wasmTranspose: (\n xId: number, xShape: Uint8Array, xShapeLength: number, dtype: CppDType,\n outId: number, perm: Uint8Array, permLength: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTranspose = backend.wasm.cwrap(Transpose, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // dtype\n 'number', // outId\n 'array', // perm\n 'number', // perm.length\n]);\n}\n\nexport function transpose(\n args:\n {inputs: TransposeInputs, backend: BackendWasm, attrs: TransposeAttrs}):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n\n // Reduce any dimensions with size one. Lower-rank transpose kernel performs\n // better due to simpler memory access pattern.\n const [reducedShape, perm] = removeOneSizeDims(inputs.x.shape, attrs.perm);\n\n let permIsNoOp = true;\n for (let i = 0; i < perm.length; i++) {\n if (perm[i] !== i) {\n permIsNoOp = false;\n }\n }\n const outShape = computeOutShape(inputs.x.shape, attrs.perm);\n const x = {\n dataId: inputs.x.dataId,\n shape: reducedShape,\n dtype: inputs.x.dtype\n };\n\n if (permIsNoOp) {\n const cloned = identity({inputs, backend});\n cloned.shape = outShape;\n return cloned;\n }\n\n const out = backend.makeOutput(outShape, x.dtype);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n const permBytes = new Uint8Array(new Int32Array(perm).buffer);\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n wasmTranspose(\n xId, xShapeBytes, x.shape.length,\n CppDType[x.dtype], outId, permBytes,\n perm.length);\n return out;\n}\n\nfunction computeOutShape(inShape: number[], perm: number[]): number[] {\n const outShape = new Array(inShape.length);\n for (let i = 0; i < outShape.length; i++) {\n outShape[i] = inShape[perm[i]];\n }\n return outShape;\n}\n\nfunction removeOneSizeDims(\n shape: number[], perm: number[]): [number[], number[]] {\n const newShape: number[] = [];\n const newPerm: number[] = [];\n for (let i = 0; i < shape.length; ++i) {\n if (shape[i] !== 1) {\n newShape.push(shape[i]);\n }\n if (shape[perm[i]] !== 1) {\n newPerm.push(perm[i]);\n }\n }\n for (let i = 0; i < newPerm.length; ++i) {\n let minValIdx = -1;\n for (let j = 0; j < newPerm.length; ++j) {\n if (newPerm[j] >= i &&\n (minValIdx === -1 || newPerm[minValIdx] > newPerm[j])) {\n minValIdx = j;\n }\n }\n newPerm[minValIdx] = i;\n }\n return [newShape, newPerm];\n}\n\nexport const

transposeConfig: KernelConfig = {\n kernelName: Transpose,\n backendName: 'wasm',\n kernelFunc: transpose as {} as KernelFunc,\n setupFunc: setup,\n};\n","/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {backend_util, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {transpose} from './Transpose';\n\n/**\n * Compute permutation axes and do a transpose if necessary.\n *\n * Used by reduction ops.\n * @param x input TensorInfo\n * @param axis reduction axes\n * @param backend wasm backend instance\n */\nexport function permuteAxesAndTranspose(\n   x: TensorInfo, axis: number|number[], backend: BackendWasm): {\n transposed: TensorInfo|null,\n axes: number[],\n originalAxes: number[],\n inputWasTransposed: boolean\n} {\n const xShape = x.shape;\n const xRank = x.shape.length;\n\n const originalAxes = util.parseAxisParam(axis, xShape);\n let axes = originalAxes;\n const permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n let xTransposed = null;\n let inputWasTransposed = false;\n if (permutedAxes != null) {\n   const newShape: number[] = new Array(xRank);\n   for (let i = 0; i < newShape.length; i++) {\n   newShape[i] = xShape[permutedAxes[i]];\n   }\n\n   axes = backend_util.getInnerMostAxes(axes.length, xRank);\n\n   xTransposed =\n   transpose({inputs: {x}, attrs: {perm: permutedAxes}, backend});\n\n   const xId = backend.dataIdMap.get(x.dataId).id;\n   const transposedId = backend.dataIdMap.get(xTransposed.dataId).id;\n   if (transposedId !== xId) {\n   inputWasTransposed = true;\n   }\n }\n\n return {transposed: xTransposed, originalAxes, axes, inputWasTransposed};\n}\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations\n under the License.\n *\n ===\n */\n\nimport {All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmAll: (xId: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmAll = backend.wasm.cwrap(All, null /*void*/, ['number, number, number']);\n}\n\nfunction all(args: {backend: BackendWasm, inputs: AllInputs, attrs: AllAttrs}):\n   TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n   const transposedId\n = backend.dataIdMap.get(transposed.dataId).id;\n   input = transposed;\n   inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('all', axes, inputRank);\n const [outShape, reduceShape] =\n   backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n   wasmAll(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n

backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n return out;\n}\n\nexport const allConfig: KernelConfig = {\n kernelName: All,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc:
 all as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmAny:
 (xId: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmAny = backend.wasm.cwrap(Any, null /*void*/, ['number, number, number']);\n}\n\nfunction any(args: {backend: BackendWasm, inputs: AnyInputs, attrs: AnyAttrs}):\n   TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n   const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   input = transposed;\n   inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('any', axes, inputRank);\n const [outShape, reduceShape] =\n   backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize =
 util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n   wasmAny(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n return out;\n}\n\nexport const anyConfig: KernelConfig = {\n kernelName: Any,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: any as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n
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==========\n */\n\nimport {ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmFunc: (\n   xId: number, dtype: number, outerSize: number, innerSize: number,\n   outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n   'number', // x_id\n   'number', // dtype\n   'number', // outer_size\n   'number', // inner_size\n   'number'
   // out_id\n]);\n}\n\nfunction argmax(\n   args: {inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs}) {\n const {backend, inputs, attrs} = args;\n const {axis} = attrs as {} as ArgMaxAttrs;\n const {x}

= inputs as {} as ArgMaxInputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n   const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   if (transposedId !== xId) {\n   // transpose was not a no-op. We will need to dispose of this\n   // once we are done.\n   input = transposed;\n   inputId = transposedId;\n   }\n }\n\n const outShape = input.shape.slice(0, -1);\n const out = backend.makeOutput(outShape, 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const outerSize = util.sizeFromShape(out.shape);\n const innerSize = input.shape[axes[0]];\n
  wasmFunc(inputId, CppDType[input.dtype], outerSize, innerSize, outId);\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n return out;\n}\n\nexport const argMaxConfig: KernelConfig = {\n kernelName: ArgMax,\n backendName: 'wasm',\n kernelFunc: argmax as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations
 under the License.\n *
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/\n\nimport {AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmAvgPool: (\n   xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n   filterHeight: number, filterWidth: number, padTop: number, padRight: number,\n   padBottom: number, padLeft: number, strideHeight: number,\n   strideWidth: number, channels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmAvgPool = backend.wasm.cwrap(AvgPool, null / void */, [\n   'number', // xId\n   'number', // batchSize\n   'number', // inputHeight\n   'number', // inputWidth\n   'number', // filterHeight\n   'number', // filterWidth\n   'number', // padTop\n   'number', // padRight\n   'number', // padBottom\n   'number', // padLeft\n   'number', // strideHeight\n   'number', // strideWidth\n   'number', // channels\n   'number', // outId\n]);\n}\n\nfunction avgPool(\n   args: {inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs}) {\n const {inputs, attrs, backend} = args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n const {filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n   x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const channels = convInfo.inChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n
    throw new Error(\n   `wasm backend does not support dataFormat:` +\n   `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n   throw new Error(\n   `was backend only supports average pooling with dilation = [1, 1], ` +\n   `got [${convInfo.dilationHeight}, ${convInfo.dilationWidth}].`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmAvgPool(\n   xId, x.shape[0], x.shape[1], x.shape[2], filterHeight, filterWidth,\n   padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels,\n   outId);\n return out;\n}\n\nexport const avgPoolConfig: KernelConfig = {\n kernelName: AvgPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: avgPool as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License,

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==========\n */\n\nimport {KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function reshape(\n args: {inputs: ReshapeInputs, attrs: ReshapeAttrs, backend: BackendWasm}) {\n const {inputs, attrs} = args;\n const {x} = inputs;\n const {shape} = attrs;\n\n const xSize = util.sizeFromShape(x.shape);\n const $shape = util.inferFromImplicitShape(shape, xSize);\n\n util.assert(\n xSize === util.sizeFromShape($shape),\n () => `new shape: ${$shape}, old shape: ${x.shape}. New shape and old ` +\n `shape must have the same number of elements.`);\n\n // Backend needs to track refCount for the dataId for reshape op\n args.backend.incRef(x.dataId);\n return {dataId: x.dataId, shape: $shape, dtype: x.dtype};\n}\n\nexport const reshapeConfig: KernelConfig = {\n kernelName: Reshape,\n backendName: 'wasm',\n kernelFunc: reshape as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from './Reshape';\n\nlet wasmBatchMatMul: (\n aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n transposeB: boolean, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul, null /* void */, [\n 'number', // a_id\n 'array', // a_shape\n 'number', // a_shape.length\n 'number', // b_id\n 'array', // b_shape\n 'number',
// b_shape.length\n 'number', // transpose_a\n 'number', // transpose_b\n 'number' // out_id\n]);\n}\n\nfunction batchMatMul(args: {\n inputs: BatchMatMulInputs,\n backend: BackendWasm,\n attrs: BatchMatMulAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {a, b} = inputs;\n const {transposeA, transposeB} = attrs;\n\n if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n throw new Error(\n `BatchMatMul for non non-float32 tensors not yet supported.`);\n }\n\n const aRank = a.shape.length;\n const bRank = b.shape.length;\n\n const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];\n const innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];\n\n const outerShapeA = transposeA ? a.shape[aRank - 1] : a.shape[aRank - 2];\n const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank - 1];\n\n const outerDimsA = a.shape.slice(0, -2);\n const outerDimsB = b.shape.slice(0, -2);\n\n const batchDimA = util.sizeFromShape(outerDimsA);\n const batchDimB = util.sizeFromShape(outerDimsB);\n\n const batchDimsCompatible =\n batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;\n\n util.assert(\n aRank >= 2 && bRank >= 2 && batchDimsCompatible,\n () => `Error in matMul: the input batch dimensions must either be the ` +\n `same or at least one input batch dimension must be 1. Got input ` +\n `batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);\n\n const outShapeOuterDims =\n batchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);\n const outShape = outShapeOuterDims.concat([outerShapeA, outerShapeB]);\n\n util.assert(\n innerShapeA === innerShapeB,\n () => `Error in matMul: inner shapes (${innerShapeA}) and (` +\n `${innerShapeB}) of Tensors with shapes ${a.shape} and ` +\n `${b.shape} and transposeA=${transposeA}` +\n ` and transposeB=${transposeB}

must match.`);\n\n const
 a3dShape = transposeA ? [batchDimA, innerShapeA, outerShapeA] :\n   [batchDimA,
outerShapeA, innerShapeA];\n const b3dShape = transposeB ? [batchDimB, outerShapeB, innerShapeB] :\n
          [batchDimB, innerShapeB, outerShapeB];\n\n // The rest of the implementation is designed to operate on
rank-3 tensors\n const a3d = reshape({inputs: {x: a}, backend, attrs: {shape: a3dShape}});\n const b3d =
reshape({inputs: {x: b}, backend, attrs: {shape: b3dShape}});\n\n const a3dId =
backend.dataIdMap.get(a3d.dataId).id;\n const b3dId = backend.dataIdMap.get(b3d.dataId).id;\n\n const leftDim =
transposeA ? a3d.shape[2] : a3d.shape[1];\n const rightDim = transposeB ? b3d.shape[1] : b3d.shape[2];\n const
batchDim = Math.max(batchDimA, batchDimB);\n\n const out = backend.makeOutput([batchDim, leftDim,
rightDim], a3d.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new
Uint8Array(new Int32Array(a3d.shape).buffer);\n
  const bShapeBytes = new Uint8Array(new Int32Array(b3d.shape).buffer);\n\n wasmBatchMatMul(\n   a3dId,
aShapeBytes, a3d.shape.length, b3dId, bShapeBytes,\n   b3d.shape.length, transposeA, transposeB, outId);\n\n
backend.disposeData(a3d.dataId);\n backend.disposeData(b3d.dataId);\n\n out.shape = outShape;\n return
out;\n}\n\nexport const batchMatMulConfig: KernelConfig = {\n kernelName: BatchMatMul,\n backendName:
'wasm',\n setupFunc: setup,\n kernelFunc: batchMatMul as {} as KernelFunc\n};\n","/**\n * @license\n *
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==\n
*/\nimport { backend_util, util } from '@tensorflow/tfjs-core';\nexport function concatImpl(inputs, outShape, dtype,
simplyConcat) {\n   const outVals = util.getArrayFromDType(dtype, util.sizeFromShape(outShape));\n   if
(simplyConcat && dtype !== 'string') {\n   // Use built-in TypedArray.set() method for speed.\n   let offset =
0;\n   inputs.forEach(input => {\n   const size = util.sizeFromShape(input.shape);\n
outVals.set(input.vals, offset);\n   offset += size;\n   });\n   }\n   else {\n   let colOffset = 0;\n
inputs.forEach(input => {\n   const decodedData = dtype === 'string' ?\n
backend_util.fromUint8ToStringArray(input.vals) :\n   input.vals;\n
            let tIdx = 0;\n   for (let row = 0; row < input.shape[0]; ++row) {\n   const resIdx = row *
outShape[1] + colOffset;\n   for (let col = 0; col < input.shape[1]; ++col) {\n   outVals[resIdx +
col] = decodedData[tIdx++];\n   }\n   }\n   colOffset += input.shape[1];\n   });\n   }\n   return
outVals;\n}\n//#
sourceMappingURL=data:application/json; base64,eyJ2ZXJzaW9uIjozLCJmaWxlIjoiQ29uY2F0X2ltcGwuanMiLC
Jzb3VyY2VSb290IjoiIiwic291cmNlcyI6WyIuLi8uLi8uLi8uLi8uLi8uLi90ZmpzLWJhY2tlbmQtY3B1L3NyYy9rZ
XJuZWxzL0NvbmNhdF9pbXBsLnRzIl0sIm5hbWVzIjpbXSwibWFwcGluZ3MiOiJBQUFBOzs7Ozs7Ozs7Oz
s7R0FlRztBQUVILE9BQU8sRUFBQyxZQUFZLEVBQUUsSUFBSSxFQUFDLE1BQU0sdUJBQXVCLENBQUM
FDO0FBRTlGLE1BQU0sVUFBVSxVQUFVLENBQ3RCLE1BQWlCLEVBQUUsUUFBa0IsRUFBRSxLQUFlLEVBQ3RELFlBQXNCO
xFQUFFLFlBQXFCO3hDLE1BQU0sT0FBTyxxQkFBaUIsQ0FBQyxpQkFBaUIsQ0FBQyxxQkFBaUIsLQUFLLL
EVBQUUsUSFBSSxDQUFDLGFBQWEsQ0FBQyxRQUFRLENBQUMsQ0FBQyxxQkFBaUIsQ0FBQyxDO0lBRTVFLFL
sWUFBWSxJQUFJLEtBQUssS0FBSyxRQUFRLEVBQUU7UUFDdEMsMa0RBQWtEO1FBQ2xELElBQUksTUFB
TSxHQUFHLENBQUNmLE1BQU0sQ0FBQztQUNmLE1sQ0FBQyxpPQUFPLENBQUMsQ0FBQyxpQixDQUFDLENBQU
U7WUFDckIsTUFBTSxJLEdBQUcsSUFBSSxDQUFDLGFBQWEsQ0FBQyxLQUFLLENBQUMsQ0FBQyxpQixDQUFDLENBQ
xDQUFDLENBQUM7UUFDRixNUMsT0FBc0IsQ0FBQyxHQUFHLENBQUMsQ0FBQyxpQixDQUFDLENBQUMsaQixDQUFDLENBQ
BQUUsTUFBTSxDQUFDLENBQUMsaQixDQUFDLENBQUMsaQixDQUFDLENBQUMsaQixDQUFDLENBQUMsaQixDQUFDLENBQ
BQUMsQ0FBQztLQUNOO1NBQU07UUFDTCxJQUFJLFNBQVMsR0FBRyxDQUFDLENBQUM7UUFDbEIsS0FBSyxJQUFJLEdBQUcsR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLE1BQU0sQ0FBQyxLQUFLLENBQUMsQ0FBQyxDQ
BQUMsRUFBRSxHQUFHLEVBQUU7WUFDbkMsS0FBSyxJQUFJLEdBQUcsR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLE1BQU0sQ0FBQyxLQUFLLENBQUMsQ0FBQyxDQ
BQUMsRUFBRSxHQUFHLEVBQUU7Z0JBQ25DLE1BQU0sQ0FBQyxHQUFHLEdBQUcsR0FBRyxNQUFNLENBQUMsS0FBSyxDQUFDLENBQUMsQ0FBQyxHQUFHLFNBQVMs

UFBTSxDQUFDLE9BQU8sQ0FBQyxLQUFLLENBQUMsRUFBRTtZQUNyQixNQUFNLFdBQVcsR0FBRyxL
QUFLLEtBQUssUUFBUSxDQUFDLENBQUM7Z0JBQ3BDLFlBQVksQ0FBQyxzQkFBc0IsQ0FBQyxLQUFLL
ENBQUMsSUFBb0IsQ0FBQyxDQUFDLENBQUM7Z0JBQ2pFLFlBQVksQ0FBQyxJQUFrQixDQUFDO1lBRTd
CLElBQUksSUFBSSxHQUFHLENBQUMsQ0FBQztZQUViLEtBQUssSUFBSSxHLEdBQUcsQ0FBQyxxF
QUFFLEdBQUcsR0FBRyxLQUFLLENBQUMsS0FBSyxDQUFDLENBQUMsQ0FBQyxFQUFFQUUsR0F
BRyxFQUFFO2dCQUM3QyxNQUFNLE1sR0FBRyxHQUFHLEdBQUcsUUFBUSxDQUFDLENBQUMsQ
0FBQyxHQUFHLFNBQVMsQ0FBQztnQkFDN0QsTUFBTSxNMsS0FBSyxJQUFJLEdBQUcsR0FBRyxDQUFDLEVBQUUsR0
FBRyxHQUFHLEtBQUssQ0FBQyxLQUFLLENBQUMsQ0FBQyxDQUFDLEVBQUUsRUFBRSxSxHQUFHLEVB
QUU7b0JBQzdDLE1BQU0sRE9BQU8sQ0FBQyxNQUFNLEdBQUcsR0FBRyxDQUFDLEdBQUcsV0FBVyxDQUFDLEVBQUUsRUFBQ
UksRUFBRSxDQUFDLENBQUM7aUJBQzdDLE1BQU0sRE9BQU8sQ0FBQyxNQUFNLEdBQUcsR0FBRyxDQUFDLEdBQUcsV0FBVyxDQUFDLEVBQUUsRUFBRSxDQUFDLENBQUMsS0FBS

software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\nimport { util } from '@tensorflow/tfjs-core';\nexport function rangeImpl(start, stop, step, dtype) {\n const sameStartStop = start === stop;\n const increasingRangeNegativeStep = start < stop && step < 0;\n const decreasingRangePositiveStep = stop < start && step > 1;\n if (sameStartStop || increasingRangeNegativeStep ||\n decreasingRangePositiveStep) {\n return util.makeZerosTypedArray(0, dtype);\n }\n const numElements = Math.abs(Math.ceil((stop - start) / step));\n const values = util.makeZerosTypedArray(numElements, dtype);\n if (stop < start && step === 1) {\n // Auto adjust the step's sign if it hasn't been set\n // (or was set to 1)\n step = -1;\n }\n values[0] = start;\n for (let i = 1; i < values.length; i++) {\n values[i] = values[i - 1] + step;\n }\n return values;\n}\n//# sourceMappingURL=data:application/json; base64,eyJ2ZXJzaW9uIjozLCJmaWxlIjoiUmFuZ2VfaW1wbC5qcyIsInNvdXJjZVJvb3QiOiIiLCJzb3VyY2VzIjpbIi4uLy4uLy4uLy4uLy4uLy4uL3RmanMtYmFja2VuZC1jcHUvc3JjL3tlcm5lbHMvUmFuZ2VfaW1wbC50cyJdLCJuYW1lcyI6W10sIm1hcHBpbmdzIjoiQUFBQTs7Ozs7Ozs7Ozs7O0dBZUc7QUFFSCxPQUFPLEVBQUUsSUFBSSxFQUFFLE1BQU0sdUJBQXVCLENBQUM7QUFFN0MsTUFBTSxVQUFVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLE1BQU0sYSBTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLMTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLMTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLMTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLMTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLMTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLMTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLMTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLMTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLMTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLMTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLMTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLMTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLMTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLMTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3BFLMTSxxVQUFVVLFNBQVMsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO

WNyZWFzaW5nUmFuZ2VQb3NpdGl2ZVN0ZXAgPSBzdG9wIDwgc3RhcnQgJiYgc3RlcCA+IDE7XG5cbiAga
WYgKHNhbWVTdGFydFN0b3AgfHwgaW5jcmVhc2luZ1JhbmdlTmVnYXRpdmVTdGVwIHx8XG4gICAgICBk
ZWNyZWFzaW5nUmFuZ2VQb3NpdGl2ZVN0ZXApIHtcbiAgICByZXR1cm4gdXRpbC5tYWtlWmVyb3NUeXB
lZEFycmF5KDAsIGR0eXBlKTtcbiAgfVxuXG4gIGNvbnN0IG51bUVsZW1lbnRzID0gTWF0aC5hYnMoTWF0aC
5jZWlsKChzdG9wIC0gc3RhcnQpIC8gc3RlcCkpO1xuICBjb25zdCB2YWx1ZXMgPSBuZXcgQXJyYXkobnVtRWxlbWVudHMpO1
5cGVkQXJyYXkobnVtRWxlbWVudHMsIGR0eXBlKTtcblxuICBpZiAoc3RvcCA8IHN0YXJ0ICYmIHN0ZXAgP
T09IDEpIHtcbiAgICAvLyBBdXRvIGFkanVzdCB0aGUgc3RlcCBzIHNpZ24gaWYgaXQgaGFzbid0IGJlZW4gc2V
0XG4gICAgLy8gKG9yIHdhcyBzZXQgdG8gMSlcbiAgICBzdGVwID0gLTE7XG4gIH1cblxuICB2YWx1ZXMubGVuZ3RoOyBpKyspIHtcbiAgICB2YWx1ZXNbaV0gPSBzdGFydDtcbiAgICBzdGFydCArPSBzdGVwO1xuICB9XG5cbiAgcmV0dXJuIHV0aWwubWFrZVR5cGVkQXJyYXkodmFsdWVzLCBkdHlwZSk7XG59XG5cbmV4cG9ydCBjb25zdCByYW5nZUNvbmZpZyA9IHtcbiAga2VybmVsTmFtZTogUmFuZ2UsXG4gIGJhY2tlbmROYW1lOiAnY3B1JyxcbiAga2VybmVsRnVuYzogcmFuZ2VcbX07XG5cbi8qKlxuICogQGxpY2Vuc2VcbiAqIENvcHlyaWdodCAyMDIwIEdvb2dsZSBMTEMuIEFsbCBSaWdodHMgUmVzZXJ2ZWQuXG4gKiBMaWNlbnNlZCB1bmRlciB0aGUgQXBhY2hlIExpY2Vuc2UsIFZlcnNpb24gMi4wICh0aGUgXCJMaWNlbnNlXCIpO1xuICogeW91IG1heSBub3QgdXNlIHRoaXMgZmlsZSBleGNlcHQgaW4gY29tcGxpYW5jZSB3aXRoIHRoZSBMaWNlbnNlLlxuICogWW91IG1heSBvYnRhaW4gYSBjb3B5IG9mIHRoZSBMaWNlbnNlIGF0XG4gKlxuICogaHR0cDovL3d3dy5hcGFjaGUub3JnL2xpY2Vuc2VzL0xJQ0VOU0UtMi4wXG4gKlxuICogVW5sZXNzIHJlcXVpcmVkIGJ5IGFwcGxpY2FibGUgbGF3IG9yIGFncmVlZCB0byBpbiB3cml0aW5nLCBzb2Z0d2FyZVxuICogZGlzdHJpYnV0ZWQgdW5kZXIgdGhlIExpY2Vuc2UgaXMgZGlzdHJpYnV0ZWQgb24gYW4gXCJBUyBJU1wiIEJBU0lTLFxuICogV0lUSE9VVCBXQVJSQU5USUVTIE9SIENPTkRJVElPTlMgT0YgQU5ZIEtJTkQsIGVpdGhlciBleHByZXNzIG9yIGltcGxpZWQuXG4gKiBTZWUgdGhlIExpY2Vuc2UgZm9yIHRoZSBzcGVjaWZpYyBsYW5ndWFnZSBnb3Zlcm5pbmcgcGVybWlzc2lvbnMgYW5kXG4gKiBsaW1pdGF0aW9ucyB1bmRlciB0aGUgTGljZW5zZS5cbiAqXG4gKj09PT09PT09PT

QUFDO1NBQ3RFO1FBRUQsT0FBUSxJQUFtQixDQUFDLFFBQVEsQ0FBQyxVQUFVLEVBQUUsVUFBVSx
HQUFHLE1BQU0sQ0FBQyxDQUFDO0tBQ3ZFO0lBRUQsTUFBTSxXQUFXLEdBQUcsS0FBSyxLQUFFB
QVEsQ0FBQyxDQUFDO1FBQ3BDLFlBQVksQ0FBQyxzQkFBc0IsQ0FBQyxJQUFvQixxDQUFDLENBQUMsQ
0FBQztRQUMzRCxxQkFBRrQixDQUFDO0lBRXZCLE1BQU0sS0FBSyxHLE1BQU0sQ0FBQyxxLQUFLLLE
VBQUUsS0FBSyxFQUFFLFdBQVcsQ0FBQyxxDQUFDO0lBQ2hELE1BQU0sTUFBTSxHLE1BQU0sQ0F
BQyxJQUFJLEVBQUUsS0FBSyxDQUFDLENBQUM7SUFDbkMsSUFBSSxDQUFDLENBQUMsSUFBSSxDQUFDLENBQUMsSUFBSSxDQUFDLENBQU

A9IHV0aWwuc2l6ZUZyb21TaGFwZShzaXplKTtcbiAgY29uc3QgeFN0cmlkZXMgPSB1dGlsLmNvbXB1dGVTd
HJpZGVzKHNoYXBlKTtcblxuICBpZiAoaXNDb250aW5vdXMpIHtcbiAgICBjb25zdCBmbGF0T2Zmc2V0ID0gc
2xpY2VfdXRpbC5jb21wdXRlRmxhdE9mZnNldChiZWdpbiwgeFN0cmlkZXMpO1xuXG4gICAgaWYgKGR0eX
BlID09PSAnc3RyaW5nJykge1xuICAgICAgY29uc3QgZmxhdE9mZnNldCA9IHV0aWwuY29tcHV0ZUZsYXRPZmZzZXQoc
hape, begin_, size_);\n\n const xVals = backend.readSync(x.dataId);\n const out =
backend.makeOutput(size_, x.dtype);\n const xStrides = util.computeStrides(x.shape);\n const outData =
backend.dataIdMap.get(out.dataId);\n\n if (isContinous) {\n   const flatOffset =
slice_util.computeFlatOffset(begin_, xStrides);\n\n   if (x.dtype === 'string') {\n   outData.stringBytes =\n
(xVals as Uint8Array[])\n   .slice(flatOffset, flatOffset + util.sizeFromShape(size_));\n   } else {\n   const
outVals = backend.typedArrayFromHeap(out);\n   outVals.set(\n   (xVals as TypedArray)\n
.subarray(flatOffset, flatOffset + util.sizeFromShape(size_)));\n   }\n\n   return out;\n }\n\n if (x.dtype ===
'string') {\n   const res = sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype);\n   outData.stringBytes = res as

```
Uint8Array[];\n
    return out;\n  }\n\n  const outVals = backend.typedArrayFromHeap(out);\n  const rank = x.shape.length;\n  if (rank === 2) {\n    slice2d(\n        xVals as TypedArray, xStrides[0], outVals, begin_ as [number, number],\n        size_ as [number, number]);\n  } else if (rank === 3) {\n    slice3d(\n        xVals as TypedArray, xStrides[0], xStrides[1], outVals,\n        begin_ as [number, number, number], size_ as [number, number, number]);\n  } else if (rank === 4) {\n    slice4d(\n        xVals as TypedArray, xStrides[0], xStrides[1], xStrides[2], outVals,\n        begin_ as [number, number, number, number],\n        size_ as [number, number, number, number]);\n  } else {\n    const res =\n        sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype) as TypedArray;\n    outVals.set(res);\n  }\n\n  return out;\n}\n\nfunction slice2d(\n    xVals: backend_util.TypedArray, xStride: number,\n    outVals: backend_util.TypedArray, begin: [number, number],\n    size: [number, number]):
 void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const endI = beginI + size[0];\n  for (let i = beginI; i < endI; i++) {\n    const xOffset = i * xStride + beginJ;\n    outVals.set(xVals.subarray(xOffset, xOffset + size[1]), outOffset);\n    outOffset += size[1];\n  }\n}\n\nfunction slice3d(\n    xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n    outVals: backend_util.TypedArray, begin: [number, number, number],\n    size: [number, number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const beginK = begin[2];\n  const endI = beginI + size[0];\n  const endJ = beginJ + size[1];\n  for (let i = beginI; i < endI; i++) {\n    for (let j = beginJ; j < endJ; j++) {\n      const xOffset = i * xStride1 + j * xStride2 + beginK;\n      outVals.set(xVals.subarray(xOffset, xOffset + size[2]), outOffset);\n      outOffset += size[2];\n    }\n  }\n}\n\nfunction slice4d(\n    xVals: backend_util.TypedArray,
 xStride1: number, xStride2: number,\n    xStride3: number, outVals: backend_util.TypedArray,\n    begin: [number, number, number, number],\n    size: [number, number, number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const beginK = begin[2];\n  const endI = beginI + size[0];\n  const endJ = beginJ + size[1];\n  const endK = beginK + size[2];\n  const beginL = begin[3];\n\n  for (let i = beginI; i < endI; i++) {\n    for (let j = beginJ; j < endJ; j++) {\n      for (let k = beginK; k < endK; k++) {\n        const xOffset = i * xStride1 + j * xStride2 + k * xStride3 + beginL;\n        outVals.set(xVals.subarray(xOffset, xOffset + size[3]), outOffset);\n        outOffset += size[3];\n      }\n    }\n  }\n}\n\nexport const sliceConfig: KernelConfig = {\n  kernelName: Slice,\n  backendName: 'wasm',\n  kernelFunc: slice as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from './Reshape';\nimport {slice} from './Slice';\nimport {transpose} from './Transpose';\n\nfunction batchToSpaceND(args: {\n  inputs: BatchToSpaceNDInputs,\n
  backend: BackendWasm,\n  attrs: BatchToSpaceNDAttrs\n}) {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {blockShape, crops} = attrs;\n\n  const prod = blockShape.reduce((a, b) => a * b);\n\n  const reshaped = backend_util.getReshaped(x.shape, blockShape, prod);\n  const permuted =
backend_util.getPermuted(reshaped.length, blockShape.length);\n  const reshapedPermuted =\n
backend_util.getReshapedPermuted(x.shape, blockShape, prod);\n  const sliceBeginCoords =\n
backend_util.getSliceBeginCoords(crops, blockShape.length);\n  const sliceSize =\n
backend_util.getSliceSize(reshapedPermuted, crops, blockShape.length);\n\n  const xReshaped = reshape({inputs: {x}, backend, attrs: {shape: reshaped}});\n  const xTransposed =\n      transpose({inputs: {x: xReshaped}, backend, attrs: {perm: permuted}});\n  const xTransposedReshaped = reshape(\n      {inputs: {x: xTransposed}, backend,
```

attrs: {shape: reshapedPermuted}});\n const result
 = slice({\n   inputs: {x: xTransposedReshaped},\n   backend,\n   attrs: {begin: sliceBeginCoords, size: sliceSize}\n });\n\n backend.disposeData(xReshaped.dataId);\n backend.disposeData(xTransposed.dataId);\n backend.disposeData(xReshaped.dataId);\n\n return result;\n}\n\nexport const batchToSpaceNDConfig: KernelConfig = {\n kernelName: BatchToSpaceND,\n backendName: 'wasm',\n kernelFunc: batchToSpaceND as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
 the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function cast(\n   args: {inputs: CastInputs, attrs: CastAttrs, backend: BackendWasm}):\n   TensorInfo {\n const {inputs: {x}, attrs: {dtype}, backend} = args;\n const out = backend.makeOutput(x.shape, dtype);\n const inVals = backend.typedArrayFromHeap(x);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const castConfig: KernelConfig = {\n kernelName: Cast,\n backendName: 'wasm',\n kernelFunc: cast as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n
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*/\nimport {KernelConfig, Ceil} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n
 * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
/\n\nimport {ClipByValue, ClipByValueAttrs, ClipByValueInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmClip: (xId: number, min: number, max: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmClip = backend.wasm.cwrap(ClipByValue, null / void */, [\n   'number', // x_id\n   'number', // min\n   'number', // max\n   'number'   // out_id\n]);\n}\n\nfunction clip(args: {\n
 inputs: ClipByValueInputs,\n backend: BackendWasm,\n attrs: ClipByValueAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {clipValueMin, clipValueMax} = attrs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmClip(xId, clipValueMin, clipValueMax, outId);\n return out;\n}\n\nexport const clipByValueConfig: KernelConfig = {\n kernelName: ClipByValue,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: clip as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you

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the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {concatImplCPU} from '../kernel_utils/shared';\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\n\nexport function concat(\n   args: {inputs: ConcatInputs, backend: BackendWasm, attrs: ConcatAttrs}) {\n const {inputs, backend} = args;\n\n const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];\n\n let outShape = backend_util.computeOutShape(inputs.map(t => t.shape), axis);\n\n // Keep only non-empty tensors (ignore tensors with 0 in their shape).\n const
$inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);\n if ($inputs.length === 1) {\n   return identity({inputs: {x: $inputs[0]}, backend});\n }\n\n const out = backend.makeOutput(outShape, inputs[0].dtype);\n\n if (util.sizeFromShape(outShape) === 0) {\n   return out;\n }\n\n const shapes = $inputs.map(t => t.shape);\n backend_util.assertParamsConsistent(shapes, axis);\n\n if ($inputs[0].dtype === 'string') {\n   // Any concat of n-dimensional tensors across any axis can be reduced to\n   // a concatenation of two-dimensional tensors across the axis 1 by first\n   // partitioning the axes of the original tensors into those less than the\n   // axis to be concatenated and the rest. Then reshape the tensors\n   // into a two-dimensional tensor by collapsing these two sets of axes and\n   // concatenate the resulting matrices across the axis 1, finally reshaping\n   // the result to have the proper shape.\n   const inputs2D = $inputs.map(t => {\n   const
innerSize = util.sizeFromShape(t.shape.slice(axis));\n   const shape = [-1, innerSize];\n   return reshape({inputs: {x: t}, backend, attrs: {shape}});\n   });\n\n   const inputsValShapes = inputs2D.map(t => {\n   return {vals: backend.readSync(t.dataId), shape: t.shape};\n   });\n\n   // Concats 2d tensors along axis=1.\n   outShape =\n backend_util.computeOutShape(inputs2D.map(t => t.shape), 1 /* axis */);\n   const simplyConcat = inputs2D[0].shape[0] === 1;\n   const outVals = concatImplCPU(\n   inputsValShapes, outShape, inputs[0].dtype,\n   simplyConcat) as string[];\n\n   const finalOutShape =\n backend_util.computeOutShape($inputs.map(t => t.shape), axis);\n\n   out.shape = finalOutShape;\n   const outData = backend.dataIdMap.get(out.dataId);\n   outData.stringBytes = backend_util.fromStringArrayToUint8(outVals);\n\n   inputs2D.forEach(t => backend.disposeData(t.dataId));\n\n   return out;\n }\n\n const
batchDim = util.sizeFromShape($inputs[0].shape.slice(0, axis));\n let sumInnerDims = 0;\n const innerDims = $inputs.map(input => {\n   const innerDim = util.sizeFromShape(input.shape.slice(axis));\n   sumInnerDims += innerDim;\n   return innerDim;\n });\n const inVals = $inputs.map(input => backend.typedArrayFromHeap(input));\n const outVals = backend.typedArrayFromHeap(out);\n for (let b = 0; b < batchDim; b++) {\n   let outOffset = b * sumInnerDims;\n   for (let i = 0; i < inVals.length; i++) {\n   const innerDim = innerDims[i];\n   const inOffset = b * innerDim;\n   const vals = inVals[i].subarray(inOffset, inOffset + innerDim);\n   outVals.set(vals, outOffset);\n   outOffset += innerDim;\n   }\n }\n return out;\n}\n\nexport const concatConfig: KernelConfig = {\n kernelName: Concat,\n backendName: 'wasm',\n kernelFunc: concat as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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==========\n*/\n\nimport {backend_util, Conv2D, Conv2DAttrs, Conv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmConv2d: (\n    xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n    filterId: number, filterHeight: number, filterWidth: number, padTop: number,\n    padRight: number,
 padBottom: number, padLeft: number, isSamePad: number,\n    dilationHeight: number, dilationWidth: number, strideHeight: number,\n    strideWidth: number, inputChannels: number, outputChannels: number,\n    outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmConv2d = backend.wasm.cwrap(Conv2D, null /* void */, [\n    'number',  // xId\n    'number',  // batchSize\n    'number',  // inputHeight\n    'number',  // inputWidth\n    'number',  // filterId\n    'number',  // filterHeight\n    'number',  // filterWidth\n    'number',  // padTop\n    'number',  // padRight\n    'number',  // padBottom\n    'number',  // padLeft\n    'number',  // isSamePad\n    'number',  // dilationHeight\n    'number',  // dilationWidth\n    'number',  // strideHeight\n    'number',  // strideWidth\n    'number',  // inputChannels\n    'number',  // outputChannels\n    'number',  // outId\n  ]);\n}\n\nfunction conv2d(\n    args: {inputs: Conv2DInputs, backend: BackendWasm, attrs: Conv2DAttrs}) {\n  const {inputs, attrs, backend} = args;\n\n  const {x, filter} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n  const {strides, dilations, pad, dimRoundingMode, dataFormat} = attrs;\n  const $dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n  const convInfo = backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n      pad, dimRoundingMode, false, $dataFormat);\n\n  const filterHeight = convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const padRight = convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft = convInfo.padInfo.left;\n  const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth = convInfo.dilationWidth;\n  const strideHeight = convInfo.strideHeight;\n  const strideWidth = convInfo.strideWidth;\n  const inputChannels = convInfo.inChannels;\n  const outputChannels = convInfo.outChannels;\n  const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n  if (convInfo.dataFormat !== 'channelsLast') {\n    throw new Error(\n        `wasm backend Conv2D does not support dataFormat:` +\n        `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n  }\n\n  const out = backend.makeOutput(convInfo.outShape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmConv2d(\n      xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n      filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n      dilationHeight, dilationWidth, strideHeight, strideWidth, inputChannels,\n      outputChannels, outId);\n  return out;\n}\n\nexport const conv2DConfig: KernelConfig = {\n  kernelName: Conv2D,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: conv2d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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==========\n*/\n\nimport {backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmConv2DBackpropInput: (\n    dyId: number, filterId: number, batchSize: number, filterHeight: number,\n    filterWidth: number,
 inHeight: number, inWidth: number, inChannels: number,\n    outHeight: number, outWidth: number, outChannels: number,\n    strideHeight: number, strideWidth: number, topPad: number, leftPad: number,\n    fltS0: number, fltS1: number, fltS2: number, xBatchStride: number,\n    xRowStride: number, xColStride: number, xChannelStride:
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number,\n yBatchStride: number, yRowStride: number, yColStride: number,\n yChannelStride: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmConv2DBackpropInput = backend.wasm.cwrap(Conv2DBackpropInput, null, [\n 'number', // dyId\n 'number', // filterId\n 'number', // batchSize\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // inHeight\n 'number', // inWidth\n 'number', // inChannels\n 'number', // outHeight\n 'number', // outWidth\n 'number', // outChannels\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // topPad\n 'number', // leftPad\n 'number', // fltS0\n 'number', // fltS1\n 'number', // fltS2\n 'number', // xBatchStride\n 'number', // xRowStride\n 'number', // xColStride\n 'number', // xChannelStride\n 'number', // yBatchStride\n 'number', // yRowStride\n 'number', // yColStride\n 'number', // yChannelStride\n 'number', // outId\n]);\n}\n\nfunction conv2DBackpropInput(args: {\n backend: BackendWasm,\n inputs: Conv2DBackpropInputInputs,\n attrs: Conv2DBackpropInputAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {dy, filter} = inputs;\n const {strides, pad, dataFormat, dimRoundingMode, inputShape} = attrs;\n\n const dilations = 1;\n\n const $dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n   inputShape, filter.shape as [number, number, number, number], strides,\n   dilations, pad, dimRoundingMode, false /* depthwise */, $dataFormat);\n const {\n   batchSize,\n   filterHeight,\n   filterWidth,\n   inChannels,\n   inHeight,\n   inWidth,\n   outChannels,\n   outHeight,\n   outWidth,\n   strideHeight,\n   strideWidth\n } = convInfo;\n\n const topPad = filterHeight - 1 - convInfo.padInfo.top;\n const leftPad = filterWidth - 1 - convInfo.padInfo.left;\n\n const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n const dxStrides = util.computeStrides(convInfo.inShape);\n const dyStrides = util.computeStrides(dy.shape);\n const [fltS0, fltS1, fltS2] = util.computeStrides(filter.shape);\n const xBatchStride = dxStrides[0];\n const xRowStride = isChannelsLast ? dxStrides[1] : dxStrides[2];\n const xColStride = isChannelsLast ? dxStrides[2] : 1;\n const xChannelStride = isChannelsLast ? 1 : dxStrides[1];\n const yBatchStride = dyStrides[0];\n const yRowStride = isChannelsLast ? dyStrides[1] : dyStrides[2];\n const yColStride = isChannelsLast ? dyStrides[2] : 1;\n const yChannelStride = isChannelsLast\n ? 1 : dyStrides[1];\n\n const out = backend.makeOutput(convInfo.inShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const dyId = backend.dataIdMap.get(dy.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n wasmConv2DBackpropInput(\n   dyId, filterId, batchSize,\n   filterHeight, filterWidth, inHeight, inWidth,\n   inChannels, outHeight, outWidth, outChannels, strideHeight,\n   strideWidth,\n   topPad, leftPad, fltS0, fltS1, fltS2, xBatchStride, xRowStride,\n   xColStride, xChannelStride,\n   yBatchStride, yRowStride, yColStride,\n   yChannelStride, outId);\n return out;\n}\n\nexport const conv2DBackpropInputConfig: KernelConfig = {\n kernelName: Conv2DBackpropInput,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: conv2DBackpropInput as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
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*/\n\nimport {Cos, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const cosConfig: KernelConfig = createUnaryKernelConfig(Cos);\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of
the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for

the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\nimport {Cosh, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from './Cast';\n\n// Must match enum in CropAndResize.cc\nenum InterpolationMethod {\n bilinear = 0,\n nearest = 1\n}\n\nlet wasmCropAndResize: (\n   imagesId: number, boxesId: number, boxIndId: number, numBoxes: number,\n   imagesShape: Uint8Array, cropHeight: number, cropWidth: number,\n   method: number, extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n   'number', // imagesId\n   'number', // boxesId\n   'number', // boxIndId\n   'number', // numBoxes\n   'array',   // images shape\n   'number', // cropHeight\n   'number', // cropWidth\n   'number', // method\n   'number', // extrapolation value\n   'number'   // out id\n]);\n}\n\nfunction cropAndResize(args: {\n backend: BackendWasm,\n inputs: CropAndResizeInputs,\n attrs: CropAndResizeAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {method, extrapolationValue, cropSize} = attrs;\n const {image, boxes, boxInd} = inputs;\n\n const numBoxes = boxes.shape[0];\n\n const [cropHeight, cropWidth] = cropSize as [number, number];\n const outShape = [numBoxes, cropHeight, cropWidth, image.shape[3]];\n\n let imagesData = backend.dataIdMap.get(image.dataId);\n let castedData;\n if (image.dtype !== 'float32') {\n   castedData = cast({backend, inputs: {x: image}, attrs: {dtype: 'float32'}});\n   imagesData = backend.dataIdMap.get(castedData.dataId);\n }\n\n const imagesId = imagesData.id;\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const boxIndId = backend.dataIdMap.get(boxInd.dataId).id;\n\n const out = backend.makeOutput(outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n\n wasmCropAndResize(\n   imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n   cropWidth,\n   InterpolationMethod[method as {} as keyof typeof InterpolationMethod],\n   extrapolationValue, outId);\n\n if (castedData != null) {\n   backend.disposeData(castedData.dataId);\n }\n\n return out;\n}\n\nexport const cropAndResizeConfig: KernelConfig = {\n kernelName: CropAndResize,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: cropAndResize as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Cumsum, CumsumAttrs, CumsumInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nimport {transpose} from './Transpose';\n\nlet wasmCumsum: (xId: number, exclusive:

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number, reverse: number,\n                finalDim: number, outId: number, dtype: CppDType) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmCumsum = backend.wasm.cwrap(Cumsum, null /* void */, [\n    'number', // x_id\n    'number', // exclusive\n    'number', // reverse\n    'number', // final_dim\n    'number', // out_id\n    'number'  // dtype\n  ]);\n}\n\nexport function cumsum(\n  args: {inputs: CumsumInputs, backend: BackendWasm, attrs: CumsumAttrs}):\nTensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {axis, exclusive, reverse} = attrs;\n  const xRank = x.shape.length;\n\n  util.assert(x.dtype === 'float32' || x.dtype === 'int32',\n    () => `cumsum does not support ${x.dtype} tensors in the WASM backend`);\n  // permute required axis to inner most axis\n  const permutation = backend_util.getAxesPermutation([axis], xRank);\n  let permutedX = x;\n  if (permutation !== null) {\n    permutedX = transpose({inputs: {x}, attrs: {perm: permutation}, backend});\n  }\n  const permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];\n  backend_util.assertAxesAreInnerMostDims('cumsum', [permutedAxis], xRank);\n\n  const permutedOut = backend.makeOutput(permutedX.shape, permutedX.dtype);\n  const finalDim = permutedX.shape[permutedAxis];\n  const permutedXId = backend.dataIdMap.get(permutedX.dataId).id;\n  const permutedOutId = backend.dataIdMap.get(permutedOut.dataId).id;\n  wasmCumsum(permutedXId, exclusive ? 1 : 0, reverse ? 1 : 0, finalDim,\n             permutedOutId, CppDType[x.dtype]);\n\n  // transpose data back if permuted\n  let out = permutedOut;\n  if (permutation !== null) {\n    const undoPermutation = backend_util.getUndoAxesPermutation(permutation);\n    out = transpose(\n        {inputs: {x: permutedOut}, attrs: {perm: undoPermutation}, backend});\n    backend.disposeData(permutedX.dataId);\n    backend.disposeData(permutedOut.dataId);\n  }\n  return out;\n}\n\nexport const cumsumConfig: KernelConfig = {\n  kernelName: Cumsum,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: cumsum as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n */\n\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthToSpace: (\n    xId: number, blockSize: number, channelsLast: number, xStrides: Uint8Array,\n    xStridesLength: number, outputShape: Uint8Array, outputStrides: Uint8Array,\n    outSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmDepthToSpace = backend.wasm.cwrap(DepthToSpace, null /*void*/, [\n    'number',  // xId\n    'number',  // blockSize\n    'number',  // channelsLast\n    'array',   // xStrides\n    'number',  // xStridesLength\n    'array',   // outputShape\n    'array',   // outputStrides\n    'number',  // outSize\n    'number',  // outId\n  ]);\n}\n\nexport function depthToSpace(args: {\n  backend: BackendWasm,\n  inputs: DepthToSpaceInputs,\n  attrs: DepthToSpaceAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {x} = inputs;\n  const {blockSize, dataFormat} = attrs;\n\n  const batchSize = x.shape[0];\n  const inputHeight = (dataFormat === 'NHWC') ? x.shape[1] : x.shape[2];\n  const inputWidth = (dataFormat === 'NHWC') ? x.shape[2] : x.shape[3];\n  const inputDepth = (dataFormat === 'NHWC') ? x.shape[3] : x.shape[1];\n\n  const outputHeight = inputHeight * blockSize;\n  const outputWidth = inputWidth * blockSize;\n  const outputDepth = inputDepth / (blockSize * blockSize);\n\n  const outputShape = (dataFormat === 'NHWC') ?\n      [batchSize, outputHeight, outputWidth, outputDepth] :\n      [batchSize, outputDepth, outputHeight, outputWidth];\n\n  const out = backend.makeOutput(outputShape, 'float32');\n\n  const xData = backend.dataIdMap.get(x.dataId);\n  const xId = xData.id;\n  const xStridesBytes =\n      new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n\n  const outputShapeBytes = new Uint8Array(new Int32Array(outputShape).buffer);\n  const outStridesBytes =\n      new Uint8Array(new Int32Array(util.computeStrides(outputShape)).buffer);\n\n  const outId = backend.dataIdMap.get(out.dataId).id;\n
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const channelsLast
= dataFormat === 'NHWC' ? 1 : 0;\n wasmDepthToSpace(\n xId, blockSize, channelsLast, xStridesBytes, x.shape.length - 1,\n outputShapeBytes, outStridesBytes, outputShape.length, outId);\n\n return out;\n}\n\nexport const depthToSpaceConfig: KernelConfig = {\n kernelName: DepthToSpace,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: depthToSpace as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n
* limitations under the License.\n *
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/\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs, DepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthwiseConv2d: (\n xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number, padTop: number,\n padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n dilationHeight: number, dilationWidth: number, strideHeight: number,\n strideWidth: number, inputChannels: number, outputChannels: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmDepthwiseConv2d =\n backend.wasm.cwrap(DepthwiseConv2dNative, null / void */, [\n 'number', // xId\n 'number', // batchSize\n 'number',
// inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n}\n\nfunction depthwiseConv2d(args: {\n inputs: DepthwiseConv2dNativeInputs,\n backend: BackendWasm,\n attrs: DepthwiseConv2dNativeAttrs\n}) {\n const {inputs, attrs, backend} = args;\n\n const {x, filter} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const {strides, dilations, pad, dimRoundingMode} = attrs;\n\n const $dilations = dilations
== null ? [1, 1] : dilations;\n\n const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides,\n ($dilations as number | [number, number]), pad, dimRoundingMode,\n true /* depthwise */);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend DepthwiseConv2dNative does not support
dataFormat:'` +\n `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmDepthwiseConv2d(\n xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n dilationHeight, dilationWidth, strideHeight, strideWidth, inputChannels,\n outputChannels, outId);\n return out;\n}\n\nexport const depthwiseConv2dNativeConfig: KernelConfig = {\n kernelName: DepthwiseConv2dNative,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: depthwiseConv2d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All

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*\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport {Elu, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const eluConfig: KernelConfig = createUnaryKernelConfig(Elu);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n
* distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\nimport {Equal, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const equalConfig: KernelConfig =\n createBinaryKernelConfig(Equal, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n
* distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const expConfig: KernelConfig = createUnaryKernelConfig(Exp, 'float32');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n
* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from './Reshape';\n\nexport function expandDims(args: {\n inputs: ExpandDimsInputs,\n attrs: ExpandDimsAttrs,\n backend: BackendWasm\n}) {\n const {inputs, attrs, backend} = args;\n const {input} = inputs;\n const {dim} = attrs;\n\n const inputRank = input.shape.length;\n const newShape = input.shape.slice();\n let $dim = dim;\n if (dim < 0) {\n   // Negative value is counted from the tail of rank.\n   util.assert(\n   -(inputRank + 1) <= dim,\n
  () => `Axis must be in the interval [${- (inputRank + 1)}, ${\n
        inputRank}]`);\n $dim = inputRank + dim + 1;\n }\n newShape.splice($dim, 0, 1);\n\n return reshape({inputs: {x: input}, backend, attrs: {shape: newShape}});\n}\n\nexport const expandDimsConfig: KernelConfig = {\n kernelName: ExpandDims,\n backendName: 'wasm',\n kernelFunc: expandDims as {} as

KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n */\n\nimport {KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {Fill, FillAttrs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function fill(args: {attrs: FillAttrs, backend: BackendWasm}) {\n const {attrs: {shape, value, dtype}, backend} = args;\n const out = backend.makeOutput(shape, dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(value as number);\n return out;\n}\n\nexport const fillConfig: KernelConfig = {\n kernelName: Fill,\n backendName: 'wasm',\n kernelFunc: fill as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n */\n\nimport {FlipLeftRight, FlipLeftRightInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFlipLeftRight: (\n   xId: number, batch: number, imageHeight: number, imageWidth: number,\n   numChannels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmFlipLeftRight = backend.wasm.cwrap(FlipLeftRight, null /* void */, [\n   'number', // xId\n   'number', // batch\n   'number', // imageHeight\n   'number', // imageWidth\n   'number', // numChannels\n   'number', // outId\n]);\n}\n\nexport function flipLeftRight(\n   args: {inputs: FlipLeftRightInputs, backend: BackendWasm}): TensorInfo {\n const {inputs, backend} = args;\n const {image} = inputs;\n\n const out = backend.makeOutput(image.shape, image.dtype);\n const imageId = backend.dataIdMap.get(image.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n\n wasmFlipLeftRight(\n   imageId, batch, imageHeight, imageWidth, numChannels, outId);\n return out;\n}\n\nexport const flipLeftRightConfig: KernelConfig = {\n kernelName: FlipLeftRight,\n backendName: 'wasm',\n kernelFunc: flipLeftRight as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n */\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed

under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const floorDivConfig: KernelConfig =\n createBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n *
under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmBatchNorm: (\n xId: number, meanId: number, varianceId: number, offsetId: number,\n scaleId: number, varianceEpsilon: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmBatchNorm = backend.wasm.cwrap(\n FusedBatchNorm, null /* void */,\n ['number', 'number', 'number', 'number', 'number', 'number', 'number']);\n}\n\nfunction fusedBatchNorm(args: {\n backend: BackendWasm,\n inputs: FusedBatchNormInputs,\n
attrs: FusedBatchNormAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {varianceEpsilon} = attrs;\n const {x, mean, variance, offset, scale} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const meanId = backend.dataIdMap.get(mean.dataId).id;\n const varianceId = backend.dataIdMap.get(variance.dataId).id;\n const offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n const scaleId = scale != null ? backend.dataIdMap.get(scale.dataId).id : 0;\n\n const out = backend.makeOutput(x.shape, x.dtype);\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(x.shape) === 0) {\n return out;\n }\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmBatchNorm(\n xId, meanId, varianceId, offsetId, scaleId, varianceEpsilon, outId);\n return out;\n}\n\nexport const fusedBatchNormConfig: KernelConfig = {\n kernelName: FusedBatchNorm,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchNorm
as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {backend_util, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet
wasmFusedConv2d:\n (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number,\n biasId: number, padTop: number, padRight: number, padBottom: number,\n padLeft: number, isSamePad: number, dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels: number, activation: number,\n preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n

void;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedConv2d = backend.wasm.cwrap(FusedConv2D, null /* void */, [\n   'number', // xId\n   'number', // batchSize\n   'number', // inputHeight\n   'number', // inputWidth\n   'number', // filterId\n   'number', // filterHeight\n   'number', // filterWidth\n   'number', // biasId\n   'number', // padTop\n   'number', // padRight\n   'number', // padBottom\n   'number', // padLeft\n   'number', // isSamePad\n   'number', // dilationHeight\n   'number', // dilationWidth\n   'number', // strideHeight\n   'number', // strideWidth\n   'number', // inputChannels\n   'number', // outputChannels\n   'number', // activation\n   'number', // preluActivationWeightsId\n   'number', // leakyreluAlpha\n   'number', // outId\n]);\n}\n\nfunction fusedConv2d(args: {\n inputs: FusedConv2DInputs,\n backend: BackendWasm,\n attrs: FusedConv2DAttrs\n}) {\n const {inputs, attrs, backend} = args;\n const {x, filter, bias, preluActivationWeights} = inputs;\n const {\n   strides,\n   pad,\n   dilations,\n   dataFormat,\n   dimRoundingMode,\n   activation,\n   leakyreluAlpha\n } = attrs;\n\n const convInfo = backend_util.computeConv2DInfo(\n   (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n   pad, dimRoundingMode);\n\n const fusedActivation =\n FusableActivation[activation as {} as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n   throw new Error(\n   `${activation} activation not yet supported for FusedConv2D ` +\n   `in the wasm backend.`);\n }\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n if (bias != null) {\n   const biasData = backend.dataIdMap.get(bias.dataId);\n   if (biasData.shape.length !== 1) {\n   throw new Error(\n   `FusedConv2D only supports rank-1 bias but got ` +\n   `rank ${biasData.shape.length}.`);\n   }\n   if (biasData.shape[0] !== outputChannels) {\n   throw new Error(\n`FusedConv2D bias shape (${biasData.shape}) does not ` +\n   `match the number of output channels (${outputChannels})`);\n   }\n   biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize = convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if (dataFormat !== 'NHWC') {\n   throw new Error(\n   `wasm backend FusedConv2D does not support dataFormat:'` +\n   `${dataFormat}'. Please use 'NHWC'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const preluActivationWeightsId = preluActivationWeights == null ?\n   0 :\n   backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedConv2d(\n   xId, batchSize, inHeight, inWidth, filterId, filterHeight, filterWidth,\n   biasId, padTop, padRight, padBottom, padLeft, isSamePad, dilationHeight,\n   dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n   fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedConv2DConfig: KernelConfig = {\n kernelName: FusedConv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedConv2d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {backend_util, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs, FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet

wasmFusedDepthwiseConv2d:\n (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number,\n biasId: number, padTop: number, padRight: number, padBottom: number,\n padLeft: number, isSamePad: number, dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels: number, activation: number,\n preluActivationWeightsId:
number, leakyreluAlpha: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedDepthwiseConv2d =\n backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // biasId\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // activation\n 'number', // preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number',
// outId\n]);\n}\n\nfunction fusedDepthwiseConv2d(args: {\n inputs: FusedDepthwiseConv2DInputs,\n backend: BackendWasm,\n attrs: FusedDepthwiseConv2DAttrs\n}) {\n const {inputs, attrs, backend} = args;\n const {x, filter, bias, preluActivationWeights} = inputs;\n const {\n strides,\n pad,\n dilations,\n dataFormat,\n dimRoundingMode,\n activation,\n leakyreluAlpha\n } = attrs;\n\n const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode, true /* depthwise */);\n\n const fusedActivation =\n FusableActivation[activation as {} as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n throw new Error(\n `${activation} activation not yet supported for FusedDepthwiseConv2D ` +\n `in the wasm backend.`);\n }\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n
const outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n if (bias != null) {\n const biasData = backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n throw new Error(\n `FusedDepthwiseConv2D only supports rank-1 bias but got ` +\n `rank ${biasData.shape.length}.`);\n }\n if (biasData.shape[0] !== outputChannels) {\n throw new Error(\n `FusedDepthwiseConv2D bias shape (${biasData.shape}) does not ` +\n `match the number of output channels (${outputChannels})`);\n }\n biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n
const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize = convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if (dataFormat !== 'NHWC') {\n throw new Error(\n `wasm backend FusedDepthwiseConv2D does not support dataFormat:` +\n `${dataFormat}'. Please use 'NHWC'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const preluActivationWeightsId = preluActivationWeights == null ?\n 0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedDepthwiseConv2d(\n xId, batchSize, inHeight, inWidth, filterId, filterHeight, filterWidth,\n biasId, padTop, padRight, padBottom, padLeft, isSamePad, dilationHeight,\n dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedDepthwiseConv2DConfig: KernelConfig = {\n kernelName: FusedDepthwiseConv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedDepthwiseConv2d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or

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==========\n */\n\nimport {gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmGatherNd: (\n xId: number, dtype: CppDType, indicesId: number, numSlices: number,\n sliceRank: number, sliceSize: number, strides: Uint8Array, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n 'number', // xId\n 'number', // dtype\n 'number', // indicesId\n 'number', // numSlices\n 'number', // sliceRank\n 'number', // sliceSize\n 'array', // strides\n 'number' // outId\n]);\n}\n\nfunction gatherNd(args: {backend: BackendWasm, inputs: GatherNdInputs}):\n TensorInfo {\n const {backend, inputs} = args;\n const {params, indices} = inputs;\n\n const [resultShape, numSlices, sliceSize, strides] =\n gather_util.prepareAndValidate(params, indices);\n\n const out = backend.makeOutput(resultShape, params.dtype);\n if (numSlices === 0) {\n return out;\n }\n\n const indicesShape = indices.shape;\n const sliceRank = indicesShape[indicesShape.length - 1];\n\n const xData = backend.dataIdMap.get(params.dataId);\n const xId = xData.id;\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const stridesBytes = new Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmGatherNd(\n xId, CppDType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n stridesBytes, outId);\n\n return out;\n}\n\nexport const gatherNdConfig: KernelConfig = {\n kernelName: GatherNd,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherNd\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may
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==========\n */\n\nimport {backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc, Tensor, TensorInfo, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from './Reshape';\nimport {CppDType} from './types';\n\nlet wasmGather: (\n xId: number, dtype: CppDType, xStrides: Uint8Array, stridesSize: number,\n indicesId: number, batchSize: number, outStrides:
Uint8Array,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmGather = backend.wasm.cwrap('Gather', null /*void*/, [\n 'number', // xId\n 'number', // dtype\n 'array', // xStrides\n 'number', // stridesSize\n 'number', // indicesId\n 'number', // batchSize\n 'array', // outStrides\n 'number' // outId\n]);\n}\n\nfunction gatherV2(\n args: {backend: BackendWasm, inputs: GatherV2Inputs, attrs: GatherV2Attrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x, indices} = inputs;\n const {axis, batchDims} = attrs;\n\n // Throw error when any index is out of bound.\n const parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n const indicesVals = backend.readSync(indices.dataId) as TypedArray;\n const axisDim = x.shape[parsedAxis];\n for (let i = 0; i < indicesVals.length; ++i) {\n const index = indicesVals[i];\n util.assert(\n index <= axisDim - 1 && index >= 0,\n
() =>\n `GatherV2: the index value ${index} is not in [0, ${axisDim - 1}]`);\n }\n\n const shapeInfo = backend_util.segment_util.collectGatherOpShapeInfo(\n x as Tensor, indices as Tensor, parsedAxis, batchDims);\n\n const flattenX = reshape({\n inputs: {x},\n attrs: {\n shape: [\n shapeInfo.batchSize, shapeInfo.outerSize, shapeInfo.dimSize,\n shapeInfo.sliceSize\n]\n },\n backend\n });\n const indicesSize = util.sizeFromShape(indices.shape);\n const flattenIndex = reshape({\n inputs: {x: indices},\n attrs:

{shape: [shapeInfo.batchSize, indicesSize / shapeInfo.batchSize]},\n backend\n });\n const flattenOutputShape = [\n shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n shapeInfo.sliceSize\n];\n\n const out = backend.makeOutput(flattenOutputShape, x.dtype);\n if (util.sizeFromShape(x.shape) === 0) {\n return out;\n }\n const stridesSize = flattenX.shape.length - 1;\n\n const xData = backend.dataIdMap.get(flattenX.dataId);\n const xId = xData.id;\n\n const indicesData = backend.dataIdMap.get(flattenIndex.dataId);\n const indicesId = indicesData.id;\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const xStridesBytes = new Uint8Array(\n new Int32Array(util.computeStrides(flattenX.shape)).buffer);\n const outStridesBytes = new Uint8Array(\n new Int32Array(util.computeStrides(flattenOutputShape)).buffer);\n\n wasmGather(\n xId, CppDType[x.dtype], xStridesBytes, stridesSize, indicesId,\n shapeInfo.batchSize, outStridesBytes, outId);\n\n backend.disposeData(flattenX.dataId);\n backend.disposeData(flattenIndex.dataId);\n\n // reshape\n out.shape = shapeInfo.outputShape;\n return out;\n}\n\nexport const gatherV2Config: KernelConfig = {\n kernelName: GatherV2,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherV2 as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ==========\n */\nimport {Greater, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterConfig: KernelConfig =\n createBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ==========\n */\nimport {GreaterEqual, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterEqualConfig: KernelConfig =\n createBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ==========\n */\n\nimport {KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmFunc: (\n xId: number, dtype: number, leakyreluAlpha: number, outId: number) => void;\n\nfunction

setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(LeakyRelu, null /* void */, [\n 'number', // x_id\n   'number', // dtype\n   'number', // leakyrelu_alpha\n   'number', // out_id\n]);\n}\n\nexport function leakyRelu(\n args:\n   {inputs: LeakyReluInputs, attrs: LeakyReluAttrs, backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, attrs: {alpha}, backend} = args;\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n // According to TF API, LeakyRelu returns float32 when input is either float32\n // or int32.\n const out = backend.makeOutput(x.shape, 'float32');\n\n if (util.sizeFromShape(x.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n   wasmFunc(xId, CppDType[x.dtype], alpha, outId);\n }\n\n return out;\n}\n\nexport const leakyReluConfig: KernelConfig = {\n kernelName: LeakyRelu,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: leakyRelu as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ==\n */\nimport {KernelConfig, Less} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessConfig: KernelConfig =\n createBinaryKernelConfig(Less, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ==\n */\n\nimport {KernelConfig, LessEqual} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessEqualConfig: KernelConfig =\n createBinaryKernelConfig(LessEqual, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ==\n */\nimport {KernelConfig, Log} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const logConfig: KernelConfig = createUnaryKernelConfig(Log);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License,\n Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ==\n */\nimport {KernelConfig, LogicalAnd} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const logicalAndConfig: KernelConfig =\n createBinaryKernelConfig(LogicalAnd, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019

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==========\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmMax: (xId: number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction
setup(backend: BackendWasm): void {\n wasmMax = backend.wasm.cwrap(Max, null /*void*/, [\n   'number', // x_id\n   'number', // dtype\n   'number', // reduce_size\n   'number', // out_id\n]);\n}\n\nfunction max(args: {backend: BackendWasm, inputs: MaxInputs, attrs: MaxAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {reductionIndices: axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n   const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   input = transposed;\n   inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('max', axes, inputRank);\n const [outShape, reduceShape] =\n   backend_util.computeOutAndReduceShapes(input.shape,
axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n   wasmMax(inputId, CppDType[x.dtype], reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n return out;\n}\n\nexport const maxConfig: KernelConfig = {\n kernelName: Max,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: max as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n
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==========\n
*/\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const maximumConfig: KernelConfig =\n createBinaryKernelConfig(Maximum, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
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==========\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util}

from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmMaxPool: (\n xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterHeight: number, filterWidth: number, padTop: number, padRight: number,\n padBottom: number, padLeft: number, dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmMaxPool = backend.wasm.cwrap(MaxPool, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n}\n\nfunction maxPool(\n args: {inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n const {inputs, attrs, backend} = args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n // TF API supports int32 input. CPU and WebGL backend also support int32\n // input. WASM backend doesn't support it because it uses xnnpack which only\n // supports float32.\n //\n // Add the following assert only for the WASM backend instead of at core op\n // level.\n //\n // TODO: add support for int32 input.\n util.assert(\n x.dtype === 'float32',\n () =>\n `Error in MaxPool: only float32 input is supported. Got ${x.dtype}.`);\n\n const {filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend does not support dataFormat:` +\n `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmMaxPool(\n xId, x.shape[0], x.shape[1], x.shape[2], filterHeight, filterWidth,\n padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n strideHeight, strideWidth, inputChannels, outputChannels, outId);\n return out;\n}\n\nexport const maxPoolConfig: KernelConfig = {\n kernelName: MaxPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: maxPool as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {cast} from './Cast';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmMean: (xId: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMean =\n backend.wasm.cwrap(Mean,\n null /*void*/, ['number, number, number']);\n}\n\nexport function mean(\n args: {backend: BackendWasm, inputs: MeanInputs, attrs: MeanAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n

permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n   const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   if (transposedId !== xId) {\n   // transpose was not a no-op. We will need to dispose of this\n   // once we are done.\n   input = transposed;\n   inputId = transposedId;\n   reductionAxes = backend_util.getInnerMostAxes(\n   reductionAxes.length, input.shape.length);\n   }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n   'mean', reductionAxes, input.shape.length);\n
  const [outShape, reduceShape] =\n   backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize = util.sizeFromShape(reduceShape);\n let castedInput = input;\n if (input.dtype !== 'float32') {\n castedInput =\n   cast({backend, inputs: {x: input}, attrs: {dtype: 'float32'}});\n   inputId = backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(outShape, 'float32');\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n wasmMean(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n if (input.dtype !== 'float32') {\n   backend.disposeData(castedInput.dataId);\n }\n\n return out;\n}\n\nexport
 const meanConfig: KernelConfig = {\n kernelName: Mean,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: mean as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport
 {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmMin: (xId: number, dtype: number, reduceSize: number, outId: number) =>\n   void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMin = backend.wasm.cwrap(Min, null /*void*/, [\n   'number', // x_id\n   'number', // dtype\n   'number', // reduce_size\n   'number', // out_id\n]);\n}\n\nfunction min(args: {backend: BackendWasm, inputs: MinInputs, attrs: MinAttrs}):\n   TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   if (transposedId !== xId)
 {\n   // transpose was not a no-op. We will need to dispose of this\n   // once we are done.\n   input = transposed;\n   inputId = transposedId;\n   }\n }\n\n const inputRank = input.shape.length;\n\n backend_util.assertAxesAreInnerMostDims('min', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n wasmMin(inputId, CppDType[x.dtype], reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n return out;\n}\n\nexport const minConfig: KernelConfig
 = {\n kernelName: Min,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: min as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the

License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n===\n*/\nimport {KernelConfig, Minimum} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const minimumConfig: KernelConfig =\n createBinaryKernelConfig(Minimum, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n===\n*/\n\nimport {KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\n// Must match enum in MirrorPad.cc\nenum MirrorPaddingMode {\n reflect = 0,\n symmetric = 1\n}\n\nlet wasmMirrorPad: (\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array, mode: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmMirrorPad = backend.wasm.cwrap(MirrorPad, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n 'array', // pre-paddings\n 'array', // post-paddings\n 'number', // mode\n 'number', // outId\n]);\n}\n\nfunction mirrorPad(args: {\n inputs: MirrorPadInputs,\n backend: BackendWasm,\n attrs: MirrorPadAttrs\n}) {\n const {inputs: {x}, backend, attrs: {paddings, mode}} = args;\n\n const outShape = paddings.map(\n (p, i) => p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(outShape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n const prePaddingsBytes =\n new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const postPaddingsBytes =\n new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmMirrorPad(\n xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n postPaddingsBytes, MirrorPaddingMode[mode], outId);\n return out;\n}\n\nexport const mirrorPadConfig: KernelConfig = {\n kernelName: MirrorPad,\n backendName: 'wasm',\n kernelFunc: mirrorPad as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the\n \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n===\n*/\n\nimport {KernelConfig, Multiply} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = true;\nexport const multiplyConfig: KernelConfig =\n createBinaryKernelConfig(Multiply, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2020 Google

LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\nimport {KernelConfig, Neg} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const negConfig: KernelConfig = createUnaryKernelConfig(Neg);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {BackendWasm} from '../backend_wasm';\n\n// Analogous to `struct Result` in `non_max_suppression_impl.h`.\ninterface Result {\n pSelectedIndices: number;\n selectedSize: number;\n pSelectedScores: number;\n pValidOutputs: number;\n}\n/**\n * Parse the result of the c++ method, which has the shape equivalent to\n * `Result`.\n */\nexport function parseResultStruct(\n backend: BackendWasm, resOffset: number): Result {\n const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);\n const pSelectedIndices = result[0];\n const selectedSize = result[1];\n const pSelectedScores = result[2];\n const pValidOutputs = result[3];\n // Since the result was allocated on the heap, we have to delete it.\n backend.wasm._free(resOffset);\n return {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs};\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs, NonMaxSuppressionV3Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number) => number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n NonMaxSuppressionV3,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', // scoreThreshold\n]);\n}\n\nfunction kernelFunc(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV3Inputs,\n attrs: NonMaxSuppressionV3Attrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold} = attrs;\n const {boxes, scores} = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset =\n wasmFunc(boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V3, we have to delete it from the heap.\n backend.wasm._free(pSelectedScores);\n backend.wasm._free(pValidOutputs);\n\n const selectedIndicesTensor =\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n return

selectedIndicesTensor;\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n kernelName: NonMaxSuppressionV3,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020
 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs, NonMaxSuppressionV4Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n boxesId: number, scoresId:
 number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number,\n padToMaxOutputSize: boolean) => number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n NonMaxSuppressionV4,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n
 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', // scoreThreshold\n 'bool', // padToMaxOutputSize\n]);\n}\n\nfunction nonMaxSuppressionV4(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV4Inputs,\n attrs: NonMaxSuppressionV4Attrs\n}): TensorInfo[] {\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold, padToMaxOutputSize} =\n attrs;\n const {boxes, scores} = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset = wasmFunc(\n boxesId,
 scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n padToMaxOutputSize);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V4, we have to delete it from the heap.\n backend.wasm._free(pSelectedScores);\n\n const selectedIndicesTensor =\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n const validOutputsTensor = backend.makeOutput([], 'int32', pValidOutputs);\n\n return [selectedIndicesTensor, validOutputsTensor];\n}\n\nexport const nonMaxSuppressionV4Config: KernelConfig = {\n kernelName: NonMaxSuppressionV4,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: nonMaxSuppressionV4 as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You
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*/\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs, NonMaxSuppressionV5Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc:\n (boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number, softNmsSigma: number) =>\n number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc
 = backend.wasm.cwrap(\n NonMaxSuppressionV5,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n
 'number', // scoreThreshold\n 'number', // softNmsSigma\n]);\n}\n\nfunction kernelFunc(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV5Inputs,\n attrs: NonMaxSuppressionV5Attrs\n}): TensorInfo[] {\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold,

softNmsSigma} = attrs;\n const {boxes, scores} = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset = wasmFunc(\n   boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n softNmsSigma);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n //
 Since we are not using validOutputs for V5, we have to delete it from the\n // heap.\n backend.wasm._free(pValidOutputs);\n\n const selectedIndicesTensor =\n   backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n const selectedScoresTensor =\n   backend.makeOutput([selectedSize], 'float32', pSelectedScores);\n\n return [selectedIndicesTensor, selectedScoresTensor];\n}\n\nexport const nonMaxSuppressionV5Config: KernelConfig = {\n kernelName: NonMaxSuppressionV5,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License
 is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\nimport {KernelConfig, NotEqual} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const notEqualConfig: KernelConfig =\n createBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the
 License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmOneHot: (\n   indicesId: number, depth: number, onValue: number, offValue: number,\n   outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmOneHot = backend.wasm.cwrap(OneHot, null /* void */, [\n   'number', // indices_id\n   'number', // depth,\n   'number', // onValue\n   'number', // offValue\n   'number'   // out_id\n]);\n}\n\nfunction oneHot(\n   args: {inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm}) {\n const {inputs, backend, attrs} = args;\n const {indices}
 = inputs;\n const {depth, onValue, offValue} = attrs;\n\n const out = backend.makeOutput([...indices.shape, depth], 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n wasmOneHot(indicesId, depth, onValue, offValue, outId);\n\n return out;\n}\n\nexport const oneHotConfig: KernelConfig = {\n kernelName: OneHot,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: oneHot as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES

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==========================================================================\n
*/\n\nimport {KernelConfig, KernelFunc, OnesLike, OnesLikeInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nfunction onesLike(args: {inputs: OnesLikeInputs, backend: BackendWasm}) {\n  const {inputs: {x}, backend} = args;\n  const out = backend.makeOutput(x.shape, x.dtype);\n const outVals = backend.typedArrayFromHeap(out);\n  outVals.fill(1);\n  return out;\n}\n\nexport const onesLikeConfig: KernelConfig = {\n  kernelName: OnesLike,\n  backendName: 'wasm',\n  kernelFunc: onesLike as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nimport {concat} from './Concat';\nimport {expandDims} from './ExpandDims';\n\nexport function pack(\n    args: {inputs: PackInputs, backend: BackendWasm, attrs: PackAttrs}):\n    TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {axis} = attrs;\n\n  if (inputs.length === 1) {\n    return expandDims(\n        {inputs: {input: inputs[0]}, backend, attrs: {dim: axis}});\n  }\n\n  const shape = inputs[0].shape;\n  const dtype = inputs[0].dtype;\n\n  inputs.forEach(t => {\n    util.assertShapesMatch(\n        shape, t.shape,\n        'All tensors passed to stack must have matching shapes');\n    util.assert(\n        dtype === t.dtype,\n        () => 'All tensors passed to stack must have matching dtypes');\n  });\n\n  const intermediateTensorInfos: TensorInfo[] = [];\n  const expandedTensors = inputs.map(t => {\n    const expandedT =\n        expandDims({inputs: {input: t}, backend, attrs: {dim: axis}});\n    intermediateTensorInfos.push(expandedT);\n    return expandedT;\n  });\n\n  const result = concat({inputs: expandedTensors, backend, attrs: {axis}});\n\n  intermediateTensorInfos.forEach(t => backend.disposeData(t.dataId));\n\n  return result;\n}\n\nexport const packConfig: KernelConfig = {\n  kernelName: Pack,\n  backendName: 'wasm',\n  kernelFunc: pack as {} as KernelFunc\n};\n","/**\n
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*/\n\nimport {KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {fill} from './Fill';\n\nimport {CppDType} from './types';\n\nlet wasmPadV2: (\n    xId: number, xShapeBytes:
 Uint8Array, xShapeLength: number, xDtype: number,\n    prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array,\n    constantValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmPadV2 = backend.wasm.cwrap(PadV2, null /* void */, [\n    'number',  // xId\n    'array',   // x.shape\n    'number',  // x.shape.length\n    'number',  // x.dtype\n    'array',   // pre-paddings\n    'array',   // post-paddings\n    'number',  // constantValue\n    'number',  // outId\n  ]);\n}\n\nfunction pad(\n    args: {inputs: PadV2Inputs, backend: BackendWasm, attrs: PadV2Attrs}) {\n  const {inputs: {x}, backend, attrs: {paddings, constantValue}} = args;\n\n const outShape = paddings.map(\n      (p, i) => p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n\n  if (util.sizeFromShape(x.shape) === 0) {\n    // Short-circuit the computation, since x doesn't have value, only\n    //
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the shape is used to compute output shape to pad.\n   return fill({\n
  backend,\n   attrs: {shape: outShape, value: constantValue, dtype: x.dtype}\n   });\n }\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(outShape, x.dtype);\n const outTensorData = backend.dataIdMap.get(out.dataId);\n const outId = outTensorData.id;\n\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n const prePaddingsBytes =\n   new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const postPaddingsBytes =\n   new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmPadV2(\n   xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n   postPaddingsBytes, constantValue, outId);\n return out;\n}\n\nexport const padV2Config: KernelConfig = {\n kernelName: PadV2,\n backendName: 'wasm',\n kernelFunc: pad as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n
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*/\nimport {KernelConfig, Pow} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const powConfig: KernelConfig =\n createBinaryKernelConfig(Pow, supportsFullBroadcast);\n","/**\n *
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*/\n\nimport {KernelConfig, KernelFunc, Prelu, PreluInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from './Cast';\n\nlet wasmPrelu: (xId: number, weightsId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
  wasmPrelu = backend.wasm.cwrap(Prelu, null /* void */, [\n   'number', // x_id\n   'number', // weights_id\n   'number'   // out_id\n]);\n}\n\nfunction prelu(args: {inputs: PreluInputs, backend: BackendWasm}) {\n const {inputs, backend} = args;\n const {x, alpha} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const weightsId = backend.dataIdMap.get(alpha.dataId).id;\n\n let inputId = xId;\n const input = x;\n let castedInput = input;\n if (input.dtype !== 'float32') {\n   castedInput = cast({backend, inputs: {x}, attrs: {dtype: 'float32'}});\n   inputId = backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(x.shape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmPrelu(inputId, weightsId, outId);\n\n if (input.dtype !== 'float32') {\n   backend.disposeData(castedInput.dataId);\n }\n return out;\n}\n\nexport const preluConfig: KernelConfig = {\n kernelName: Prelu,\n backendName: 'wasm',\n
  setupFunc: setup,\n kernelFunc: prelu as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {backend_util, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose}
from './kernel_utils';\n\nimport {CppDType} from './types';\n\nlet wasmProd: (\n xId: number, reduceSize: number,\n dtype: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmProd = backend.wasm.cwrap(Prod, null /*void*/, [\n 'number',\n 'number',\n 'number',\n 'number'\n]);\n}\n\nfunction prod(args: {\n backend: BackendWasm,\n inputs: ProdInputs,\n attrs: ProdAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was not a no-op. We will need to dispose of this\n // once
we are done.\n input = transposed;\n inputId = transposedId;\n reductionAxes =
backend_util.getInnerMostAxes(\n reductionAxes.length, input.shape.length);\n }\n }\n\n
backend_util.assertAxesAreInnerMostDims(\n 'prod', reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmProd(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return out;\n}\n\nexport const prodConfig:
KernelConfig = {\n kernelName: Prod,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prod as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport
{rangeImplCPU} from '../kernel_utils/shared';\n\nexport const range =\n (args: {backend: BackendWasm, attrs: RangeAttrs}): TensorInfo => {\n const {backend, attrs} = args;\n const {start, stop, step, dtype} = attrs;\n const values = rangeImplCPU(start, stop, step, dtype);\n\n const out = backend.makeOutput([values.length], dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(values);\n return out;\n};\n\nexport const rangeConfig: KernelConfig = {\n kernelName: Range,\n backendName: 'wasm',\n kernelFunc: range as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n
* distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {KernelConfig, RealDiv} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from

'./binary_kernel';\n\nconst supportsFullBroadcast = true;\nexport const realDivConfig: KernelConfig =\n createBinaryKernelConfig(RealDiv, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n
* distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {KernelConfig, Relu} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const reluConfig: KernelConfig = createUnaryKernelConfig(Relu);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT
WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {KernelConfig, Relu6} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const relu6Config: KernelConfig = createUnaryKernelConfig(Relu6);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License
for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from './Cast';\n\nlet wasmResizeBilinear: (\n xId: number, batch: number, oldHeight: number, oldWidth: number,\n numChannels: number, newHeight: number, newWidth: number,\n alignCorners: number, halfPixelCenters: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmResizeBilinear = backend.wasm.cwrap(ResizeBilinear, null /*void*/, [\n 'number', // xId\n 'number', // batch\n 'number', // oldHeight\n 'number', // oldWidth\n 'number', // numChannels\n 'number', // newHeight\n 'number', // newWidth\n 'number', // alignCorners\n 'number',
// halfPixelCenters\n 'number' // outId\n]);\n}\n\nfunction resizeBilinear(args: {\n backend: BackendWasm,\n inputs: ResizeBilinearInputs,\n attrs: ResizeBilinearAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n\n const {images} = inputs;\n const {alignCorners, halfPixelCenters, size} = attrs;\n const [newHeight, newWidth] = size;\n\n const [batch, oldHeight, oldWidth, numChannels] = images.shape;\n const outShape = [batch, newHeight, newWidth, numChannels];\n\n let xData = backend.dataIdMap.get(images.dataId);\n let castedData;\n if (xData.dtype !== 'float32') {\n castedData =\n cast({backend, inputs: {x: images}, attrs: {dtype: 'float32'}});\n xData = backend.dataIdMap.get(castedData.dataId);\n }\n const xId = xData.id;\n\n const out = backend.makeOutput(outShape, 'float32');\n if (util.sizeFromShape(images.shape) === 0) {\n return out;\n }\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmResizeBilinear(\n xId, batch, oldHeight, oldWidth, numChannels, newHeight, newWidth,\n alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId);\n\n if (castedData != null) {\n backend.disposeData(castedData.dataId);\n }\n\n

return out;\n}\n\nexport const resizeBilinearConfig: KernelConfig = {\n kernelName: ResizeBilinear,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: resizeBilinear as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
 governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\n\nlet wasmReverse: (\n   xId: number, axes: Uint8Array, axesLength: number, outShape: Uint8Array,\n   outShapeLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmReverse = backend.wasm.cwrap(Reverse, null, [\n   'number', // x_id\n   'array',   // axes\n   'number', // axes_length\n   'array',   // out_shape\n   'number', // out_shape_length\n   'number'
 // out_id\n]);\n}\n\nexport function reverse(\n   args: {inputs: ReverseInputs, backend: BackendWasm, attrs: ReverseAttrs}):\n   TensorInfo {\n const {inputs, backend, attrs} = args;\n const
 {x} = inputs;\n const {dims} = attrs;\n\n const axes = util.parseAxisParam(dims, x.shape);\n\n if (x.shape.length === 0) {\n   return identity({inputs: {x}, backend});\n }\n\n const out = backend.makeOutput(x.shape, x.dtype);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const axesBytes = new Uint8Array(new Int32Array(axes).buffer);\n const outShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n wasmReverse(\n   xId, axesBytes, axes.length, outShapeBytes, x.shape.length, outId);\n\n const reshaped =\n   reshape({inputs: {x: out}, attrs: {shape: x.shape}, backend});\n\n backend.disposeData(out.dataId);\n return reshaped;\n}\n\nexport const reverseConfig: KernelConfig = {\n kernelName: Reverse,\n backendName: 'wasm',\n kernelFunc: reverse as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License,
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*/\n\nimport {KernelConfig, KernelFunc, RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmRotate: (\n   xId: number, batch: number, imageHeight: number, imageWidth: number,\n   numChannels: number, radians: number, centerX:
 number, centerY: number,\n   fillBytes: Uint8Array, fillLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmRotate = backend.wasm.cwrap(RotateWithOffset, null /* void */, [\n   'number', // xId\n   'number', // batch\n   'number', // imageHeight\n   'number', // imageWidth\n   'number', // numChannels\n   'number', // radians\n   'number', // centerX\n   'number', // centerY\n   'array',   // fillBytes\n   'number', // fillLength\n   'number', // outId\n]);\n}\n\nexport function rotateWithOffset(args: {\n inputs: RotateWithOffsetInputs,\n backend: BackendWasm,\n attrs: RotateWithOffsetAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {image} = inputs;\n const {radians, fillValue, center} = attrs;\n\n const out = backend.makeOutput(image.shape, image.dtype);\n const imageId = backend.dataIdMap.get(image.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch,

imageHeight, imageWidth, numChannels] = image.shape;\n\n const [centerX, centerY] =\n backend_util.getImageCenter(center, imageHeight, imageWidth);\n\n const fillIsBlack = fillValue === 0;\n const fullOpacityValue = 255;\n\n const fillValues = typeof fillValue === 'number' ?\n   [fillValue, fillValue, fillValue, fillIsBlack ? 0 : fullOpacityValue] :\n   [...fillValue, fullOpacityValue];\n const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);\n\n wasmRotate(\n   imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX,\n   centerY, fillBytes, fillValues.length, outId);\n return out;\n}\n\nexport const rotateWithOffsetConfig: KernelConfig = {\n kernelName: RotateWithOffset,\n backendName: 'wasm',\n kernelFunc: rotateWithOffset as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\nimport {KernelConfig, Round} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {KernelConfig, KernelFunc, scatter_util, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmScatterNd: (\n   indicesId: number, updatesId: number, dtype: CppDType, sliceRank: number,\n   numUpdates: number, sliceSize: number, strides: Uint8Array,\n   outputSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmScatterNd = backend.wasm.cwrap(ScatterNd, null /*void*/, [\n   'number', // indicesId\n   'number',
  // updatesId\n   'number', // dtype\n   'number', // sliceRank\n   'number', // numUpdates\n   'number', // sliceSize\n   'array',   // strides\n   'number', // outputSize\n   'number'   // outId\n]);\n}\n\nfunction scatterNd(\n args:\n   {backend: BackendWasm, inputs: ScatterNdInputs, attrs: ScatterNdAttrs}):\n   TensorInfo {\n const {backend, inputs, attrs} = args;\n const {indices, updates} = inputs;\n const {shape} = attrs;\n\n const out = backend.makeOutput(shape, updates.dtype);\n if (util.sizeFromShape(shape) === 0) {\n   return out;\n }\n\n const {sliceRank, numUpdates, sliceSize, strides, outputSize} =\n   scatter_util.calculateShapes(updates, indices, shape);\n\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n

const updatesData = backend.dataIdMap.get(updates.dataId);\n const updatesId = updatesData.id;\n\n const stridesBytes = new Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmScatterNd(\n   indicesId, updatesId, CppDType[updates.dtype], sliceRank, numUpdates,\n   sliceSize, stridesBytes, outputSize, outId);\n\n return out;\n}\n\nexport const scatterNdConfig: KernelConfig = {\n kernelName: ScatterNd,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: scatterNd as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ==\n */\n\nimport {KernelConfig, KernelFunc, Select, SelectInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmSelect: (\n   conditionId: number, tId: number, eId: number, offset: number,\n   outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmSelect = backend.wasm.cwrap('SelectV2', null, [\n   'number', // conditionId\n   'number', // tId\n   'number', // eId\n   'number', // offset\n   'number', // outId\n]);\n}\n\nfunction select(args: {inputs: SelectInputs, backend: BackendWasm}) {\n const {inputs, backend} = args;\n const {condition, t, e} = inputs;\n\n const conditionId = backend.dataIdMap.get(condition.dataId).id;\n const tId = backend.dataIdMap.get(t.dataId).id;\n const eId = backend.dataIdMap.get(e.dataId).id;\n const out = backend.makeOutput(t.shape, t.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const cRank = condition.shape.length;\n const tRank = t.shape.length;\n\n const offset = cRank === 0 || cRank > 1 || tRank === 1 ?\n   1 :\n   util.sizeFromShape(t.shape.slice(1));\n\n wasmSelect(conditionId, tId, eId, offset, outId);\n return out;\n}\n\nexport const selectConfig: KernelConfig = {\n kernelName: Select,\n backendName: 'wasm',\n kernelFunc: select as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ==\n */\n\nimport {KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Sigmoid, null /* void */, ['number', 'number']);\n}\n\nfunction sigmoid(args: {backend: BackendWasm, inputs: SigmoidInputs}):\n   TensorInfo {\n const {backend, inputs: {x}} = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n   return out;\n }\n\n wasmFunc(xId, outId);\n return out;\n}\n\nexport const sigmoidConfig:\n   KernelConfig = {\n kernelName: 'Sigmoid',\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sigmoid as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or

implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\nimport {KernelConfig, Sin} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const
sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\n\nimport {KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number,
channels: number, batch: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Softmax, null /* void */, [\n 'number', // xId\n 'number', // outId\n 'number', // channels\n 'number' // batch\n]);\n}\n\nfunction softmax(\n args: {backend: BackendWasm, inputs: SoftmaxInputs, attrs: SoftmaxAttrs}):\n TensorInfo {\n const {backend, inputs: {logits}, attrs: {dim}} = args;\n const xId = backend.dataIdMap.get(logits.dataId).id;\n const out = backend.makeOutput(logits.shape, logits.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const channels = logits.shape[dim];\n const batch = util.sizeFromShape(logits.shape) / channels;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId, outId, channels, batch);\n return out;\n}\n\nexport const softmaxConfig: KernelConfig = {\n kernelName: Softmax,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: softmax as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\n\nimport {backend_util, KernelConfig, KernelFunc, ReshapeAttrs, ReshapeInputs, SpaceToBatchND, SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, TransposeAttrs, TransposeInputs, util} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nimport {padV2Config} from './PadV2';\nimport {reshape} from './Reshape';\nimport {transpose} from './Transpose';\n\nfunction spaceToBatchND(args: {\n inputs: SpaceToBatchNDInputs,\n backend: BackendWasm,\n attrs: SpaceToBatchNDAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {blockShape, paddings} = attrs;\n\n const prod = util.sizeFromShape(blockShape);\n\n const completePaddings: Array<[number, number]> = [[0, 0]];\n completePaddings.push(...(paddings as Array<[number, number]>));\n\n for (let i = 1 + blockShape.length; i < x.shape.length; ++i) {\n completePaddings.push([0, 0]);\n }\n\n const paddedX = padV2Config.kernelFunc({\n inputs: {x},\n backend,\n attrs: {paddings: completePaddings, constantValue: 0}\n }) as TensorInfo;\n\n const reshapedPaddedShape =\n backend_util.getReshaped(paddedX.shape, blockShape, prod, false);\n\n const permutedReshapedPaddedPermutation

= backend_util.getPermuted(\n reshapedPaddedShape.length, blockShape.length, false);\n\n const flattenShape =\n backend_util.getReshapedPermuted(paddedX.shape, blockShape, prod, false);\n\n const reshapeInputs: ReshapeInputs = {x: paddedX};\n const reshapeAttrs: ReshapeAttrs = {shape: reshapedPaddedShape};\n const paddedXReshaped =\n reshape({inputs: reshapeInputs, backend, attrs: reshapeAttrs});\n\n const transposeInputs: TransposeInputs = {x: paddedXReshaped};\n const transposeAttrs:\n TransposeAttrs = {perm: permutedReshapedPaddedPermutation};\n const paddedXT =\n transpose({inputs: transposeInputs, backend, attrs: transposeAttrs});\n\n const resultReshapeInputs: ReshapeInputs = {x: paddedXT};\n const resultReshapeAttrs: ReshapeAttrs = {shape: flattenShape};\n const result = reshape(\n {inputs: resultReshapeInputs, backend, attrs: resultReshapeAttrs});\n\n backend.disposeData(paddedX.dataId);\n backend.disposeData(paddedXReshaped.dataId);\n
backend.disposeData(paddedXT.dataId);\n\n return result;\n}\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n kernelName: SpaceToBatchND,\n backendName: 'wasm',\n kernelFunc: spaceToBatchND as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, SplitV,
SplitVAttrs, SplitVInputs, util} from '@tensorflow/tfjs-core';\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {slice} from './Slice';\n\nexport function splitV(\n args: {inputs: SplitVInputs, attrs: SplitVAttrs, backend: BackendWasm}) {\n const {inputs, attrs, backend} = args;\n const {x} = inputs;\n const {numOrSizeSplits, axis} = attrs;\n\n const $axis = util.parseAxisParam(axis, x.shape)[0];\n\n const splitSizes = backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n const begin = new Array(x.shape.length).fill(0);\n const size = x.shape.slice();\n return splitSizes.map(s => {\n const xSliceSize = [...size];\n xSliceSize[$axis] = s;\n const xSlice =\n slice({inputs: {x}, attrs: {begin, size: xSliceSize}, backend});\n begin[$axis] += s;\n return xSlice;\n });\n}\n\nexport const splitVConfig: KernelConfig = {\n kernelName: SplitV,\n backendName: 'wasm',\n kernelFunc: splitV as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, Sqrt} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const sqrtConfig: KernelConfig = createUnaryKernelConfig(Sqrt);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport {KernelConfig, Square} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const squareConfig: KernelConfig = createUnaryKernelConfig(Square);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n
* you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\nimport {KernelConfig, SquaredDifference} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const squaredDifferenceConfig: KernelConfig =\n createBinaryKernelConfig(SquaredDifference, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {KernelConfig, KernelFunc, Step, StepAttrs, StepInputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmStep: (xId: number, alpha: number, dtype: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmStep = backend.wasm.cwrap(Step, null /*void*/, [\n 'number', // x_id\n 'number', // alpha\n 'number', // dtype\n 'number', // out_id\n]);\n}\n\nfunction step(\n args: {backend: BackendWasm, inputs: StepInputs, attrs: StepAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {alpha} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmStep(xId, alpha, CppDType[x.dtype], outId);\n return out;\n}\n\nexport const stepConfig: KernelConfig = {\n kernelName: Step,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: step as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from './Reshape';\nimport {slice} from './Slice';\n\nlet wasmStridedSlice: (\n xId: number, xStridesBytes: Uint8Array, xRank: number,\n beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n outShapeBytes: Uint8Array, outStridesBytes: Uint8Array,\n outShapeLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm):
void {\n wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n 'number', // xId\n 'array', // xStrides\n 'number', // xRank\n 'array', // beginBytes\n 'array', // endBytes\n 'array', // stridesBytes\n 'array', // outShapeBytes\n 'array', // outStridesBytes\n 'number', // outShapeLength\n 'number', // outId\n]);\n}\n\nexport function stridedSlice(args: {\n backend: BackendWasm,\n inputs: StridedSliceInputs,\n attrs:

StridedSliceAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x} = inputs;\n\n const {\n begin,\n end,\n strides,\n beginMask,\n endMask,\n ellipsisMask,\n newAxisMask,\n shrinkAxisMask\n } = attrs;\n\n const {\n finalShapeSparse,\n finalShape,\n isIdentity,\n sliceDim0,\n isSimpleSlice,\n begin: $begin,\n end: $end,\n strides: $strides\n } =\n slice_util.sliceInfo(\n x.shape, begin, end, strides, beginMask, endMask,
ellipsisMask,\n newAxisMask, shrinkAxisMask);\n\n let result;\n\n if (isIdentity) {\n // Optimization #1, slice is a no-op plus reshape\n result = reshape({inputs: {x}, backend, attrs: {shape: finalShape}});\n } else if (sliceDim0 || isSimpleSlice) {\n // Optimization #2, slice is memory contiguous (only occurs in dim 0)\n util.assert(\n x.shape.length >= 1,\n () => `Input must have rank at least 1, got: ${x.shape.length}`);\n\n const size = slice_util.computeOutShape($begin, $end, $strides);\n // To tolerate begin[0] > end[0] (a 0-output slice), we min(begin, end).\n const sliced = slice({inputs: {x}, backend, attrs: {begin: $begin, size}});\n result =\n reshape({inputs: {x: sliced}, backend, attrs: {shape: finalShape}});\n backend.disposeData(sliced.dataId);\n } else {\n const out = backend.makeOutput(finalShapeSparse, 'float32');\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const xStridesBytes =\n new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n const beginBytes = new Uint8Array(new Int32Array($begin).buffer);\n const endBytes = new Uint8Array(new Int32Array($end).buffer);\n const stridesBytes = new Uint8Array(new Int32Array($strides).buffer);\n\n const outputShapeBytes =\n new Uint8Array(new Int32Array(finalShapeSparse).buffer);\n const outStridesBytes = new Uint8Array(\n new Int32Array(util.computeStrides(finalShapeSparse)).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmStridedSlice(\n xId, xStridesBytes, x.shape.length, beginBytes, endBytes, stridesBytes,\n outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);\n\n result = reshape({inputs: {x: out}, backend, attrs: {shape: finalShape}});\n\n backend.disposeData(out.dataId);\n }\n\n return result;\n}\n\nexport const stridedSliceConfig: KernelConfig = {\n kernelName: StridedSlice,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: stridedSlice as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport {KernelConfig, Sub} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const subConfig: KernelConfig =\n createBinaryKernelConfig(Sub,
supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport
{CppDType} from './types';\n\nlet wasmSum: (xId: number, reduceSize: number, dtype: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmSum = backend.wasm.cwrap(Sum, null

/*void*/, [\n 'number', // input_id\n 'number', // reduce_size\n 'number', // dtype\n 'number', // out_id\n]);\n}\n\nfunction sum(args: {backend: BackendWasm, inputs: SumInputs, attrs: SumAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n   // transpose was not a no-op. We will need to dispose of this\n   // once we are done.\n   input = transposed;\n   inputId = transposedId;\n   reductionAxes = backend_util.getInnerMostAxes(\n   reductionAxes.length, input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n   'sum', reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n   backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmSum(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return out;\n}\n\nexport
 const sumConfig: KernelConfig = {\n kernelName: Sum,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sum as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport {KernelConfig, Tan} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const
 tanConfig: KernelConfig = createUnaryKernelConfig(Tan);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n","/**\n * @license\n * Copyright
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number, xShape: Uint8Array, xShapeSize: number, newShape: Uint8Array,\n newShapeSize: number,
 dtype: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTile =
backend.wasm.cwrap(Tile, null /* void */, [\n 'number', // x_id\n 'array', // x_shape\n 'number', //
x_shape.length\n 'array', // new_shape\n 'number', // new_shape.length\n 'number' // out_id\n
]);\n}\n\nfunction tile(\n args: {inputs: TileInputs, backend: BackendWasm, attrs: TileAttrs}) {\n const {inputs,
backend, attrs} = args;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const {reps} =
attrs;\n\n const newShape: number[] = new Array(x.shape.length);\n for (let i = 0; i < newShape.length; i++) {\n
newShape[i] = x.shape[i] * reps[i];\n }\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n
const newShapeBytes = new Uint8Array(new Int32Array(newShape).buffer);\n\n const out =
backend.makeOutput(newShape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmTile(\n
xId, xShapeBytes,
 x.shape.length, newShapeBytes, newShape.length,\n CppDType[out.dtype], outId);\n return out;\n}\n\nexport
const tileConfig: KernelConfig = {\n kernelName: Tile,\n backendName: 'wasm',\n setupFunc: setup,\n
kernelFunc: tile as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights
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except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
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*/\n\nimport
 {KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\nimport {CppDType} from './types';\n\nlet wasmTopK: (\n xId:
number, xShapeBytes: Uint8Array, xShapeLength: number,\n xDtype: CppDType, k: number, sorted: boolean,
outValuesId: number,\n outIndicesId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number',
// x.shape.length\n 'number', // x.dtype\n 'number', // k\n 'bool', // sorted\n 'number', // outValuesId\n
'number', // outIndicesId\n]);\n}\n\nexport const topk:\n (args: {inputs: TopKInputs, backend: BackendWasm,
attrs: TopKAttrs}) =>\n TensorInfo[] | TensorInfo = ({inputs, backend, attrs}) => {\n const {x} = inputs;\n
 const {k, sorted} = attrs;\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n
 const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n const outputShape =
x.shape.slice();\n outputShape[outputShape.length - 1] = k;\n const outValues =
backend.makeOutput(outputShape, x.dtype);\n const outValuesId =
backend.dataIdMap.get(outValues.dataId).id;\n const outIndices = backend.makeOutput(outputShape,
'int32');\n const outIndicesId = backend.dataIdMap.get(outIndices.dataId).id;\n\n wasmTopK(\n
xId, xShapeBytes, x.shape.length, CppDType[x.dtype], k, sorted,\n outValuesId, outIndicesId);\n\n
return [outValues, outIndices];\n };\n\nexport const topKConfig: KernelConfig = {\n kernelName: TopK,\n
backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: topk as {} as KernelFunc,\n};\n","/**\n * @license\n *
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\"License\");\n * you may not use
 this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transform, TransformAttrs, TransformInputs, util} from

'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmTransform: (\n imageId: number, transformsId: number, isBatchTransform: boolean,\n batch: number, outHeight: number, outWidth: number, numChannels: number,\n imageWidth: number, imageHeight: number, strides: Uint8Array,\n stridesLength:
number, interpolationModeId: number, fillModeId: number,\n fillValue: number, outId: number) =>
void;\n\nfunction setup(backend: BackendWasm): void {\n wasmTransform = backend.wasm.cwrap(Transform, null /*void*/, [\n 'number', // imageId\n 'number', // transformsId\n 'bool', // isBatchTransform\n 'number', // batch\n 'number', // outHeight\n 'number', // outWidth\n 'number', // numChannels\n 'number', // imageWidth\n 'number', // imageHeight\n 'array', // strides\n 'number', // stridesLength\n 'number', // interpolationModeId\n 'number', // fillModeId\n 'number', // fillValue\n 'number' // outId\n]);\n}\n\nfunction transform(\n args:\n {backend: BackendWasm, inputs: TransformInputs, attrs: TransformAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {image, transforms} = inputs;\n const {interpolation, fillMode, fillValue, outputShape} = attrs;\n\n const [batch, imageHeight, imageWidth,
numChannels] = image.shape;\n const [outHeight, outWidth] =\n outputShape != null ? outputShape :
[imageHeight, imageWidth];\n const outShape =\n [batch, outHeight, outWidth,\n numChannels] as [number, number, number, number];\n const strides =\n new Uint8Array(new Int32Array(util.computeStrides(image.shape)).buffer);\n\n const out = backend.makeOutput(outShape, image.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const imageData = backend.dataIdMap.get(image.dataId);\n const imageId = imageData.id;\n\n const transformsData = backend.dataIdMap.get(transforms.dataId);\n const transformsId = transformsData.id;\n\n const interpolationModeId = interpolation === 'nearest' ? 1 : 2;\n let fillModeId;\n switch (fillMode) {\n case 'constant':\n fillModeId = 1;\n break;\n case 'reflect':\n fillModeId = 2;\n break;\n case 'wrap':\n fillModeId = 3;\n break;\n case 'nearest':\n fillModeId = 4;\n
break;\n default:\n fillModeId = 1;\n break;\n }\n\n wasmTransform(\n imageId, transformsId, (transforms.shape[0] > 1), batch, outHeight,\n outWidth, numChannels, imageWidth, imageHeight, strides,\n image.shape.length - 1, interpolationModeId, fillModeId, fillValue,\n outId);\n\n return out;\n}\n\nexport const transformConfig: KernelConfig = {\n kernelName: Transform,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: transform as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS
OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {slice} from './Slice';\n\nfunction unpack(\n args: {inputs: UnpackInputs, backend: BackendWasm, attrs: UnpackAttrs}):\n TensorInfo[] {\n const {inputs, backend, attrs} = args;\n const {value} = inputs;\n let {axis} = attrs;\n\n if (axis < 0) {\n axis += value.shape.length;\n }\n\n const numOutputs = value.shape[axis];\n const rank = value.shape.length;\n const outShape: number[] = new Array(rank - 1);\n let outIndex = 0;\n for (let i = 0; i < rank; i++) {\n if (i !== axis) {\n outShape[outIndex++] = value.shape[i];\n }\n }\n const outs: TensorInfo[] =
new Array(numOutputs);\n const begin = new Array(rank).fill(0);\n const size = value.shape.slice();\n size[axis] = 1;\n for (let i = 0; i < outs.length; i++) {\n begin[axis] = i;\n outs[i] = slice({inputs: {x: value}, attrs: {begin, size}, backend});\n }\n return outs.map(({dataId, dtype}) => ({dataId, dtype, shape: outShape}));\n}\n\nexport const unpackConfig: KernelConfig = {\n kernelName: Unpack,\n backendName: 'wasm',\n kernelFunc: unpack as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed

under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {KernelConfig, KernelFunc, ZerosLike, ZerosLikeInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nfunction zerosLike(args: {inputs: ZerosLikeInputs, backend: BackendWasm}) {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(0);\n return out;\n}\n\nexport const zerosLikeConfig: KernelConfig = {\n kernelName: ZerosLike,\n backendName: 'wasm',\n kernelFunc: zerosLike as {} as KernelFunc,\n};\n\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n//
We explicitly import the modular kernels so they get registered in the\n// global registry when we compile the library. A modular build would replace\n// the contents of this file and import only the kernels that are needed.\nimport {KernelConfig, registerKernel} from '@tensorflow/tfjs-core';\n\nimport {fusedMatMulConfig} from './kernels/_FusedMatMul';\nimport {absConfig} from './kernels/Abs';\nimport {addConfig} from './kernels/Add';\nimport {addNConfig} from './kernels/AddN';\nimport {allConfig} from './kernels/All';\nimport {anyConfig} from './kernels/Any';\nimport {argMaxConfig} from './kernels/ArgMax';\nimport {avgPoolConfig} from './kernels/AvgPool';\nimport {batchMatMulConfig} from './kernels/BatchMatMul';\nimport {batchToSpaceNDConfig} from './kernels/BatchToSpaceND';\nimport {castConfig} from './kernels/Cast';\nimport {ceilConfig} from './kernels/Ceil';\nimport {clipByValueConfig} from './kernels/ClipByValue';\nimport {concatConfig} from './kernels/Concat';\nimport {conv2DConfig} from './kernels/Conv2D';\nimport {conv2DBackpropInputConfig} from './kernels/Conv2DBackpropInput';\nimport {cosConfig} from './kernels/Cos';\nimport {coshConfig} from './kernels/Cosh';\nimport {cropAndResizeConfig} from './kernels/CropAndResize';\nimport {cumsumConfig} from './kernels/Cumsum';\nimport {depthToSpaceConfig} from './kernels/DepthToSpace';\nimport {depthwiseConv2dNativeConfig} from './kernels/DepthwiseConv2dNative';\nimport {eluConfig} from './kernels/Elu';\nimport {equalConfig} from './kernels/Equal';\nimport {expConfig} from './kernels/Exp';\nimport {expandDimsConfig} from './kernels/ExpandDims';\nimport {fillConfig} from './kernels/Fill';\nimport {flipLeftRightConfig} from './kernels/FlipLeftRight';\nimport {floorConfig} from './kernels/Floor';\nimport {floorDivConfig} from './kernels/FloorDiv';\nimport {fusedBatchNormConfig} from './kernels/FusedBatchNorm';\nimport {fusedConv2DConfig} from './kernels/FusedConv2D';\nimport {fusedDepthwiseConv2DConfig} from './kernels/FusedDepthwiseConv2D';\nimport {gatherNdConfig} from './kernels/GatherNd';\nimport {gatherV2Config} from './kernels/GatherV2';\nimport {greaterConfig} from './kernels/Greater';\nimport {greaterEqualConfig} from './kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport {leakyReluConfig} from './kernels/LeakyRelu';\nimport {lessConfig} from './kernels/Less';\nimport {lessEqualConfig} from './kernels/LessEqual';\nimport {logConfig} from './kernels/Log';\nimport {logicalAndConfig} from './kernels/LogicalAnd';\nimport {maxConfig} from './kernels/Max';\nimport {maximumConfig} from './kernels/Maximum';\nimport {maxPoolConfig} from './kernels/MaxPool';\nimport {meanConfig} from

'./kernels/Mean';\nimport {minConfig} from './kernels/Min';\nimport {minimumConfig} from
'./kernels/Minimum';\nimport {mirrorPadConfig} from './kernels/MirrorPad';\nimport {multiplyConfig} from
'./kernels/Multiply';\nimport {negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from
'./kernels/NonMaxSuppressionV3';\nimport {nonMaxSuppressionV4Config} from
'./kernels/NonMaxSuppressionV4';\nimport {nonMaxSuppressionV5Config} from
'./kernels/NonMaxSuppressionV5';\nimport {notEqualConfig} from './kernels/NotEqual';\nimport {oneHotConfig}
from './kernels/OneHot';\nimport {onesLikeConfig} from './kernels/OnesLike';\nimport {packConfig} from
'./kernels/Pack';\nimport {padV2Config} from './kernels/PadV2';\nimport {powConfig} from
'./kernels/Pow';\nimport {preluConfig} from './kernels/Prelu';\nimport
{prodConfig} from './kernels/Prod';\nimport {rangeConfig} from './kernels/Range';\nimport {realDivConfig} from
'./kernels/RealDiv';\nimport {reluConfig} from './kernels/Relu';\nimport {relu6Config} from
'./kernels/Relu6';\nimport {reshapeConfig} from './kernels/Reshape';\nimport {resizeBilinearConfig} from
'./kernels/ResizeBilinear';\nimport {reverseConfig} from './kernels/Reverse';\nimport {rotateWithOffsetConfig}
from './kernels/RotateWithOffset';\nimport {roundConfig} from './kernels/Round';\nimport {rsqrtConfig} from
'./kernels/Rsqrt';\nimport {scatterNdConfig} from './kernels/ScatterNd';\nimport {selectConfig} from
'./kernels/Select';\nimport {sigmoidConfig} from './kernels/Sigmoid';\nimport {sinConfig} from
'./kernels/Sin';\nimport {sliceConfig} from './kernels/Slice';\nimport {softmaxConfig} from
'./kernels/Softmax';\nimport {spaceToBatchNDConfig} from './kernels/SpaceToBatchND';\nimport {splitVConfig}
from './kernels/SplitV';\nimport {sqrtConfig} from './kernels/Sqrt';\nimport
{squareConfig} from './kernels/Square';\nimport {squaredDifferenceConfig} from
'./kernels/SquaredDifference';\nimport {stepConfig} from './kernels/Step';\nimport {stridedSliceConfig} from
'./kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig} from
'./kernels/Sum';\nimport {tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport
{tileConfig} from './kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transformConfig} from
'./kernels/Transform';\nimport {transposeConfig} from './kernels/Transpose';\nimport {unpackConfig} from
'./kernels/Unpack';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst
kernelConfigs: KernelConfig[] = [\n absConfig,\n addConfig,\n addNConfig,\n allConfig,\n anyConfig,\n
argMaxConfig,\n avgPoolConfig,\n batchMatMulConfig,\n batchToSpaceNDConfig,\n castConfig,\n
ceilConfig,\n clipByValueConfig,\n concatConfig,\n
conv2DConfig,\n conv2DBackpropInputConfig,\n cosConfig,\n coshConfig,\n cropAndResizeConfig,\n
cumsumConfig,\n depthToSpaceConfig,\n depthwiseConv2dNativeConfig,\n eluConfig,\n equalConfig,\n
expConfig,\n expandDimsConfig,\n fillConfig,\n flipLeftRightConfig,\n floorConfig,\n floorDivConfig,\n
fusedMatMulConfig,\n fusedBatchNormConfig,\n fusedConv2DConfig,\n fusedDepthwiseConv2DConfig,\n
gatherNdConfig,\n gatherV2Config,\n greaterConfig,\n greaterEqualConfig,\n identityConfig,\n
leakyReluConfig,\n lessConfig,\n lessEqualConfig,\n logConfig,\n logicalAndConfig,\n maxConfig,\n
maximumConfig,\n maxPoolConfig,\n meanConfig,\n minConfig,\n minimumConfig,\n mirrorPadConfig,\n
multiplyConfig,\n negConfig,\n nonMaxSuppressionV3Config,\n nonMaxSuppressionV4Config,\n
nonMaxSuppressionV5Config,\n notEqualConfig,\n oneHotConfig,\n onesLikeConfig,\n packConfig,\n
padV2Config,\n powConfig,\n preluConfig,\n prodConfig,\n rangeConfig,\n realDivConfig,\n
reluConfig,\n relu6Config,\n reshapeConfig,\n resizeBilinearConfig,\n reverseConfig,\n
rotateWithOffsetConfig,\n rsqrtConfig,\n roundConfig,\n scatterNdConfig,\n selectConfig,\n sigmoidConfig,\n
sinConfig,\n sliceConfig,\n softmaxConfig,\n spaceToBatchNDConfig,\n splitVConfig,\n sqrtConfig,\n
squareConfig,\n squaredDifferenceConfig,\n stepConfig,\n stridedSliceConfig,\n subConfig,\n sumConfig,\n
tanConfig,\n tanhConfig,\n tileConfig,\n topKConfig,\n transformConfig,\n transposeConfig,\n unpackConfig,\n
zerosLikeConfig\n];\n\nfor (const kernelConfig of kernelConfigs) {\n registerKernel(kernelConfig);\n}\n","/**\n *
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2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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law
or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {env} from '@tensorflow/tfjs-core';\n\nconst ENV = env();\n\n/**\n * True if SIMD is supported.\n */\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag(\n // This typed array passed in to WebAssembly.validate is WebAssembly binary\n // code. In this case it is a small program that contains SIMD\n // instructions.\n 'WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new Uint8Array([\n 0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3,\n 2, 1, 0, 10, 9, 1, 7, 0, 65, 0, 253, 15, 26, 11\n])));\n\n/**\n * True if threads are supported.\n */\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag('WASM_HAS_MULTITHREAD_SUPPORT', async () => {\n // TODO(annxingyuan): Enable node support once this is resolved:\n // https://github.com/tensorflow/tfjs/issues/3830\n if (ENV.get('IS_NODE')) {\n return false;\n }\n\n try {\n // Test for transferability of SABs (needed for Firefox)\n // https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkBZlHETpA/dwsMNchWEQAJ\n new MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n // This typed array is a WebAssembly program containing threaded\n // instructions.\n return WebAssembly.validate(new Uint8Array([\n 0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3, 2, 1, 0, 5,\n 4, 1, 3, 1, 1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26, 11\n]));\n } catch (e) {\n return false;\n }\n});\n","\nvar WasmBackendModuleThreadedSimd = (function() {\nvar _scriptDir = typeof document !== 'undefined'
&& document.currentScript ? document.currentScript.src : undefined;\n if (typeof __filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return (\nfunction(WasmBackendModuleThreadedSimd) {\n WasmBackendModuleThreadedSimd = WasmBackendModuleThreadedSimd || {};\n\n\nfunction GROWABLE_HEAP_I8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAP8}function GROWABLE_HEAP_U8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAPU8}function GROWABLE_HEAP_I32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAP32}function GROWABLE_HEAP_U32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAPU32}function GROWABLE_HEAP_F64(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAPF64}var Module=typeof WasmBackendModuleThreadedSimd!==\"undefined\"?WasmBackendModuleThreadedSimd:{};var readyPromiseResolve,readyPromiseReject;Module[\"ready\"]=new Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var moduleOverrides={};var key;for(key in Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var thisProgram=\"./this.program\";var quit_=function(status,toThrow){throw toThrow};var ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof window===\"object\";ENVIRONMENT_IS_WORKER=typeof importScripts===\"function\";ENVIRONMENT_IS_NODE=typeof process===\"object\"&&typeof process.versions===\"object\"&&typeof process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONMENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var ENVIRONMENT_IS_PTHREAD=Module[\"ENVIRONMENT_IS_PTHREAD\"]||false;if(ENVIRONMENT_IS_P

THREAD){buffer=Module[\"buffer\"]}var scriptDirectory=\"\";function
locateFile(path){if(Module[\"locateFile\"]){return Module[\"locateFile\"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\"path\").
dirname(scriptDirectory)+\"/\"}else{scriptDirectory=__dirname+\"/\"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=n
odePath[\"normalize\"](filename);return
nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\")};readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process[\"argv\"].length>1){thisProgram=process[\"argv\"][1].replace(/\\\\/g,\"/\")}arguments_=process[\"arg
v\"].slice(2);process[\"on\"](\"uncaughtException\",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process[\"on\"](\"unhandledRejection\",abort);quit_=function(status){process[\"exit\"](status)};Module[\"insp
ect\"]=function(){return\"[Emscripten
Module object]\"};var
nodeWorkerThreads;try{nodeWorkerThreads=require(\"worker_threads\")}catch(e){console.error('The
\"worker_threads\" module is not supported in this node.js build - perhaps a newer version is needed?');throw
e}global.Worker=nodeWorkerThreads.Worker}else if(ENVIRONMENT_IS_SHELL){if(typeof
read!=\"undefined\"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var
data;if(typeof readbuffer===\"function\"){return new
Uint8Array(readbuffer(f))}data=read(f,\"binary\");assert(typeof data===\"object\");return data};if(typeof
scriptArgs!=\"undefined\"){arguments_=scriptArgs}else if(typeof
arguments!=\"undefined\"){arguments_=arguments}if(typeof
quit===\"function\"){quit_=function(status){quit(status)}}if(typeof print!==\"undefined\"){if(typeof
console===\"undefined\")console={};console.log=print;console.warn=console.error=typeof
printErr!==\"undefined\"?printErr:print}}else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else
if(typeof
document!==\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(typeof
_scriptDir !== \"undefined\" &&
_scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf(\"blob:\")!==0){scriptDirectory=scriptDirectory.s
ubstr(0,scriptDirectory.lastIndexOf(\"/\")+1)}else{scriptDirectory=\"\"}if(ENVIRONMENT_IS_NODE){read_=fun
ction
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=n
odePath[\"normalize\"](filename);return
nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\")};readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret}}else{read_=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.responseType=\"arraybuffer\";xhr.send(null);return
new Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,true);xhr.responseType=\"arraybuffer\";xhr.onload=function(){if(xhr.status
==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror()};xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title}}else{}if(ENVIRONMENT_IS_NODE){if(typeof
performance===\"undefined\"){global.performance=require(\"perf_hooks\").performance}}var
out=Module[\"print\"]||console.log.bind(console);var err=Module[\"printErr\"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr

ides=null;if(Module[\"arguments\"])arguments_=Module[\"arguments\"];if(Module[\"thisProgram\"])thisProgram=Module[\"thisProgram\"];if(Module[\"quit\"])quit_=Module[\"quit\"];function warnOnce(text){if(!warnOnce.shown)warnOnce.shown={};if(!warnOnce.shown[text]){warnOnce.shown[text]=1;err(text)}}var
Atomics_load=Atomics.load;var Atomics_store=Atomics.store;var Atomics_compareExchange=Atomics.compareExchange;var wasmBinary;if(Module[\"wasmBinary\"])wasmBinary=Module[\"wasmBinary\"];var noExitRuntime=Module[\"noExitRuntime\"]||true;if(typeof WebAssembly!==\"object\"){abort(\"no native wasm support detected\")}var wasmMemory;var wasmModule;var ABORT=false;var EXITSTATUS;function assert(condition,text){if(!condition){abort(\"Assertion failed: \"+text)}}function getCFunc(ident){var func=Module[\"_\"+ident];assert(func,\"Cannot call unknown function \"+ident+\", make sure it is exported\");return func}function ccall(ident,returnType,argTypes,args,opts){var toC={\"string\":function(str){var ret=0;if(str!==null&&str!==undefined&&str!==0){var len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\"array\":function(arr){var ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function convertReturnValue(ret){if(returnType===\"string\")return
UTF8ToString(ret);if(returnType===\"boolean\")return Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var i=0;i<args.length;i++){var converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i]=args[i]}}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var numericArgs=argTypes.every(function(type){return type===\"number\"});var numericRet=returnType!==\"string\";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return function(){return ccall(ident,returnType,argTypes,arguments,opts)}}function UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var str=\"\";while(!(idx>=endIdx)){var u0=heap[idx++];if(!u0)return str;if(!(u0&128)){str+=String.fromCharCode(u0);continue}var u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[idx++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function UTF8ToString(ptr,maxBytesToRead){return ptr?UTF8ArrayToString(GROWABLE_HEAP_U8(),ptr,maxBytesToRead):\"\"}function stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var u=str.charCodeAt(i);if(u>=55296&&u<=57343){var u1=str.charCodeAt(++i);u=65536+((u&1023)<<10)|u1&1023}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return
outIdx-startIdx}function stringToUTF8(str,outPtr,maxBytesToWrite){return stringToUTF8Array(str,GROWABLE_HEAP_U8(),outPtr,maxBytesToWrite)}function lengthBytesUTF8(str){var len=0;for(var i=0;i<str.length;++i){var u=str.charCodeAt(i);if(u>=55296&&u<=57343)u=65536+((u&1023)<<10)|str.charCodeAt(++i)&1023;if(u<=127)++len;else if(u<=2047)len+=2;else if(u<=65535)len+=3;else len+=4}return len}function writeArrayToMemory(array,buffer){GROWABLE_HEAP_I8().set(array,buffer)}function alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var

buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function updateGlobalBufferAndViews(buf){buffer=buf;Module[\"HEAP8\"]=HEAP8=new Int8Array(buf);Module[\"HEAP16\"]=HEAP16=new Int16Array(buf);Module[\"HEAP32\"]=HEAP32=new Int32Array(buf);Module[\"HEAPU8\"]=HEAPU8=new Uint8Array(buf);Module[\"HEAPU16\"]=HEAPU16=new Uint16Array(buf);Module[\"HEAPU32\"]=HEAPU32=new Uint32Array(buf);Module[\"HEAPF32\"]=HEAPF32=new Float32Array(buf);Module[\"HEAPF64\"]=HEAPF64=new Float64Array(buf)}var INITIAL_MEMORY=Module[\"INITIAL_MEMORY\"]||16777216;if(ENVIRONMENT_IS_PTHREAD){wasmMemory=Module[\"wasmMemory\"];buffer=Module[\"buffer\"]}else{if(Module[\"wasmMemory\"]){wasmMemory=Module[\"wasmMemory\"]}else{wasmMemory=new WebAssembly.Memory({\"initial\":INITIAL_MEMORY/65536,\"maximum\":2147483648/65536,\"shared\":true});if(!(wasmMemory.buffer instanceof SharedArrayBuffer)){err(\"requested a shared WebAssembly.Memory but the returned buffer is not a SharedArrayBuffer, indicating that while the browser has SharedArrayBuffer it does not have WebAssembly threads support - you may need to set a flag\");if(ENVIRONMENT_IS_NODE){console.log(\"(on node you may need: --experimental-wasm-threads --experimental-wasm-bulk-memory and also use a recent version)\")}throw Error(\"bad memory\")}}}if(wasmMemory){buffer=wasmMemory.buffer}INITIAL_MEMORY=buffer.byteLength;updateGlobalBufferAndViews(buffer);var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var __ATEXIT__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;var runtimeExited=false;if(!ENVIRONMENT_IS_PTHREAD)__ATINIT__.push({func:function(){___wasm_call_ctors()}});function preRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module[\"preRun\"]){if(typeof Module[\"preRun\"]==\"function\")Module[\"preRun\"]=[Module[\"preRun\"]];while(Module[\"preRun\"].length){addOnPreRun(Module[\"preRun\"].shift())}}callRuntimeCallbacks(__ATPRERUN__)}function initRuntime(){runtimeInitialized=true;if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATINIT__)}function preMain(){if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATMAIN__)}function exitRuntime(){if(ENVIRONMENT_IS_PTHREAD)return;runtimeExited=true}function postRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module[\"postRun\"]){if(typeof Module[\"postRun\"]==\"function\")Module[\"postRun\"]=[Module[\"postRun\"]];while(Module[\"postRun\"].length){addOnPostRun(Module[\"postRun\"].shift())}}callRuntimeCallbacks(__ATPOSTRUN__)}function addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function addRunDependency(id){assert(!ENVIRONMENT_IS_PTHREAD,\"addRunDependency cannot be used in a pthread worker\");runDependencies++;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}}function removeRunDependency(id){runDependencies--;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}if(runDependencies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}if(dependenciesFulfilled){var callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}}Module[\"preloadedImages\"]={};Module[\"preloadedAudios\"]={};function abort(what){if(Module[\"onAbort\"]){Module[\"onAbort\"](what)}if(ENVIRONMENT_IS_PTHREAD)console.error(\"Pthread aborting at \"+(new Error).stack);what+=\"\";err(what);ABORT=true;EXITSTATUS=1;what=\"abort(\"+what+\"). Build with -s ASSERTIONS=1 for more info.\";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var

dataURIPrefix=\"data:application/octet-stream; base64,\";function isDataURI(filename){return hasPrefix(filename,dataURIPrefix)}var fileURIPrefix=\"file://\";function isFileURI(filename){return hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile=\"tfjs-backend-wasm-threaded-simd.wasm\";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function getBinary(file){try{if(file==wasmBinaryFile&&wasmBinary){return new Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw\"both async and sync fetching of the wasm failed\"}}catch(err){abort(err)}}function getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof fetch===\"function\"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){if(!response[\"ok\"]){throw\"failed to load wasm binary file at '\"+wasmBinaryFile+\"'\"}return response[\"arrayBuffer\"]()}).catch(function(){return getBinary(wasmBinaryFile)})}else{if(readAsync){return new Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new Uint8Array(response))},reject)})}}}return Promise.resolve().then(function(){return getBinary(wasmBinaryFile)})}function createWasm(){var info={\"a\":asmLibraryArg};function receiveInstance(instance,module){var exports=instance.exports;Module[\"asm\"]=exports;wasmTable=Module[\"asm\"][\"I\"];wasmModule=module;if(!ENVIRONMENT_IS_PTHREAD){var numWorkersToLoad=PThread.unusedWorkers.length;PThread.unusedWorkers.forEach(function(w){PThread.loadWasmModuleToWorker(w,function(){if(!--numWorkersToLoad)removeRunDependency(\"wasm-instantiate\")})})}if(!ENVIRONMENT_IS_PTHREAD){addRunDependency(\"wasm-instantiate\")}function receiveInstantiatedSource(output){receiveInstance(output[\"instance\"],output[\"module\"])}function instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err(\"failed to asynchronously prepare wasm: \"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof WebAssembly.instantiateStreaming===\"function\"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFile)&&typeof fetch===\"function\"){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return result.then(receiveInstantiatedSource,function(reason){err(\"wasm streaming compile failed: \"+reason);err(\"falling back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)})})}else{return instantiateArrayBuffer(receiveInstantiatedSource)}}if(Module[\"instantiateWasm\"]){try{var exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports}catch(e){err(\"Module.instantiateWasm callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}var ASM_CONSTS={10520:function(){throw\"Canceled!\"},10538:function($0,$1){setTimeout(function(){__emscripten_do_dispatch_to_thread($0,$1)},0)}};function initPthreadsJS(){PThread.initRuntime()}function callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof callback==\"function\"){callback(Module);continue}var func=callback.func;if(typeof func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)()}else{wasmTable.get(func)(callback.arg)}}else{func(callback.arg===undefined?null:callback.arg)}}}var ERRNO_CODES={EPERM:63,ENOENT:44,ESRCH:71,EINTR:27,EIO:29,ENXIO:60,E2BIG:1,ENOEXEC:45,EBADF:8,ECHILD:12,EAGAIN:6,EWOULDBLOCK:6,ENOMEM:48,EACCES:2,EFAULT:21,ENOTBLK:105,EBUSY:10,EEXIST:20,EXDEV:75,ENODEV:43,ENOTDIR:54,EISDIR:31,EINVAL:28,ENFILE:41,EMFILE:33,ENOTTY:59,ETXTBSY:74,EFBIG:22,ENOSPC:51,ESPIPE:70,EROFS:69,EMLINK:34,EPIPE:64,EDOM:18,ERANGE:68,ENOMSG:49,EIDRM:24,ECHRNG:106,EL2NSYNC:156,EL3HLT:107,EL3RST:108,ELNRNG:109,EUNATCH:110,ENOCSI:111,EL2HLT:112,EDEADLK:16,ENOLCK:46,EBADE:113,EBADR:114,EXFULL:115,ENOANO:104,EBADRQC:103,EBADSLT:102,EDEADLOCK:16,EBFONT:101,ENOSTR:100,ENODATA:116,ETIME:117,ENOSR:118,ENONET:119,ENOPKG:120,EREMOTE:121,ENOLINK:47,EADV:122,ESRMNT:123,ECOMM:124,EPROTO:65,EMULTIHOP:36,EDOTDOT:125,EBADMSG:9,ENOTUNIQ:126,EBADFD:127,EREMCHG:1

28,ELIBACC:129,ELIBBAD:130,ELIBSCN:131,ELIBMAX:132,ELIBEXEC:133,ENOSYS:52,ENOTEMPTY:55,ENAMETOOLONG:37,ELOOP:32,EOPNOTSUPP:138,EPFNOSUPPORT:139,ECONNRESET:15,ENOBUFS:42,EAFNOSUPPORT:5,EPROTOTYPE:67,ENOTSOCK:57,ENOPROTOOPT:50,ESHUTDOWN:140,ECONNREFUSED:14,EADDRINUSE:3,ECONNABORTED:13,ENETUNREACH:40,ENETDOWN:38,ETIMEDOUT:73,EHOSTDOWN:142,EHOSTUNREACH:23,EINPROGRESS:26,EALREADY:7,EDESTADDRREQ:17,EMSGSIZE:35,EPROTONOSUPPORT:66,ESOCKTNOSUPPORT:137,EADDRNOTAVAIL:4,ENETRESET:39,EISCONN:30,ENOTCONN:53,ETOOMANYREFS:141,EUSERS:136,EDQUOT:19,ESTALE:72,ENOTSUP:138,ENOMEDIUM:148,EILSEQ:25,EOVERFLOW:61,ECANCELED:11,ENOTRECOVERABLE:56,EOWNERDEAD:62,ESTRPIPE:135};function _emscripten_futex_wake(addr,count){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0||count<0)return-28;if(count==0)return 0;if(count>=2147483647)count=Infinity;var mainThreadWaitAddress=Atomics.load(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2);var mainThreadWoken=0;if(mainThreadWaitAddress==addr){var loadedAddr=Atomics.compareExchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,mainThreadWaitAddress,0);if(loadedAddr==mainThreadWaitAddress){--count;mainThreadWoken=1;if(count<=0)return 1}}var ret=Atomics.notify(GROWABLE_HEAP_I32(),addr>>2,count);if(ret>=0)return ret+mainThreadWoken;throw\"Atomics.notify returned an unexpected value \"+ret}Module[\"_emscripten_futex_wake\"]=_emscripten_futex_wake;function killThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! killThread() can only ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in killThread!\";GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var pthread=PThread.pthreads[pthread_ptr];pthread.worker.terminate();PThread.freeThreadData(pthread);PThread.runningWorkers.splice(PThread.runningWorkers.indexOf(pthread.worker),1);pthread.worker.pthread=undefined}function cancelThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cancelThread() can only ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in cancelThread!\";var pthread=PThread.pthreads[pthread_ptr];pthread.worker.postMessage({\"cmd\":\"cancel\"})}function cleanupThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cleanupThread() can only ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in cleanupThread!\";var pthread=PThread.pthreads[pthread_ptr];if(pthread){GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var worker=pthread.worker;PThread.returnWorkerToPool(worker)}}var PThread={unusedWorkers:[],runningWorkers:[],initMainThreadBlock:function(){var pthreadPoolSize=8;for(var i=0;i<pthreadPoolSize;++i){PThread.allocateUnusedWorker()}},initRuntime:function(){var tb=_malloc(228);for(var i=0;i<228/4;++i)GROWABLE_HEAP_U32()[tb/4+i]=0;GROWABLE_HEAP_I32()[tb+12>>2]=tb;var headPtr=tb+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var tlsMemory=_malloc(512);for(var i=0;i<128;++i)GROWABLE_HEAP_U32()[tlsMemory/4+i]=0;Atomics.store(GROWABLE_HEAP_U32(),tb+100>>2,tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tb+40>>2,tb);__emscripten_thread_init(tb,!ENVIRONMENT_IS_WORKER,1);_emscripten_register_main_browser_thread_id(tb)},initWorker:function(){},pthreads:{},threadExitHandlers:[],setThreadStatus:function(){},runExitHandlers:function(){while(PThread.threadExitHandlers.length>0){PThread.threadExitHandlers.pop()()}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self())___pthread_tsd_run_dtors()},runExitHandlersAndDeinitThread:function(tb,exitCode){Atomics.store(GROWABLE_HEAP_U32(),tb+56>>2,1);Atomics.store(GROWABLE_HEAP_U32(),tb+60>>2,0);PThread.runExitHandlers();Atomics.store(GROWABLE_HEAP_U32(),tb+4>>2,exitCode);Atomics.store(GROWABLE_HEAP_U32(),tb+0>>2,1);_emscripten_futex_wake(tb+0,2147483647);__emscripten_thread_init(0,0,0)},threadExit:function(exitCode){var tb=_pthread_self();if(tb){PThread.runExitHandlersAndDeinitThread(tb,exitCode);if(ENVIRONMENT_IS_PTHREAD){postMessage({\"cmd\":\"exit\"})}}},threadCancel:function(){PThread.runExitHandlersAndDeinitThread(_pthr

ead_self(),-1);postMessage({\"cmd\":\"cancelDone\"})},terminateAllThreads:function(){for(var t in PThread.pthreads){var pthread=PThread.pthreads[t];if(pthread&&pthread.worker){PThread.returnWorkerToPool(pthread.worker)}}PThread.pthreads={};for(var i=0;i<PThread.unusedWorkers.length;++i){var worker=PThread.unusedWorkers[i];worker.terminate()}PThread.unusedWorkers=[];for(var i=0;i<PThread.runningWorkers.length;++i){var worker=PThread.runningWorkers[i];var pthread=worker.pthread;PThread.freeThreadData(pthread);worker.terminate()}PThread.runningWorkers=[]},freeThreadData:function(pthread){if(!pthread)return;if(pthread.threadInfoStruct){var tlsMemory=GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2];GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2]=0;_free(tlsMemory);_free(pthread.threadInfoStruct)}pthread.threadInfoStruct=0;if(pthread.allocatedOwnStack&&pthread.stackBase)_free(pthread.stackBase);pthread.stackBase=0;if(pthread.worker)pthread.worker.pthread=null},returnWorkerToPool:function(worker){PThread.runWithoutMainThreadQueuedCalls(function(){delete PThread.pthreads[worker.pthread.threadInfoStruct];PThread.unusedWorkers.push(worker);PThread.runningWorkers.splice(PThread.runningWorkers.indexOf(worker),1);PThread.freeThreadData(worker.pthread);worker.pthread=undefined})},runWithoutMainThreadQueuedCalls:function(func){GROWABLE_HEAP_I32()[__emscripten_allow_main_runtime_queued_calls>>2]=0;try{func()}finally{GROWABLE_HEAP_I32()[__emscripten_allow_main_runtime_queued_calls>>2]=1}},receiveObjectTransfer:function(data){},loadWasmModuleToWorker:function(worker,onFinishedLoading){worker.onmessage=function(e){var d=e[\"data\"];var cmd=d[\"cmd\"];if(worker.pthread)PThread.currentProxiedOperationCallerThread=worker.pthread.threadInfoStruct;if(d[\"targetThread\"]&&d[\"targetThread\"]!=_pthread_self()){var thread=PThread.pthreads[d.targetThread];if(thread){thread.worker.postMessage(e.data,d[\"transferList\"])}else{console.error('Internal error! Worker sent a message \"'+cmd+'\" to target pthread '+d[\"targetThread\"]+\", but that thread no longer exists!\")}PThread.currentProxiedOperationCallerThread=undefined;return}if(cmd===\"processQueuedMainThreadWork\"){_emscripten_main_thread_process_queued_calls()}else if(cmd===\"spawnThread\"){spawnThread(e.data)}else if(cmd===\"cleanupThread\"){cleanupThread(d[\"thread\"])}else if(cmd===\"killThread\"){killThread(d[\"thread\"])}else if(cmd===\"cancelThread\"){cancelThread(d[\"thread\"])}else if(cmd===\"loaded\"){worker.loaded=true;if(onFinishedLoading)onFinishedLoading(worker);if(worker.runPthread){worker.runPthread();delete worker.runPthread}}else if(cmd===\"print\"){out(\"Thread \"+d[\"threadId\"]+\": \"+d[\"text\"])}else if(cmd===\"printErr\"){err(\"Thread \"+d[\"threadId\"]+\": \"+d[\"text\"])}else if(cmd===\"alert\"){alert(\"Thread \"+d[\"threadId\"]+\": \"+d[\"text\"])}else if(cmd===\"exit\"){var detached=worker.pthread&&Atomics.load(GROWABLE_HEAP_U32(),worker.pthread.threadInfoStruct+64>>2);if(detached){PThread.returnWorkerToPool(worker)}}else if(cmd===\"exitProcess\"){try{exit(d[\"returnCode\"])}catch(e){if(e instanceof ExitStatus)return;throw e}}else if(cmd===\"cancelDone\"){PThread.returnWorkerToPool(worker)}else if(cmd===\"objectTransfer\"){PThread.receiveObjectTransfer(e.data)}else if(e.data.target===\"setimmediate\"){worker.postMessage(e.data)}else{err(\"worker sent an unknown command \"+cmd)}PThread.currentProxiedOperationCallerThread=undefined};worker.onerror=function(e){err(\"pthread sent an error! \"+e.filename+\":\"+e.lineno+\": \"+e.message)};if(ENVIRONMENT_IS_NODE){worker.on(\"message\",function(data){worker.onmessage({data:data})});worker.on(\"error\",function(data){worker.onerror(data)});worker.on(\"exit\",function(data){})}worker.postMessage({\"cmd\":\"load\",\"urlOrBlob\":Module[\"mainScriptUrlOrBlob\"]||_scriptDir,\"wasmMemory\":wasmMemory,\"wasmModule\":wasmModule})},allocateUnusedWorker:function(){var pthreadMainJs=locateFile(\"tfjs-

backend-wasm-threaded-simd.worker.js\");PThread.unusedWorkers.push(new Worker(pthreadMainJs))},getNewWorker:function(){if(PThread.unusedWorkers.length==0){PThread.allocateUnusedWorker();PThread.loadWasmModuleToWorker(PThread.unusedWorkers[0])}if(PThread.unusedWorkers.length>0)return PThread.unusedWorkers.pop();else return null},busySpinWait:function(msecs){var t=performance.now()+msecs;while(performance.now()<t){}}};function establishStackSpace(stackTop,stackMax){_emscripten_stack_set_limits(stackTop,stackMax);stackRestore(stackTop)}Module[\"establishStackSpace\"]=establishStackSpace;function getNoExitRuntime(){return noExitRuntime}Module[\"getNoExitRuntime\"]=getNoExitRuntime;function invokeEntryPoint(ptr,arg){return wasmTable.get(ptr)(arg)}Module[\"invokeEntryPoint\"]=invokeEntryPoint;function ___assert_fail(condition,filename,line,func){abort(\"Assertion failed: \"+UTF8ToString(condition)+\", at: \"+[filename?UTF8ToString(filename):\"unknown filename\",line,func?UTF8ToString(func):\"unknown function\"])}function ___call_main(argc,argv){var returnCode=_main(argc,argv)}var _emscripten_get_now;if(ENVIRONMENT_IS_NODE){_emscripten_get_now=function(){var t=process[\"hrtime\"]();return t[0]*1e3+t[1]/1e6}}else if(ENVIRONMENT_IS_PTHREAD){_emscripten_get_now=function(){return performance.now()-Module[\"__performance_now_clock_drift\"]}}else if(typeof dateNow!==\"undefined\"){_emscripten_get_now=dateNow}else _emscripten_get_now=function(){return performance.now()};function setErrNo(value){GROWABLE_HEAP_I32()[___errno_location()>>2]=value;return value}function _atexit(func,arg){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(1,1,func,arg)}function __emscripten_notify_thread_queue(targetThreadId,mainThreadId){if(targetThreadId==mainThreadId){postMessage({\"cmd\":\"processQueuedMainThreadWork\"})}else if(ENVIRONMENT_IS_PTHREAD){postMessage({\"targetThread\":targetThreadId,\"cmd\":\"processThreadQueue\"})}else{var pthread=PThread.pthreads[targetThreadId];var worker=pthread&&pthread.worker;if(!worker){return}worker.postMessage({\"cmd\":\"processThreadQueue\"})}return 1}function _abort(){abort()}function _emscripten_asm_const_int(code,sigPtr,argbuf){var args=readAsmConstArgs(sigPtr,argbuf);return ASM_CONSTS[code].apply(null,args)}function _emscripten_conditional_set_current_thread_status(expectedStatus,newStatus){}function _emscripten_futex_wait(addr,val,timeout){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0)return-28;if(!ENVIRONMENT_IS_WEB){var ret=Atomics.wait(GROWABLE_HEAP_I32(),addr>>2,val,timeout);if(ret===\"timed-out\")return-73;if(ret===\"not-equal\")return-6;if(ret===\"ok\")return 0;throw\"Atomics.wait returned an unexpected value \"+ret}else{if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}var tNow=performance.now();var tEnd=tNow+timeout;var lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr);while(1){tNow=performance.now();if(tNow>tEnd){lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,0);return-73}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,0);if(lastAddr==0){break}_emscripten_main_thread_process_queued_calls();if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr)}return 0}}function _emscripten_memcpy_big(dest,src,num){GROWABLE_HEAP_U8().copyWithin(dest,src,src+num)}function _emscripten_num_logical_cores(){if(ENVIRONMENT_IS_NODE)return require(\"os\").cpus().length;return navigator[\"hardwareConcurrency\"]}function _emscripten_proxy_to_main_thread_js(index,sync){var numCallArgs=arguments.length-2;var stack=stackSave();var serializedNumCallArgs=numCallArgs;var args=stackAlloc(serializedNumCallArgs*8);var b=args>>3;for(var i=0;i<numCallArgs;i++){var

arg=arguments[2+i];GROWABLE_HEAP_F64()[b+i]=arg}var ret=_emscripten_run_in_main_runtime_thread_js(index,serializedNumCallArgs,args,sync);stackRestore(stack);return ret}var _emscripten_receive_on_main_thread_js_callArgs=[];var readAsmConstArgsArray=[];function readAsmConstArgs(sigPtr,buf){readAsmConstArgsArray.length=0;var ch;buf>>=2;while(ch=GROWABLE_HEAP_U8()[sigPtr++]){var double=ch<105;if(double&&buf&1)buf++;readAsmConstArgsArray.push(double?GROWABLE_HEAP_F64()[buf++>>1]:GROWABLE_HEAP_I32()[buf]);++buf}return readAsmConstArgsArray}function _emscripten_receive_on_main_thread_js(index,numCallArgs,args){_emscripten_receive_on_main_thread_js_callArgs.length=numCallArgs;var b=args>>3;for(var i=0;i<numCallArgs;i++){_emscripten_receive_on_main_thread_js_callArgs[i]=GROWABLE_HEAP_F64()[b+i]}var isEmAsmConst=index<0;var func=!isEmAsmConst?proxiedFunctionTable[index]:ASM_CONSTS[-index-1];return func.apply(null,_emscripten_receive_on_main_thread_js_callArgs)}function _emscripten_get_heap_size(){return GROWABLE_HEAP_U8().length}function emscripten_realloc_buffer(size){try{wasmMemory.grow(size-buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return 1}catch(e){}}function _emscripten_resize_heap(requestedSize){var oldSize=_emscripten_get_heap_size();if(requestedSize<=oldSize){return false}var maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var cutDown=1;cutDown<=4;cutDown*=2){var overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize+100663296);var newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var JSEvents={inEventHandler:0,removeAllEventListeners:function(){for(var i=JSEvents.eventHandlers.length-1;i>=0;--i){JSEvents._removeHandler(i)}JSEvents.eventHandlers=[];JSEvents.deferredCalls=[]},registerRemoveEventListeners:function(){if(!JSEvents.removeEventListenersRegistered){__ATEXIT__.push(JSEvents.removeAllEventListeners);JSEvents.removeEventListenersRegistered=true}},deferredCalls:[],deferCall:function(targetFunction,precedence,argsList){function arraysHaveEqualContent(arrA,arrB){if(arrA.length!=arrB.length)return false;for(var i in arrA){if(arrA[i]!=arrB[i])return false}return true}for(var i in JSEvents.deferredCalls){var call=JSEvents.deferredCalls[i];if(call.targetFunction==targetFunction&&arraysHaveEqualContent(call.argsList,argsList)){return}}JSEvents.deferredCalls.push({targetFunction:targetFunction,precedence:precedence,argsList:argsList});JSEvents.deferredCalls.sort(function(x,y){return x.precedence<y.precedence})},removeDeferredCalls:function(targetFunction){for(var i=0;i<JSEvents.deferredCalls.length;++i){if(JSEvents.deferredCalls[i].targetFunction==targetFunction){JSEvents.deferredCalls.splice(i,1);--i}}},canPerformEventHandlerRequests:function(){return JSEvents.inEventHandler&&JSEvents.currentEventHandler.allowsDeferredCalls},runDeferredCalls:function(){if(!JSEvents.canPerformEventHandlerRequests()){return}for(var i=0;i<JSEvents.deferredCalls.length;++i){var call=JSEvents.deferredCalls[i];JSEvents.deferredCalls.splice(i,1);--i;call.targetFunction.apply(null,call.argsList)}},eventHandlers:[],removeAllHandlersOnTarget:function(target,eventTypeString){for(var i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==target&&(!eventTypeString||eventTypeString==JSEvents.eventHandlers[i].eventTypeString)){JSEvents._removeHandler(i--)}}},_removeHandler:function(i){var h=JSEvents.eventHandlers[i];h.target.removeEventListener(h.eventTypeString,h.eventListenerFunc,h.useCapture);JSEvents.eventHandlers.splice(i,1)},registerOrRemoveHandler:function(eventHandler){var jsEventHandler=function jsEventHandler(event){++JSEvents.inEventHandler;JSEvents.currentEventHandler=eventHandler;JSEvents.runDef

erredCalls();eventHandler.handlerFunc(event);JSEvents.runDeferredCalls();--
JSEvents.inEventHandler};if(eventHandler.callbackfunc){eventHandler.eventListenerFunc=jsEventHandler;eventH
andler.target.addEventListener(eventHandler.eventTypeString,jsEventHandler,eventHandler.useCapture);JSEvents.e
ventHandlers.push(eventHandler);JSEvents.registerRemoveEventListeners()}else{for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==eventHandler.target&&JSEvents.e
ventHandlers[i].eventTypeString==eventHandler.eventTypeString){JSEvents._removeHandler(i--
)}}}},queueEventHandlerOnThread_iiii:function(targetThread,eventHandlerFunc,eventTypeId,eventData,userData)
{var
stackTop=stackSave();var
varargs=stackAlloc(12);GROWABLE_HEAP_I32()[varargs>>2]=eventTypeId;GROWABLE_HEAP_I32()[varargs
+4>>2]=eventData;GROWABLE_HEAP_I32()[varargs+8>>2]=userData;__emscripten_call_on_thread(0,targetThr
ead,637534208,eventHandlerFunc,eventData,varargs);stackRestore(stackTop)},getTargetThreadForEventCallback:f
unction(targetThread){switch(targetThread){case 1:return 0;case 2:return
PThread.currentProxiedOperationCallerThread;default:return
targetThread}},getNodeNameForTarget:function(target){if(!target)return\"\";if(target==window)return\"#window\";
if(target==screen)return\"#screen\";return
target&&target.nodeName?target.nodeName:\"\"},fullscreenEnabled:function(){return
document.fullscreenEnabled||document.webkitFullscreenEnabled}};function stringToNewUTF8(jsString){var
length=lengthBytesUTF8(jsString)+1;var cString=_malloc(length);stringToUTF8(jsString,cString,length);return
cString}function
_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height){var
stackTop=stackSave();var varargs=stackAlloc(12);var
targetCanvasPtr=0;if(targetCanvas){targetCanvasPtr=stringToNewUTF8(targetCanvas)}GROWABLE_HEAP_I32(
)[varargs>>2]=targetCanvasPtr;GROWABLE_HEAP_I32()[varargs+4>>2]=width;GROWABLE_HEAP_I32()[var
args+8>>2]=height;__emscripten_call_on_thread(0,targetThread,657457152,0,targetCanvasPtr,varargs);stackRestor
e(stackTop)}function
_emscripten_set_offscreencanvas_size_on_target_thread(targetThread,targetCanvas,width,height){targetCanvas=tar
getCanvas?UTF8ToString(targetCanvas):\"\";_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThr
ead,targetCanvas,width,height)}function maybeCStringToJsString(cString){return
cString>2?UTF8ToString(cString):cString}var specialHTMLTargets=[0,typeof
document!==\"undefined\"?document:0,typeof window!==\"undefined\"?window:0];function
findEventTarget(target){target=maybeCStringToJsString(target);var
domElement=specialHTMLTargets[target]||(typeof
document!==\"undefined\"?document.querySelector(target):undefined);return domElement}function
findCanvasEventTarget(target){return findEventTarget(target)}function
_emscripten_set_canvas_element_size_calling_thread(target,width,height){var
canvas=findCanvasEventTarget(target);if(!canvas)return-
4;if(canvas.canvasSharedPtr){GROWABLE_HEAP_I32()[canvas.canvasSharedPtr>>2]=width;GROWABLE_HEA
P_I32()[canvas.canvasSharedPtr+4>>2]=height}if(canvas.offscreenCanvas||!canvas.controlTransferredOffscreen){if
(canvas.offscreenCanvas)canvas=canvas.offscreenCanvas;var
autoResizeViewport=false;if(canvas.GLctxObject&&canvas.GLctxObject.GLctx){var
prevViewport=canvas.GLctxObject.GLctx.getParameter(2978);autoResizeViewport=prevViewport[0]===0&&prev
Viewport[1]===0&&prevViewport[2]===canvas.width&&prevViewport[3]===canvas.height}canvas.width=width;
canvas.height=height;if(autoResizeViewport){canvas.GLctxObject.GLctx.viewport(0,0,width,height)}}else
if(canvas.canvasSharedPtr){var
targetThread=GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+8>>2];_emscripten_set_offscreencanvas_size_o
n_target_thread(targetThread,target,width,height);return 1}else{return-4}return 0}function
_emscripten_set_canvas_element_size_main_thread(target,width,height){if(ENVIRONMENT_IS_PTHREAD)retur

n _emscripten_proxy_to_main_thread_js(2,1,target,width,height);return
_emscripten_set_canvas_element_size_calling_thread(target,width,height)}function
_emscripten_set_canvas_element_size(target,width,height){var
canvas=findCanvasEventTarget(target);if(canvas){return
_emscripten_set_canvas_element_size_calling_thread(target,width,height)}else{return
_emscripten_set_canvas_element_size_main_thread(target,width,height)}}function
_emscripten_set_current_thread_status(newStatus){}function
_emscripten_set_thread_name(threadId,name){}function __webgl_enable_ANGLE_instanced_arrays(ctx){var
ext=ctx.getExtension(\"ANGLE_instanced_arrays\");if(ext){ctx[\"vertexAttribDivisor\"]=function(index,divisor){ext[\"vertexAttribDivisorANGLE\"](index,divisor)};ctx[\"drawArraysInstanced\"]=function(mode,first,count,primcount){ext[\"drawArraysInstancedANGLE\"](mode,first,count,primcount)};ctx[\"drawElementsInstanced\"]=function(mode,count,type,indices,primcount){ext[\"drawElementsInstancedANGLE\"](mode,count,type,indices,primcount)};return
1}}function __webgl_enable_OES_vertex_array_object(ctx){var
ext=ctx.getExtension(\"OES_vertex_array_object\");if(ext){ctx[\"createVertexArray\"]=function(){return
ext[\"createVertexArrayOES\"]()};ctx[\"deleteVertexArray\"]=function(vao){ext[\"deleteVertexArrayOES\"](vao)};ctx[\"bindVertexArray\"]=function(vao){ext[\"bindVertexArrayOES\"](vao)};ctx[\"isVertexArray\"]=function(vao){return ext[\"isVertexArrayOES\"](vao)};return 1}}function __webgl_enable_WEBGL_draw_buffers(ctx){var
ext=ctx.getExtension(\"WEBGL_draw_buffers\");if(ext){ctx[\"drawBuffers\"]=function(n,bufs){ext[\"drawBuffersWEBGL\"](n,bufs)};return
1}}function
__webgl_enable_WEBGL_multi_draw(ctx){return!!(ctx.multiDrawWebgl=ctx.getExtension(\"WEBGL_multi_draw\"))}var
GL={counter:1,buffers:[],programs:[],framebuffers:[],renderbuffers:[],textures:[],uniforms:[],shaders:[],vaos:[],contexts:{},offscreenCanvases:{},timerQueriesEXT:[],programInfos:{},stringCache:{},unpackAlignment:4,recordError:function recordError(errorCode){if(!GL.lastError){GL.lastError=errorCode}},getNewId:function(table){var
ret=GL.counter++;for(var i=table.length;i<ret;i++){table[i]=null}return
ret},getSource:function(shader,count,string,length){var source=\"\";for(var i=0;i<count;++i){var
len=length?GROWABLE_HEAP_I32()[length+i*4>>2]:-
1;source+=UTF8ToString(GROWABLE_HEAP_I32()[string+i*4>>2],len<0?undefined:len)}return
source},createContext:function(canvas,webGLContextAttributes){var
ctx=canvas.getContext(\"webgl\",webGLContextAttributes);if(!ctx)return 0;var
handle=GL.registerContext(ctx,webGLContextAttributes);return
handle},registerContext:function(ctx,webGLContextAttributes){var
handle=_malloc(8);GROWABLE_HEAP_I32()[handle+4>>2]=_pthread_self();var
context={handle:handle,attributes:webGLContextAttributes,version:webGLContextAttributes.majorVersion,GLctx:ctx};if(ctx.canvas)ctx.canvas.GLctxObject=context;GL.contexts[handle]=context;if(typeof
webGLContextAttributes.enableExtensionsByDefault===\"undefined\"||webGLContextAttributes.enableExtensionsByDefault){GL.initExtensions(context)}return
handle},makeContextCurrent:function(contextHandle){GL.currentContext=GL.contexts[contextHandle];Module.ctx=GLctx=GL.currentContext&&GL.currentContext.GLctx;return!(contextHandle&&!GLctx)},getContext:function(contextHandle){return
GL.contexts[contextHandle]},deleteContext:function(contextHandle){if(GL.currentContext===GL.contexts[contextHandle])GL.currentContext=null;if(typeof
JSEvents===\"object\")JSEvents.removeAllHandlersOnTarget(GL.contexts[contextHandle].GLctx.canvas);if(GL.contexts[contextHandle]&&GL.contexts[contextHandle].GLctx.canvas)GL.contexts[contextHandle].GLctx.canvas.GLctxObject=undefined;_free(GL.contexts[contextHandle].handle);GL.contexts[contextHandle]=null},initExtensions:function(context){if(!context)context=GL.currentContext;if(context.initExtensionsDone)return;context.initExtension

sDone=true;var
GLctx=context.GLctx;__webgl_enable_ANGLE_instanced_arrays(GLctx);__webgl_enable_OES_vertex_array_obj
ect(GLctx);__webgl_enable_WEBGL_draw_buffers(GLctx);GLctx.disjointTimerQueryExt=GLctx.getExtension(\"
EXT_disjoint_timer_query\");__webgl_enable_WEBGL_multi_draw(GLctx);var
exts=GLctx.getSupportedExtensions()||[];exts.forEach(function(ext){if(ext.indexOf(\"lose_context\")<0&&ext.inde
xOf(\"debug\")<0){GLctx.getExtension(ext)}})},populateUniformTable:function(program){var
p=GL.programs[program];var
ptable=GL.programInfos[program]={uniforms:{},maxUniformLength:0,maxAttributeLength:-
1,maxUniformBlockNameLength:-1};var utable=ptable.uniforms;var
numUniforms=GLctx.getProgramParameter(p,35718);for(var i=0;i<numUniforms;++i){var
u=GLctx.getActiveUniform(p,i);var
name=u.name;ptable.maxUniformLength=Math.max(ptable.maxUniformLength,name.length+1);if(name.slice(-
1)==\"]\"){name=name.slice(0,name.lastIndexOf(\"[\"))}var loc=GLctx.getUniformLocation(p,name);if(loc){var
id=GL.getNewId(GL.uniforms);utable[name]=[u.size,id];GL.uniforms[id]=loc;for(var j=1;j<u.size;++j){var
n=name+\"[\"+j+\"]\";loc=GLctx.getUniformLocation(p,n);id=GL.getNewId(GL.uniforms);GL.uniforms[id]=loc}}
}};var __emscripten_webgl_power_preferences=[\"default\",\"low-power\",\"high-performance\"];function
_emscripten_webgl_do_create_context(target,attributes){var a=attributes>>2;var
powerPreference=GROWABLE_HEAP_I32()[a+(24>>2)];var
contextAttributes={\"alpha\":!!GROWABLE_HEAP_I32()[a+(0>>2)],\"depth\":!!GROWABLE_HEAP_I32()[a+(4
>>2)],\"stencil\":!!GROWABLE_HEAP_I32()[a+(8>>2)],\"antialias\":!!GROWABLE_HEAP_I32()[a+(12>>2)],\"p
remultipliedAlpha\":!!GROWABLE_HEAP_I32()[a+(16>>2)],\"preserveDrawingBuffer\":!!GROWABLE_HEAP_
I32()[a+(20>>2)],\"powerPreference\":__emscripten_webgl_power_preferences[powerPreference],\"failIfMajorPerf
ormanceCaveat\":!!GROWABLE_HEAP_I32()[a+(28>>2)],majorVersion:GROWABLE_HEAP_I32()[a+(32>>2)],
minorVersion:GROWABLE_HEAP_I32()[a+(36>>2)],enableExtensionsByDefault:GROWABLE_HEAP_I32()[a+(
40>>2)],explicitSwapControl:GROWABLE_HEAP_I32()[a+(44>>2)],proxyContextToMainThread:GROWABLE_
HEAP_I32()[a+(48>>2)],renderViaOffscreenBackBuffer:GROWABLE_HEAP_I32()[a+(52>>2)]};var
canvas=findCanvasEventTarget(target);if(!canvas){return 0}if(contextAttributes.explicitSwapControl){return
0}var contextHandle=GL.createContext(canvas,contextAttributes);return contextHandle}function
_emscripten_webgl_create_context(a0,a1){return _emscripten_webgl_do_create_context(a0,a1)}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=GROWABLE_HEAP_I32()[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var
ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function
_fd_close(fd){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(3,1,fd);return
0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(4,1,fd,offset_low,offset_high,whence,newOffset)}function
_fd_write(fd,iov,iovcnt,pnum){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(5,1,fd,iov,iovcnt,pnum);var num=0;for(var i=0;i<iovcnt;i++){var
ptr=GROWABLE_HEAP_I32()[iov+i*8>>2];var len=GROWABLE_HEAP_I32()[iov+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,GROWABLE_HEAP_U8()[ptr+j])}num+=len}GROWABLE_HEAP_I32
()[pnum>>2]=num;return 0}function _pthread_cleanup_pop(execute){var
routine=PThread.threadExitHandlers.pop();if(execute)routine()}function
_pthread_cleanup_push(routine,arg){PThread.threadExitHandlers.push(function(){wasmTable.get(routine)(arg)})}f
unction
spawnThread(threadParams){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! spawnThread() can only
ever be called from main application thread!\";var
worker=PThread.getNewWorker();if(worker.pthread!==undefined)throw\"Internal

error!\";if(!threadParams.pthread_ptr)throw\"Internal error, no pthread
ptr!\";PThread.runningWorkers.push(worker);var tlsMemory=_malloc(128*4);for(var
i=0;i<128;++i){GROWABLE_HEAP_I32()[tlsMemory+i*4>>2]=0}var
stackHigh=threadParams.stackBase+threadParams.stackSize;var
pthread=PThread.pthreads[threadParams.pthread_ptr]={worker:worker,stackBase:threadParams.stackBase,stackSize
:threadParams.stackSize,allocatedOwnStack:threadParams.allocatedOwnStack,threadInfoStruct:threadParams.pthrea
d_ptr};var
tis=pthread.threadInfoStruct>>2;Atomics.store(GROWABLE_HEAP_U32(),tis+(64>>2),threadParams.detached);A
tomics.store(GROWABLE_HEAP_U32(),tis+(100>>2),tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tis
+(40>>2),pthread.threadInfoStruct);Atomics.store(GROWABLE_HEAP_U32(),tis+(80>>2),threadParams.stackSiz
e);Atomics.store(GROWABLE_HEAP_U32(),tis+(76>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),t
is+(104>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+8>>2),stackHigh);Atom
ics.store(GROWABLE_HEAP_U32(),tis+(104+12>>2),threadParams.detached);var
global_libc=_emscripten_get_global_libc();var
global_locale=global_libc+40;Atomics.store(GROWABLE_HEAP_U32(),tis+(172>>2),global_locale);worker.pthr
ead=pthread;var
msg={\"cmd\":\"run\",\"start_routine\":threadParams.startRoutine,\"arg\":threadParams.arg,\"threadInfoStruct\":thre
adParams.pthread_ptr,\"stackBase\":threadParams.stackBase,\"stackSize\":threadParams.stackSize};worker.runPthre
ad=function(){msg.time=performance.now();worker.postMessage(msg,threadParams.transferList)};if(worker.loaded
){worker.runPthread();delete worker.runPthread}}function
_pthread_create(pthread_ptr,attr,start_routine,arg){if(typeof SharedArrayBuffer===\"undefined\"){err(\"Current
environment does not support SharedArrayBuffer, pthreads are not available!\");return
6}if(!pthread_ptr){err(\"pthread_create called with a null thread pointer!\");return 28}var transferList=[];var
error=0;if(ENVIRONMENT_IS_PTHREAD&&(transferList.length===0||error)){return
_emscripten_sync_run_in_main_thread_4(687865856,pthread_ptr,attr,start_routine,arg)}if(error)return error;var
stackSize=0;var stackBase=0;var detached=0;if(attr&&attr!=-
1){stackSize=GROWABLE_HEAP_I32()[attr>>2];stackSize+=81920;stackBase=GROWABLE_HEAP_I32()[attr+
8>>2];detached=GROWABLE_HEAP_I32()[attr+12>>2]!==0}else{stackSize=2097152}var
allocatedOwnStack=stackBase==0;if(allocatedOwnStack){stackBase=_memalign(16,stackSize)}else{stackBase-
=stackSize;assert(stackBase>0)}var threadInfoStruct=_malloc(228);for(var
i=0;i<228>>2;++i)GROWABLE_HEAP_U32()[(threadInfoStruct>>2)+i]=0;GROWABLE_HEAP_I32()[pthread_p
tr>>2]=threadInfoStruct;GROWABLE_HEAP_I32()[threadInfoStruct+12>>2]=threadInfoStruct;var
headPtr=threadInfoStruct+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var
threadParams={stackBase:stackBase,stackSize:stackSize,allocatedOwnStack:allocatedOwnStack,detached:detached
,startRoutine:start_routine,pthread_ptr:threadInfoStruct,arg:arg,transferList:transferList};if(ENVIRONMENT_IS_P
THREAD){threadParams.cmd=\"spawnThread\";postMessage(threadParams,transferList)}else{spawnThread(thread
Params)}return 0}function __pthread_testcancel_js(){if(!ENVIRONMENT_IS_PTHREAD)return;var
tb=_pthread_self();if(!tb)return;var
cancelDisabled=Atomics.load(GROWABLE_HEAP_U32(),tb+56>>2);if(cancelDisabled)return;var
canceled=Atomics.load(GROWABLE_HEAP_U32(),tb+0>>2);if(canceled==2)throw\"Canceled!\"}function
_emscripten_check_blocking_allowed(){if(ENVIRONMENT_IS_NODE)return;if(ENVIRONMENT_IS_WORKE
R)return;warnOnce(\"Blocking on the main thread is very dangerous, see
https://emscripten.org/docs/porting/pthreads.html#blocking-on-the-main-browser-thread\")}function
__emscripten_do_pthread_join(thread,status,block){if(!thread){err(\"pthread_join
attempted on a null thread pointer!\");return
ERRNO_CODES.ESRCH}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self()==thread){err(\"PThread
\"+thread+\" is attempting to join to itself!\");return ERRNO_CODES.EDEADLK}else
if(!ENVIRONMENT_IS_PTHREAD&&_emscripten_main_browser_thread_id()==thread){err(\"Main thread

\"+thread+\" is attempting to join to itself!\");return ERRNO_CODES.EDEADLK}var self=GROWABLE_HEAP_I32()[thread+12>>2];if(self!==thread){err(\"pthread_join attempted on thread \"+thread+\", which does not point to a valid thread, or does not exist anymore!\");return ERRNO_CODES.ESRCH}var detached=Atomics.load(GROWABLE_HEAP_U32(),thread+64>>2);if(detached){err(\"Attempted to join thread \"+thread+\", which was already detached!\");return ERRNO_CODES.EINVAL}if(block){_emscripten_check_blocking_allowed()}for(;;){var threadStatus=Atomics.load(GROWABLE_HEAP_U32(),thread+0>>2);if(threadStatus==1){var threadExitCode=Atomics.load(GROWABLE_HEAP_U32(),thread+4>>2);if(status)GROWABLE_HEAP_I32()[status>>2]=threadExitCode;Atomics.store(GROWABLE_HEAP_U32(),thread+64>>2,1);if(!ENVIRONMENT_IS_PTHREAD)cleanupThread(thread);else
 postMessage({\"cmd\":\"cleanupThread\",\"thread\":thread});return 0}if(!block){return ERRNO_CODES.EBUSY}__pthread_testcancel_js();if(!ENVIRONMENT_IS_PTHREAD)_emscripten_main_thread_process_queued_calls();_emscripten_futex_wait(thread+0,threadStatus,ENVIRONMENT_IS_PTHREAD?100:1)}}function _pthread_join(thread,status){return __emscripten_do_pthread_join(thread,status,true)}function _sysconf(name){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(6,1,name);switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case
 11:case 29:case 47:case 48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return
 6;case 73:return 4;case 84:{if(typeof navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-1}if(!ENVIRONMENT_IS_PTHREAD)PThread.initMainThreadBlock();var GLctx;var proxiedFunctionTable=[null,_atexit,_emscripten_set_canvas_element_size_main_thread,_fd_close,_fd_seek,_fd_write,_sysconf];var asmLibraryArg={\"e\":___assert_fail,\"r\":___call_main,\"x\":__emscripten_notify_thread_queue,\"b\":_abort,\"y\":_emscripten_asm_const_int,\"j\":_emscripten_conditional_set_current_thread_status,\"d\":_emscripten_futex_wait,\"c\":_emscripten_futex_wake,\"f\":_emscripten_get_now,\"p\":_emscripten_memcpy_big,\"A\":_emscripten_num_logical_cores,\"u\":_emscripten_receive_on_main_thread_js,\"q\":_emscripten_resize_heap,\"v\":_emscripten_set_canvas_element_size,\"i\":_emscripten_set_current_thread_status,\"s\":_emscripten_set_thread_name,\"w\":_emscripten_webgl_create_context,\"l\":_fd_close,\"n\":_fd_seek,\"g\":_fd_write,\"o\":initPthreadsJS,\"a\":wasmMemory||Module[\"wasmMemory\"],\"z\":_pthread_cleanup_pop,\"k\":_pthread_cleanup_push,\"h\":_pthread_create,\"m\":_pthread_join,\"t\":_sysconf};var
 asm=createWasm();var ___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=function(){return(___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=Module[\"asm\"][\"B\"]).apply(null,arguments)};var _init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"C\"]).apply(null,arguments)};var _init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Mod

ule[\"_init_with_threads_count\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads
_count\"]=Module[\"asm\"][\"E\"]).apply(null,arguments)};var
_register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=M
odule[\"asm\"][\"F\"]).apply(null,arguments)};var
_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"
asm\"][\"G\"]).apply(null,arguments)};var
_dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"H\"]).apply(
null,arguments)};var
_Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"J\"]).apply(null,arguments
)};var
_Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"K\"]).apply(null,argumen
ts)};var
_AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"L\"]).apply(null,ar
guments)};var
_All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"M\"]).apply(null,arguments)};
var
_Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"N\"]).apply(null,argumen
ts)};var
_ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"O\"]).ap
ply(null,arguments)};var
_AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"P\"]).a
pply(null,arguments)};var
_BatchMatMul=Module[\"_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\"_BatchMatMul\"]=Modu
le[\"asm\"][\"Q\"]).apply(null,arguments)};var
_Ceil=Module[\"_Ceil\"]=function(){return(_Ceil=Module[\"_Ceil\"]=Module[\"asm\"][\"R\"]).apply(null,argument
s)};var
_ClipByValue=Module[\"_ClipByValue\"]=function(){return(_ClipByValue=Module[\"_ClipByValue\"]=Module[\
"asm\"][\"S\"]).apply(null,arguments)};var
_Conv2D=Module[\"_Conv2D\"]=function(){return(_Conv2D=Module[\"_Conv2D\"]=Module[\"asm\"][\"T\"]).app
ly(null,arguments)};var
_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=function(){return(_Conv2DBackpropInput=Modul
e[\"_Conv2DBackpropInput\"]=Module[\"asm\"][\"U\"]).apply(null,arguments)};var
_Cos=Module[\"_Cos\"]=function(){return(_Cos=Module[\"_Cos\"]=Module[\"asm\"][\"V\"]).apply(null,arguments
)};var
_Cosh=Module[\"_Cosh\"]=function(){return(_Cosh=Module[\"_Cosh\"]=Module[\"asm\"][\"W\"]).apply(null,argu
ments)};var
_CropAndResize=Module[\"_CropAndResize\"]=function(){return(_CropAndResize=Module[\"_CropAndResize\"]
=Module[\"asm\"][\"X\"]).apply(null,arguments)};var
_Cumsum=Module[\"_Cumsum\"]=function(){return(_Cumsum=Module[\"_Cumsum\"]=Module[\"asm\"][\"Y\"]).a
pply(null,arguments)};var
_DepthToSpace=Module[\"_DepthToSpace\"]=function(){return(_DepthToSpace=Module[\"_DepthToSpace\"]=M
odule[\"asm\"][\"Z\"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=function(){return(_DepthwiseConv2dNative=M
odule[\"_DepthwiseConv2dNative\"]=Module[\"asm\"][\"_\"]).apply(null,arguments)};var
_Elu=Module[\"_Elu\"]=function(){return(_Elu=Module[\"_Elu\"]=Module[\"asm\"][\"$\"]).apply(null,arguments)}
;var
_Equal=Module[\"_Equal\"]=function(){return(_Equal=Module[\"_Equal\"]=Module[\"asm\"][\"aa\"]).apply(null,ar

guments)};var
_Exp=Module[\"_Exp\"]=function(){return(_Exp=Module[\"_Exp\"]=Module[\"asm\"][\"ba\"]).apply(null,argument
s)};var
_FlipLeftRight=Module[\"_FlipLeftRight\"]=function(){return(_FlipLeftRight=Module[\"_FlipLeftRight\"]=Modul
e[\"asm\"][\"ca\"]).apply(null,arguments)};var
_Floor=Module[\"_Floor\"]=function(){return(_Floor=Module[\"_Floor\"]=Module[\"asm\"][\"da\"]).apply(null,arg
uments)};var
_FloorDiv=Module[\"_FloorDiv\"]=function(){return(_FloorDiv=Module[\"_FloorDiv\"]=Module[\"asm\"][\"ea\"]).
apply(null,arguments)};var
_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=function(){return(_FusedBatchNorm=Module[\"_FusedBatchN
orm\"]=Module[\"asm\"][\"fa\"]).apply(null,arguments)};var
_FusedConv2D=Module[\"_FusedConv2D\"]=function(){return(_FusedConv2D=Module[\"_FusedConv2D\"]=Mod
ule[\"asm\"][\"ga\"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=function(){return(_FusedDepthwiseConv2D=M
odule[\"_FusedDepthwiseConv2D\"]=Module[\"asm\"][\"ha\"]).apply(null,arguments)};var
_Gather=Module[\"_Gather\"]=function(){return(_Gather=Module[\"_Gather\"]=Module[\"asm\"][\"ia\"]).apply(nul
l,arguments)};var
_GatherNd=Module[\"_GatherNd\"]=function(){return(_GatherNd=Module[\"_GatherNd\"]=Module[\"asm\"][\"ja\"
]).apply(null,arguments)};var
_Greater=Module[\"_Greater\"]=function(){return(_Greater=Module[\"_Greater\"]=Module[\"asm\"][\"ka\"]).apply(
null,arguments)};var
_GreaterEqual=Module[\"_GreaterEqual\"]=function(){return(_GreaterEqual=Module[\"_GreaterEqual\"]=Module[\
"asm\"][\"la\"]).apply(null,arguments)};var
_LeakyRelu=Module[\"_LeakyRelu\"]=function(){return(_LeakyRelu=Module[\"_LeakyRelu\"]=Module[\"asm\"][\
"ma\"]).apply(null,arguments)};var
_Less=Module[\"_Less\"]=function(){return(_Less=Module[\"_Less\"]=Module[\"asm\"][\"na\"]).apply(null,argume
nts)};var
_LessEqual=Module[\"_LessEqual\"]=function(){return(_LessEqual=Module[\"_LessEqual\"]=Module[\"asm\"][\"o
a\"]).apply(null,arguments)};var
_Log=Module[\"_Log\"]=function(){return(_Log=Module[\"_Log\"]=Module[\"asm\"][\"pa\"]).apply(null,argument
s)};var
_LogicalAnd=Module[\"_LogicalAnd\"]=function(){return(_LogicalAnd=Module[\"_LogicalAnd\"]=Module[\"asm
\"][\"qa\"]).apply(null,arguments)};var
_Max=Module[\"_Max\"]=function(){return(_Max=Module[\"_Max\"]=Module[\"asm\"][\"ra\"]).apply(null,argume
nts)};var
_MaxPool=Module[\"_MaxPool\"]=function(){return(_MaxPool=Module[\"_MaxPool\"]=Module[\"asm\"][\"sa\"]).
apply(null,arguments)};var
_Maximum=Module[\"_Maximum\"]=function(){return(_Maximum=Module[\"_Maximum\"]=Module[\"asm\"][\"t
a\"]).apply(null,arguments)};var
_Mean=Module[\"_Mean\"]=function(){return(_Mean=Module[\"_Mean\"]=Module[\"asm\"][\"ua\"]).apply(null,ar
guments)};var
_Min=Module[\"_Min\"]=function(){return(_Min=Module[\"_Min\"]=Module[\"asm\"][\"va\"]).apply(null,argumen
ts)};var
_Minimum=Module[\"_Minimum\"]=function(){return(_Minimum=Module[\"_Minimum\"]=Module[\"asm\"][\"wa
\"]).apply(null,arguments)};var
_MirrorPad=Module[\"_MirrorPad\"]=function(){return(_MirrorPad=Module[\"_MirrorPad\"]=Module[\"asm\"][\"x
a\"]).apply(null,arguments)};var
_Multiply=Module[\"_Multiply\"]=function(){return(_Multiply=Module[\"_Multiply\"]=Module[\"asm\"][\"ya\"]).a

pply(null,arguments)};var
_Neg=Module[\"_Neg\"]=function(){return(_Neg=Module[\"_Neg\"]=Module[\"asm\"][\"za\"]).apply(null,argumen
ts)};var
_NonMaxSuppressionV3=Module[\"_NonMaxSuppressionV3\"]=function(){return(_NonMaxSuppressionV3=Mod
ule[\"_NonMaxSuppressionV3\"]=Module[\"asm\"][\"Aa\"]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module[\"_NonMaxSuppressionV4\"]=function(){return(_NonMaxSuppressionV4=Mod
ule[\"_NonMaxSuppressionV4\"]=Module[\"asm\"][\"Ba\"]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module[\"_NonMaxSuppressionV5\"]=function(){return(_NonMaxSuppressionV5=Mod
ule[\"_NonMaxSuppressionV5\"]=Module[\"asm\"][\"Ca\"]).apply(null,arguments)};var
_NotEqual=Module[\"_NotEqual\"]=function(){return(_NotEqual=Module[\"_NotEqual\"]=Module[\"asm\"][\"Da\"
]).apply(null,arguments)};var
_OneHot=Module[\"_OneHot\"]=function(){return(_OneHot=Module[\"_OneHot\"]=Module[\"asm\"][\"Ea\"]).appl
y(null,arguments)};var
_PadV2=Module[\"_PadV2\"]=function(){return(_PadV2=Module[\"_PadV2\"]=Module[\"asm\"][\"Fa\"]).apply(nu
ll,arguments)};var
_Pow=Module[\"_Pow\"]=function(){return(_Pow=Module[\"_Pow\"]=Module[\"asm\"][\"Ga\"]).apply(null,argume
nts)};var
_Prelu=Module[\"_Prelu\"]=function(){return(_Prelu=Module[\"_Prelu\"]=Module[\"asm\"][\"Ha\"]).apply(null,arg
uments)};var
_Prod=Module[\"_Prod\"]=function(){return(_Prod=Module[\"_Prod\"]=Module[\"asm\"][\"Ia\"]).apply(null,argum
ents)};var
_RealDiv=Module[\"_RealDiv\"]=function(){return(_RealDiv=Module[\"_RealDiv\"]=Module[\"asm\"][\"Ja\"]).app
ly(null,arguments)};var
_Relu=Module[\"_Relu\"]=function(){return(_Relu=Module[\"_Relu\"]=Module[\"asm\"][\"Ka\"]).apply(null,argum
ents)};var
_Relu6=Module[\"_Relu6\"]=function(){return(_Relu6=Module[\"_Relu6\"]=Module[\"asm\"][\"La\"]).apply(null,a
rguments)};var
_ResizeBilinear=Module[\"_ResizeBilinear\"]=function(){return(_ResizeBilinear=Module[\"_ResizeBilinear\"]=Mo
dule[\"asm\"][\"Ma\"]).apply(null,arguments)};var
_Reverse=Module[\"_Reverse\"]=function(){return(_Reverse=Module[\"_Reverse\"]=Module[\"asm\"][\"Na\"]).app
ly(null,arguments)};var
_RotateWithOffset=Module[\"_RotateWithOffset\"]=function(){return(_RotateWithOffset=Module[\"_RotateWith
Offset\"]=Module[\"asm\"][\"Oa\"]).apply(null,arguments)};var
_Round=Module[\"_Round\"]=function(){return(_Round=Module[\"_Round\"]=Module[\"asm\"][\"Pa\"]).apply(nul
l,arguments)};var
_Rsqrt=Module[\"_Rsqrt\"]=function(){return(_Rsqrt=Module[\"_Rsqrt\"]=Module[\"asm\"][\"Qa\"]).apply(null,arg
uments)};var
_ScatterNd=Module[\"_ScatterNd\"]=function(){return(_ScatterNd=Module[\"_ScatterNd\"]=Module[\"asm\"][\"Ra
\"]).apply(null,arguments)};var
_SelectV2=Module[\"_SelectV2\"]=function(){return(_SelectV2=Module[\"_SelectV2\"]=Module[\"asm\"][\"Sa\"]).
apply(null,arguments)};var
_Sigmoid=Module[\"_Sigmoid\"]=function(){return(_Sigmoid=Module[\"_Sigmoid\"]=Module[\"asm\"][\"Ta\"]).ap
ply(null,arguments)};var
_Sin=Module[\"_Sin\"]=function(){return(_Sin=Module[\"_Sin\"]=Module[\"asm\"][\"Ua\"]).apply(null,arguments)
};var
_Softmax=Module[\"_Softmax\"]=function(){return(_Softmax=Module[\"_Softmax\"]=Module[\"asm\"][\"Va\"]).a
pply(null,arguments)};var
_Sqrt=Module[\"_Sqrt\"]=function(){return(_Sqrt=Module[\"_Sqrt\"]=Module[\"asm\"][\"Wa\"]).apply(null,argume

nts)};var
_Square=Module[\"_Square\"]=function(){return(_Square=Module[\"_Square\"]=Module[\"asm\"][\"Xa\"]).apply(null,arguments)};var
_SquaredDifference=Module[\"_SquaredDifference\"]=function(){return(_SquaredDifference=Module[\"_SquaredDifference\"]=Module[\"asm\"][\"Ya\"]).apply(null,arguments)};var
_Step=Module[\"_Step\"]=function(){return(_Step=Module[\"_Step\"]=Module[\"asm\"][\"Za\"]).apply(null,arguments)};var
_StridedSlice=Module[\"_StridedSlice\"]=function(){return(_StridedSlice=Module[\"_StridedSlice\"]=Module[\"asm\"][\"_a\"]).apply(null,arguments)};var
_Sub=Module[\"_Sub\"]=function(){return(_Sub=Module[\"_Sub\"]=Module[\"asm\"][\"$a\"]).apply(null,arguments)};var
_Sum=Module[\"_Sum\"]=function(){return(_Sum=Module[\"_Sum\"]=Module[\"asm\"][\"ab\"]).apply(null,arguments)};var
_Tan=Module[\"_Tan\"]=function(){return(_Tan=Module[\"_Tan\"]=Module[\"asm\"][\"bb\"]).apply(null,arguments)};var
_Tanh=Module[\"_Tanh\"]=function(){return(_Tanh=Module[\"_Tanh\"]=Module[\"asm\"][\"cb\"]).apply(null,arguments)};var
_Tile=Module[\"_Tile\"]=function(){return(_Tile=Module[\"_Tile\"]=Module[\"asm\"][\"db\"]).apply(null,arguments)};var
_TopK=Module[\"_TopK\"]=function(){return(_TopK=Module[\"_TopK\"]=Module[\"asm\"][\"eb\"]).apply(null,arguments)};var
_Transform=Module[\"_Transform\"]=function(){return(_Transform=Module[\"_Transform\"]=Module[\"asm\"][\"fb\"]).apply(null,arguments)};var
_Transpose=Module[\"_Transpose\"]=function(){return(_Transpose=Module[\"_Transpose\"]=Module[\"asm\"][\"gb\"]).apply(null,arguments)};var
__FusedMatMul=Module[\"__FusedMatMul\"]=function(){return(__FusedMatMul=Module[\"__FusedMatMul\"]=Module[\"asm\"][\"hb\"]).apply(null,arguments)};var
_malloc=Module[\"_malloc\"]=function(){return(_malloc=Module[\"_malloc\"]=Module[\"asm\"][\"ib\"]).apply(null,arguments)};var
_free=Module[\"_free\"]=function(){return(_free=Module[\"_free\"]=Module[\"asm\"][\"jb\"]).apply(null,arguments)};var
___errno_location=Module[\"___errno_location\"]=function(){return(___errno_location=Module[\"___errno_location\"]=Module[\"asm\"][\"kb\"]).apply(null,arguments)};var
_emscripten_get_global_libc=Module[\"_emscripten_get_global_libc\"]=function(){return(_emscripten_get_global_libc=Module[\"_emscripten_get_global_libc\"]=Module[\"asm\"][\"lb\"]).apply(null,arguments)};var
_pthread_self=Module[\"_pthread_self\"]=function(){return(_pthread_self=Module[\"_pthread_self\"]=Module[\"asm\"][\"mb\"]).apply(null,arguments)};var
___pthread_tsd_run_dtors=Module[\"___pthread_tsd_run_dtors\"]=function(){return(___pthread_tsd_run_dtors=Module[\"___pthread_tsd_run_dtors\"]=Module[\"asm\"][\"nb\"]).apply(null,arguments)};var
_emscripten_main_thread_process_queued_calls=Module[\"_emscripten_main_thread_process_queued_calls\"]=function(){return(_emscripten_main_thread_process_queued_calls=Module[\"_emscripten_main_thread_process_queued_calls\"]=Module[\"asm\"][\"ob\"]).apply(null,arguments)};var
_emscripten_current_thread_process_queued_calls=Module[\"_emscripten_current_thread_process_queued_calls\"]=function(){return(_emscripten_current_thread_process_queued_calls=Module[\"_emscripten_current_thread_process_queued_calls\"]=Module[\"asm\"][\"pb\"]).apply(null,arguments)};var
_emscripten_register_main_browser_thread_id=Module[\"_emscripten_register_main_browser_thread_id\"]=function(){return(_emscripten_register_main_browser_thread_id=Module[\"_emscripten_register_main_browser_thread_id\"]=Module[\"asm\"][\"qb\"]).apply(null,arguments)};var

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_emscripten_main_browser_thread_id=Module[\"_emscripten_main_browser_thread_id\"]=function(){return(_ems
cripten_main_browser_thread_id=Module[\"_emscripten_main_browser_thread_id\"]=Module[\"asm\"][\"rb\"]).app
ly(null,arguments)};var
__emscripten_do_dispatch_to_thread=Module[\"__emscripten_do_dispatch_to_thread\"]=function(){return(__emsc
ripten_do_dispatch_to_thread=Module[\"__emscripten_do_dispatch_to_thread\"]=Module[\"asm\"][\"sb\"]).apply(n
ull,arguments)};var
_emscripten_sync_run_in_main_thread_4=Module[\"_emscripten_sync_run_in_main_thread_4\"]=function(){retur
n(_emscripten_sync_run_in_main_thread_4=Module[\"_emscripten_sync_run_in_main_thread_4\"]=Module[\"asm\
"][\"tb\"]).apply(null,arguments)};var
_emscripten_run_in_main_runtime_thread_js=Module[\"_emscripten_run_in_main_runtime_thread_js\"]=function(
){return(_emscripten_run_in_main_runtime_thread_js=Module[\"_emscripten_run_in_main_runtime_thread_js\"]=
Module[\"asm\"][\"ub\"]).apply(null,arguments)};var
__emscripten_call_on_thread=Module[\"__emscripten_call_on_thread\"]=function(){return(__emscripten_call_on_t
hread=Module[\"__emscripten_call_on_thread\"]=Module[\"asm\"][\"vb\"]).apply(null,arguments)};var
_emscripten_tls_init=Module[\"_emscripten_tls_init\"]=function(){return(_emscripten_tls_init=Module[\"_emscript
en_tls_init\"]=Module[\"asm\"][\"wb\"]).apply(null,arguments)};var
__emscripten_thread_init=Module[\"__emscripten_thread_init\"]=function(){return(__emscripten_thread_init=Mod
ule[\"__emscripten_thread_init\"]=Module[\"asm\"][\"xb\"]).apply(null,arguments)};var
stackSave=Module[\"stackSave\"]=function(){return(stackSave=Module[\"stackSave\"]=Module[\"asm\"][\"yb\"]).a
pply(null,arguments)};var
stackRestore=Module[\"stackRestore\"]=function(){return(stackRestore=Module[\"stackRestore\"]=Module[\"asm\"
][\"zb\"]).apply(null,arguments)};var
stackAlloc=Module[\"stackAlloc\"]=function(){return(stackAlloc=Module[\"stackAlloc\"]=Module[\"asm\"][\"Ab\"
]).apply(null,arguments)};var
_emscripten_stack_set_limits=Module[\"_emscripten_stack_set_limits\"]=function(){return(_emscripten_stack_set_
limits=Module[\"_emscripten_stack_set_limits\"]=Module[\"asm\"][\"Bb\"]).apply(null,arguments)};var
_memalign=Module[\"_memalign\"]=function(){return(_memalign=Module[\"_memalign\"]=Module[\"asm\"][\"Cb
\"]).apply(null,arguments)};var
__emscripten_allow_main_runtime_queued_calls=Module[\"__emscripten_allow_main_runtime_queued_calls\"]=1
0512;var
__emscripten_main_thread_futex=Module[\"__emscripten_main_thread_futex\"]=12148;Module[\"cwrap\"]=cwrap
;Module[\"PThread\"]=PThread;Module[\"PThread\"]=PThread;Module[\"wasmMemory\"]=wasmMemory;Module
[\"ExitStatus\"]=ExitStatus;var calledRun;function
ExitStatus(status){this.name=\"ExitStatus\";this.message=\"Program terminated with
exit(\"+status+\")\";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}if(ENVIRONMENT_IS_PTHREAD){readyPromis
eResolve(Module);initRuntime();postMessage({\"cmd\":\"loaded\"});return}preRun();if(runDependencies>0){retur
n}function
doRun(){if(calledRun)return;calledRun=true;Module[\"calledRun\"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module[\"onRuntimeInitialized\"])Module[\"onRuntimeInitialized\"]();postRun(
)}if(Module[\"setStatus\"]){Module[\"setStatus\"](\"Running...\");setTimeout(function(){setTimeout(function(){Mo
dule[\"setStatus\"](\"\")},1);doRun()},1)}else{doRun()}}Module[\"run\"]=run;function
exit(status,implicit){if(implicit&&noExitRuntime&&status===0){return}if(!implicit){if(ENVIRONMENT_IS_PT
HREAD){postMessage({\"cmd\":\"exitProcess\",\"returnCode\":status});throw new
ExitStatus(status)}else{}}if(noExitRuntime){}else{PThread.terminateAllThreads();EXITSTATUS=status;exitRunti
me();if(Module[\"onExit\"])Module[\"onExit\"](status);ABORT=true}quit_(status,new
ExitStatus(status))}if(Module[\"preInit\"]){if(typeof
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Module[\"preInit\"]==\"function\")Module[\"preInit\"]=[Module[\"preInit\"]];while(Module[\"preInit\"].length>0){
Module[\"preInit\"].pop()()}}if(ENVIRONMENT_IS_PTHREAD){noExitRuntime=false;PThread.initWorker()}run
();\n\n\n return WasmBackendModuleThreadedSimd.ready\n}\n);\n})();\nif
 (typeof exports === 'object' && typeof module === 'object')\n module.exports =
WasmBackendModuleThreadedSimd;\nelse if (typeof define === 'function' && define['amd'])\n define([],
function() { return WasmBackendModuleThreadedSimd; });\nelse if (typeof exports === 'object')\n
exports[\"WasmBackendModuleThreadedSimd\"] = WasmBackendModuleThreadedSimd;\n","export const
wasmWorkerContents = 'var Module={};function threadPrintErr(){var
text=Array.prototype.slice.call(arguments).join(\" \");console.error(text)}function threadAlert(){var
text=Array.prototype.slice.call(arguments).join(\"
\");postMessage({cmd:\"alert\",text:text,threadId:Module[\"_pthread_self\"]()})}var
err=threadPrintErr;this.alert=threadAlert;Module[\"instantiateWasm\"]=function(info,receiveInstance){var
instance=new
WebAssembly.Instance(Module[\"wasmModule\"],info);Module[\"wasmModule\"]=null;receiveInstance(instance);r
eturn instance.exports};function
moduleLoaded(){}this.onmessage=function(e){try{if(e.data.cmd===\"load\"){Module[\"wasmModule\"]=e.data.wa
smModule;Module[\"wasmMemory\"]=e.data.wasmMemory;Module[\"buffer\"]=Module[\"wasmMemory\"].buffer;
Module[\"ENVIRONMENT_IS_PTHREAD\"]=true;if(typeof
 e.data.urlOrBlob===\"string\"){importScripts(e.data.urlOrBlob)}else{var
objectUrl=URL.createObjectURL(e.data.urlOrBlob);importScripts(objectUrl);URL.revokeObjectURL(objectUrl)}
WasmBackendModuleThreadedSimd(Module).then(function(instance){Module=instance;moduleLoaded()})}else
if(e.data.cmd===\"objectTransfer\"){Module[\"PThread\"].receiveObjectTransfer(e.data)}else
if(e.data.cmd===\"run\"){Module[\"__performance_now_clock_drift\"]=performance.now()-
e.data.time;Module[\"__emscripten_thread_init\"](e.data.threadInfoStruct,0,0);var max=e.data.stackBase;var
top=e.data.stackBase+e.data.stackSize;Module[\"establishStackSpace\"](top,max);Module[\"_emscripten_tls_init\"](
);Module[\"PThread\"].receiveObjectTransfer(e.data);Module[\"PThread\"].setThreadStatus(Module[\"_pthread_self
\"](),1);try{var
result=Module[\"invokeEntryPoint\"](e.data.start_routine,e.data.arg);if(!Module[\"getNoExitRuntime\"]())Module[\
"PThread\"].threadExit(result)}catch(ex){if(ex===\"Canceled!\"){Module[\"PThread\"].threadCancel()}else
if(ex!=\"unwind\"){if(ex instanceof
Module[\"ExitStatus\"]){if(Module[\"getNoExitRuntime\"]()){}else{Module[\"PThread\"].threadExit(ex.status)}}el
se{Module[\"PThread\"].threadExit(-2);throw ex}}}}else
if(e.data.cmd===\"cancel\"){if(Module[\"_pthread_self\"]()){Module[\"PThread\"].threadCancel()}}else
if(e.data.target===\"setimmediate\"){}else
if(e.data.cmd===\"processThreadQueue\"){if(Module[\"_pthread_self\"]()){Module[\"_emscripten_current_thread_
process_queued_calls\"]()}}else{err(\"worker.js received unknown command
\"+e.data.cmd);err(e.data)}}catch(ex){err(\"worker.js onmessage() captured an uncaught exception:
\"+ex);if(ex&&ex.stack)err(ex.stack);throw ex}};if(typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof process.versions.node===\"string\"){self={location:{href:__filename}};var
 onmessage=this.onmessage;var
nodeWorkerThreads=require(\"worker_threads\");global.Worker=nodeWorkerThreads.Worker;var
parentPort=nodeWorkerThreads.parentPort;parentPort.on(\"message\",function(data){onmessage({data:data})});var
nodeFS=require(\"fs\");var nodeRead=function(filename){return nodeFS.readFileSync(filename,\"utf8\")};function
globalEval(x){global.require=require;global.Module=Module;eval.call(null,x)}importScripts=function(f){globalEva
l(nodeRead(f))};postMessage=function(msg){parentPort.postMessage(msg)};if(typeof
performance===\"undefined\"){performance={now:function(){return Date.now()}}}';","\nvar
WasmBackendModule = (function() {\n var _scriptDir = typeof document !== 'undefined' &&
document.currentScript ? document.currentScript.src : undefined;\n if (typeof __filename !== 'undefined')

_scriptDir = _scriptDir || __filename;\n return (\nfunction(WasmBackendModule) {\n WasmBackendModule = WasmBackendModule || {};\n\nvar Module=typeof WasmBackendModule!==\"undefined\"?WasmBackendModule:{};var readyPromiseResolve,readyPromiseReject;Module[\"ready\"]=new Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var moduleOverrides={};var key;for(key in Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var thisProgram=\"./this.program\";var quit_=function(status,toThrow){throw toThrow};var ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof window===\"object\";ENVIRONMENT_IS_WORKER=typeof importScripts===\"function\";ENVIRONMENT_IS_NODE=typeof process===\"object\"&&typeof process.versions===\"object\"&&typeof process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONMENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var scriptDirectory=\"\";function locateFile(path){if(Module[\"locateFile\"]){return Module[\"locateFile\"](path,scriptDirectory)}return scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\"path\").dirname(scriptDirectory)+\"/\"}else{scriptDirectory=__dirname+\"/\"}read_=function shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=nodePath[\"normalize\"](filename);return nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\")};readBinary=function readBinary(filename){var ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return ret};if(process[\"argv\"].length>1){thisProgram=process[\"argv\"][1].replace(/\\\\/g,\"/\")}arguments_=process[\"argv\"].slice(2);process[\"on\"](\"uncaughtException\",function(ex){if(!(ex instanceof ExitStatus)){throw ex}});process[\"on\"](\"unhandledRejection\",abort);quit_=function(status){process[\"exit\"](status)};Module[\"inspect\"]=function(){return\"[Emscripten Module object]\"}}else if(ENVIRONMENT_IS_SHELL){if(typeof read!=\"undefined\"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var data;if(typeof readbuffer===\"function\"){return new Uint8Array(readbuffer(f))}data=read(f,\"binary\");assert(typeof data===\"object\");return data};if(typeof scriptArgs!=\"undefined\"){arguments_=scriptArgs}else if(typeof arguments!=\"undefined\"){arguments_=arguments}if(typeof quit===\"function\"){quit_=function(status){quit(status)}}if(typeof print!==\"undefined\"){if(typeof console===\"undefined\")console={};console.log=print;console.warn=console.error=typeof printErr!==\"undefined\"?printErr:print}}else if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDirectory=self.location.href}else if(typeof document!==\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(_scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf(\"blob:\")!==0){scriptDirectory=scriptDirectory.substr(0,scriptDirectory.lastIndexOf(\"/\")+1)}else{scriptDirectory=\"\"}{read_=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.send(null);return xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.responseType=\"arraybuffer\";xhr.send(null);return new Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,true);xhr.responseType=\"arraybuffer\";xhr.onload=function(){if(xhr.status==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror()};xhr.onerror=onerror;xhr.send(null)}}setWindowTitle=function(title){document.title=title}}else{}var out=Module[\"print\"]||console.log.bind(console);var err=Module[\"printErr\"]||console.warn.bind(console);for(key

in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module[\"arguments\"])arguments_=Module[\"arguments\"];if(Module[\"thisProgram\"])thisProgram=
Module[\"thisProgram\"];if(Module[\"quit\"])quit_=Module[\"quit\"];var
wasmBinary;if(Module[\"wasmBinary\"])wasmBinary=Module[\"wasmBinary\"];var
noExitRuntime=Module[\"noExitRuntime\"]||true;if(typeof WebAssembly!==\"object\"){abort(\"no native wasm
support detected\")}var wasmMemory;var ABORT=false;var EXITSTATUS;function
assert(condition,text){if(!condition){abort(\"Assertion failed: \"+text)}}function getCFunc(ident){var
func=Module[\"_\"+ident];assert(func,\"Cannot call unknown function \"+ident+\", make sure it is exported\");return
func}function ccall(ident,returnType,argTypes,args,opts){var toC={\"string\":function(str){var
ret=0;if(str!==null&&str!==undefined&&str!==0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\"array\":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType===\"string\")return UTF8ToString(ret);if(returnType===\"boolean\")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type===\"number\"});var
numericRet=returnType!==\"string\";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}}var UTF8Decoder=typeof
TextDecoder!==\"undefined\"?new TextDecoder(\"utf8\"):undefined;function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
endPtr=idx;while(heap[endPtr]&&!(endPtr>=endIdx))++endPtr;if(endPtr-
idx>16&&heap.subarray&&UTF8Decoder){return UTF8Decoder.decode(heap.subarray(idx,endPtr))}else{var
str=\"\";while(idx<endPtr){var u0=heap[idx++];if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}}return str}function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(HEAPU8,ptr,maxBytesToRead):\"\"}function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10)|u1&1023}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return
outIdx-startIdx}function stringToUTF8(str,outPtr,maxBytesToWrite){return
stringToUTF8Array(str,HEAPU8,outPtr,maxBytesToWrite)}function
writeArrayToMemory(array,buffer){HEAP8.set(array,buffer)}function
alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var
buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function
updateGlobalBufferAndViews(buf){buffer=buf;Module[\"HEAP8\"]=HEAP8=new
Int8Array(buf);Module[\"HEAP16\"]=HEAP16=new Int16Array(buf);Module[\"HEAP32\"]=HEAP32=new

Int32Array(buf);Module[\"HEAPU8\"]=HEAPU8=new Uint8Array(buf);Module[\"HEAPU16\"]=HEAPU16=new Uint16Array(buf);Module[\"HEAPU32\"]=HEAPU32=new Uint32Array(buf);Module[\"HEAPF32\"]=HEAPF32=new Float32Array(buf);Module[\"HEAPF64\"]=HEAPF64=new Float64Array(buf)}var INITIAL_MEMORY=Module[\"INITIAL_MEMORY\"]||16777216;var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;__ATINIT__.push({func:function(){___wasm_call_ctors()}});function preRun(){if(Module[\"preRun\"]){if(typeof Module[\"preRun\"]==\"function\")Module[\"preRun\"]=[Module[\"preRun\"]];while(Module[\"preRun\"].length){addOnPreRun(Module[\"preRun\"].shift())}}callRuntimeCallbacks(__ATPRERUN__)}function initRuntime(){runtimeInitialized=true;callRuntimeCallbacks(__ATINIT__)}function preMain(){callRuntimeCallbacks(__ATMAIN__)}function postRun(){if(Module[\"postRun\"]){if(typeof Module[\"postRun\"]==\"function\")Module[\"postRun\"]=[Module[\"postRun\"]];while(Module[\"postRun\"].length){addOnPostRun(Module[\"postRun\"].shift())}}callRuntimeCallbacks(__ATPOSTRUN__)}function addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function addRunDependency(id){runDependencies++;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}}function removeRunDependency(id){runDependencies--;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}if(runDependencies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}if(dependenciesFulfilled){var callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}}Module[\"preloadedImages\"]={};Module[\"preloadedAudios\"]={};function abort(what){if(Module[\"onAbort\"]){Module[\"onAbort\"](what)}what+=\"\";err(what);ABORT=true;EXITSTATUS=1;what=\"abort(\"+what+\"). Build with -s ASSERTIONS=1 for more info.\";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var dataURIPrefix=\"data:application/octet-stream; base64,\";function isDataURI(filename){return hasPrefix(filename,dataURIPrefix)}var fileURIPrefix=\"file://\";function isFileURI(filename){return hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile=\"tfjs-backend-wasm.wasm\";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function getBinary(file){try{if(file==wasmBinaryFile&&wasmBinary){return new Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw\"both async and sync fetching of the wasm failed\"}}catch(err){abort(err)}}function getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof fetch===\"function\"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){if(!response[\"ok\"]){throw\"failed to load wasm binary file at '\"+wasmBinaryFile+\"'\"}return response[\"arrayBuffer\"]()}).catch(function(){return getBinary(wasmBinaryFile)})}else{if(readAsync){return new Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new Uint8Array(response))},reject)})}}}return Promise.resolve().then(function(){return getBinary(wasmBinaryFile)})}function createWasm(){var info={\"a\":asmLibraryArg};function receiveInstance(instance,module){var exports=instance.exports;Module[\"asm\"]=exports;wasmMemory=Module[\"asm\"][\"j\"];updateGlobalBufferAndViews(wasmMemory.buffer);wasmTable=Module[\"asm\"][\"r\"];removeRunDependency(\"wasm-instantiate\")}addRunDependency(\"wasm-instantiate\");function receiveInstantiatedSource(output){receiveInstance(output[\"instance\"])}function

instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err(\"failed to asynchronously prepare wasm: \"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof WebAssembly.instantiateStreaming===\"function\"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFile)&&typeof fetch===\"function\"){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return result.then(receiveInstantiatedSource,function(reason){err(\"wasm streaming compile failed: \"+reason);err(\"falling back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)})})}else{return instantiateArrayBuffer(receiveInstantiatedSource)}}if(Module[\"instantiateWasm\"]){try{var exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports}catch(e){err(\"Module.instantiateWasm callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}function callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof callback==\"function\"){callback(Module);continue}var func=callback.func;if(typeof func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)()}else{wasmTable.get(func)(callback.arg)}}else{func(callback.arg===undefined?null:callback.arg)}}}function _abort(){abort()}function _emscripten_memcpy_big(dest,src,num){HEAPU8.copyWithin(dest,src,src+num)}function _emscripten_get_heap_size(){return HEAPU8.length}function emscripten_realloc_buffer(size){try{wasmMemory.grow(size-buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return 1}catch(e){}}function _emscripten_resize_heap(requestedSize){var oldSize=_emscripten_get_heap_size();var maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var cutDown=1;cutDown<=4;cutDown*=2){var overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize+100663296);var newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var ret=HEAP32[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function _fd_close(fd){return 0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){}function _fd_write(fd,iov,iovcnt,pnum){var num=0;for(var i=0;i<iovcnt;i++){var ptr=HEAP32[iov+i*8>>2];var len=HEAP32[iov+(i*8+4)>>2];for(var j=0;j<len;j++){SYSCALLS.printChar(fd,HEAPU8[ptr+j])}num+=len}HEAP32[pnum>>2]=num;return 0}function _pthread_create(){return 6}function _pthread_join(){return 28}function setErrNo(value){HEAP32[___errno_location()>>2]=value;return value}function _sysconf(name){switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return

99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case
75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-1}var asmLibraryArg={\"a\":_abort,\"d\":_emscripten_memcpy_big,\"e\":_emscripten_resize_heap,\"f\":_fd_close,\"c\":_fd_seek,\"b\":_fd_write,\"h\":_pthread_create,\"g\":_pthread_join,\"i\":_sysconf};var asm=createWasm();var ___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=function(){return(___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=Module[\"asm\"][\"k\"]).apply(null,arguments)};var _init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"l\"]).apply(null,arguments)};var _init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Module[\"_init_with_threads_count\"]=Module[\"asm\"][\"m\"]).apply(null,arguments)};var _get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads_count\"]=Module[\"asm\"][\"n\"]).apply(null,arguments)};var _register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=Module[\"asm\"][\"o\"]).apply(null,arguments)};var _dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"asm\"][\"p\"]).apply(null,arguments)};var _dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"q\"]).apply(null,arguments)};var _Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"s\"]).apply(null,arguments)};var _Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"t\"]).apply(null,arguments)};var _AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"u\"]).apply(null,arguments)};var _All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"v\"]).apply(null,arguments)};var _Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"w\"]).apply(null,arguments)};var _ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"x\"]).apply(null,arguments)};var _AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"y\"]).apply(null,arguments)};var _BatchMatMul=Module[\"_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\"_BatchMatMul\"]=Module[\"asm\"][\"z\"]).apply(null,arguments)};var _Ceil=Module[\"_Ceil\"]=function(){return(_Ceil=Module[\"_Ceil\"]=Module[\"asm\"][\"A\"]).apply(null,arguments)};var _ClipByValue=Module[\"_ClipByValue\"]=function(){return(_ClipByValue=Module[\"_ClipByValue\"]=Module[\"asm\"][\"B\"]).apply(null,arguments)};var _Conv2D=Module[\"_Conv2D\"]=function(){return(_Conv2D=Module[\"_Conv2D\"]=Module[\"asm\"][\"C\"]).apply(null,arguments)};var _Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=function(){return(_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var _Cos=Module[\"_Cos\"]=function(){return(_Cos=Module[\"_Cos\"]=Module[\"asm\"][\"E\"]).apply(null,arguments)};var _Cosh=Module[\"_Cosh\"]=function(){return(_Cosh=Module[\"_Cosh\"]=Module[\"asm\"][\"F\"]).apply(null,argu

ments)};var
_CropAndResize=Module[\"_CropAndResize\"]=function(){return(_CropAndResize=Module[\"_CropAndResize\"]=Module[\"asm\"][\"G\"]).apply(null,arguments)};var
_Cumsum=Module[\"_Cumsum\"]=function(){return(_Cumsum=Module[\"_Cumsum\"]=Module[\"asm\"][\"H\"]).apply(null,arguments)};var
_DepthToSpace=Module[\"_DepthToSpace\"]=function(){return(_DepthToSpace=Module[\"_DepthToSpace\"]=Module[\"asm\"][\"I\"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=function(){return(_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=Module[\"asm\"][\"J\"]).apply(null,arguments)};var
_Elu=Module[\"_Elu\"]=function(){return(_Elu=Module[\"_Elu\"]=Module[\"asm\"][\"K\"]).apply(null,arguments)};var
_Equal=Module[\"_Equal\"]=function(){return(_Equal=Module[\"_Equal\"]=Module[\"asm\"][\"L\"]).apply(null,arguments)};var
_Exp=Module[\"_Exp\"]=function(){return(_Exp=Module[\"_Exp\"]=Module[\"asm\"][\"M\"]).apply(null,arguments)};var
_FlipLeftRight=Module[\"_FlipLeftRight\"]=function(){return(_FlipLeftRight=Module[\"_FlipLeftRight\"]=Module[\"asm\"][\"N\"]).apply(null,arguments)};var
_Floor=Module[\"_Floor\"]=function(){return(_Floor=Module[\"_Floor\"]=Module[\"asm\"][\"O\"]).apply(null,arguments)};var
_FloorDiv=Module[\"_FloorDiv\"]=function(){return(_FloorDiv=Module[\"_FloorDiv\"]=Module[\"asm\"][\"P\"]).apply(null,arguments)};var
_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=function(){return(_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=Module[\"asm\"][\"Q\"]).apply(null,arguments)};var
_FusedConv2D=Module[\"_FusedConv2D\"]=function(){return(_FusedConv2D=Module[\"_FusedConv2D\"]=Module[\"asm\"][\"R\"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=function(){return(_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=Module[\"asm\"][\"S\"]).apply(null,arguments)};var
_Gather=Module[\"_Gather\"]=function(){return(_Gather=Module[\"_Gather\"]=Module[\"asm\"][\"T\"]).apply(null,arguments)};var
_GatherNd=Module[\"_GatherNd\"]=function(){return(_GatherNd=Module[\"_GatherNd\"]=Module[\"asm\"][\"U\"]).apply(null,arguments)};var
_Greater=Module[\"_Greater\"]=function(){return(_Greater=Module[\"_Greater\"]=Module[\"asm\"][\"V\"]).apply(null,arguments)};var
_GreaterEqual=Module[\"_GreaterEqual\"]=function(){return(_GreaterEqual=Module[\"_GreaterEqual\"]=Module[\"asm\"][\"W\"]).apply(null,arguments)};var
_LeakyRelu=Module[\"_LeakyRelu\"]=function(){return(_LeakyRelu=Module[\"_LeakyRelu\"]=Module[\"asm\"][\"X\"]).apply(null,arguments)};var
_Less=Module[\"_Less\"]=function(){return(_Less=Module[\"_Less\"]=Module[\"asm\"][\"Y\"]).apply(null,arguments)};var
_LessEqual=Module[\"_LessEqual\"]=function(){return(_LessEqual=Module[\"_LessEqual\"]=Module[\"asm\"][\"Z\"]).apply(null,arguments)};var
_Log=Module[\"_Log\"]=function(){return(_Log=Module[\"_Log\"]=Module[\"asm\"][\"_\"]).apply(null,arguments)};var
_LogicalAnd=Module[\"_LogicalAnd\"]=function(){return(_LogicalAnd=Module[\"_LogicalAnd\"]=Module[\"asm\"][\"$\"]).apply(null,arguments)};var
_Max=Module[\"_Max\"]=function(){return(_Max=Module[\"_Max\"]=Module[\"asm\"][\"aa\"]).apply(null,arguments)};var
_MaxPool=Module[\"_MaxPool\"]=function(){return(_MaxPool=Module[\"_MaxPool\"]=Module[\"asm\"][\"ba\"]).

apply(null,arguments)};var
_Maximum=Module[\"_Maximum\"]=function(){return(_Maximum=Module[\"_Maximum\"]=Module[\"asm\"][\"ca\"]).apply(null,arguments)};var
_Mean=Module[\"_Mean\"]=function(){return(_Mean=Module[\"_Mean\"]=Module[\"asm\"][\"da\"]).apply(null,arguments)};var
_Min=Module[\"_Min\"]=function(){return(_Min=Module[\"_Min\"]=Module[\"asm\"][\"ea\"]).apply(null,arguments)};var
_Minimum=Module[\"_Minimum\"]=function(){return(_Minimum=Module[\"_Minimum\"]=Module[\"asm\"][\"fa\"]).apply(null,arguments)};var
_MirrorPad=Module[\"_MirrorPad\"]=function(){return(_MirrorPad=Module[\"_MirrorPad\"]=Module[\"asm\"][\"ga\"]).apply(null,arguments)};var
_Multiply=Module[\"_Multiply\"]=function(){return(_Multiply=Module[\"_Multiply\"]=Module[\"asm\"][\"ha\"]).apply(null,arguments)};var
_Neg=Module[\"_Neg\"]=function(){return(_Neg=Module[\"_Neg\"]=Module[\"asm\"][\"ia\"]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module[\"_NonMaxSuppressionV3\"]=function(){return(_NonMaxSuppressionV3=Module[\"_NonMaxSuppressionV3\"]=Module[\"asm\"][\"ja\"]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module[\"_NonMaxSuppressionV4\"]=function(){return(_NonMaxSuppressionV4=Module[\"_NonMaxSuppressionV4\"]=Module[\"asm\"][\"ka\"]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module[\"_NonMaxSuppressionV5\"]=function(){return(_NonMaxSuppressionV5=Module[\"_NonMaxSuppressionV5\"]=Module[\"asm\"][\"la\"]).apply(null,arguments)};var
_NotEqual=Module[\"_NotEqual\"]=function(){return(_NotEqual=Module[\"_NotEqual\"]=Module[\"asm\"][\"ma\"]).apply(null,arguments)};var
_OneHot=Module[\"_OneHot\"]=function(){return(_OneHot=Module[\"_OneHot\"]=Module[\"asm\"][\"na\"]).apply(null,arguments)};var
_PadV2=Module[\"_PadV2\"]=function(){return(_PadV2=Module[\"_PadV2\"]=Module[\"asm\"][\"oa\"]).apply(null,arguments)};var
_Pow=Module[\"_Pow\"]=function(){return(_Pow=Module[\"_Pow\"]=Module[\"asm\"][\"pa\"]).apply(null,arguments)};var
_Prelu=Module[\"_Prelu\"]=function(){return(_Prelu=Module[\"_Prelu\"]=Module[\"asm\"][\"qa\"]).apply(null,arguments)};var
_Prod=Module[\"_Prod\"]=function(){return(_Prod=Module[\"_Prod\"]=Module[\"asm\"][\"ra\"]).apply(null,arguments)};var
_RealDiv=Module[\"_RealDiv\"]=function(){return(_RealDiv=Module[\"_RealDiv\"]=Module[\"asm\"][\"sa\"]).apply(null,arguments)};var
_Relu=Module[\"_Relu\"]=function(){return(_Relu=Module[\"_Relu\"]=Module[\"asm\"][\"ta\"]).apply(null,arguments)};var
_Relu6=Module[\"_Relu6\"]=function(){return(_Relu6=Module[\"_Relu6\"]=Module[\"asm\"][\"ua\"]).apply(null,arguments)};var
_ResizeBilinear=Module[\"_ResizeBilinear\"]=function(){return(_ResizeBilinear=Module[\"_ResizeBilinear\"]=Module[\"asm\"][\"va\"]).apply(null,arguments)};var
_Reverse=Module[\"_Reverse\"]=function(){return(_Reverse=Module[\"_Reverse\"]=Module[\"asm\"][\"wa\"]).apply(null,arguments)};var
_RotateWithOffset=Module[\"_RotateWithOffset\"]=function(){return(_RotateWithOffset=Module[\"_RotateWithOffset\"]=Module[\"asm\"][\"xa\"]).apply(null,arguments)};var
_Round=Module[\"_Round\"]=function(){return(_Round=Module[\"_Round\"]=Module[\"asm\"][\"ya\"]).apply(null,arguments)};var
_Rsqrt=Module[\"_Rsqrt\"]=function(){return(_Rsqrt=Module[\"_Rsqrt\"]=Module[\"asm\"][\"za\"]).apply(null,arg

uments)};var
_ScatterNd=Module[\"_ScatterNd\"]=function(){return(_ScatterNd=Module[\"_ScatterNd\"]=Module[\"asm\"][\"Aa\"]).apply(null,arguments)};var
_SelectV2=Module[\"_SelectV2\"]=function(){return(_SelectV2=Module[\"_SelectV2\"]=Module[\"asm\"][\"Ba\"]).apply(null,arguments)};var
_Sigmoid=Module[\"_Sigmoid\"]=function(){return(_Sigmoid=Module[\"_Sigmoid\"]=Module[\"asm\"][\"Ca\"]).apply(null,arguments)};var
_Sin=Module[\"_Sin\"]=function(){return(_Sin=Module[\"_Sin\"]=Module[\"asm\"][\"Da\"]).apply(null,arguments)};var
_Softmax=Module[\"_Softmax\"]=function(){return(_Softmax=Module[\"_Softmax\"]=Module[\"asm\"][\"Ea\"]).apply(null,arguments)};var
_Sqrt=Module[\"_Sqrt\"]=function(){return(_Sqrt=Module[\"_Sqrt\"]=Module[\"asm\"][\"Fa\"]).apply(null,arguments)};var
_Square=Module[\"_Square\"]=function(){return(_Square=Module[\"_Square\"]=Module[\"asm\"][\"Ga\"]).apply(null,arguments)};var
_SquaredDifference=Module[\"_SquaredDifference\"]=function(){return(_SquaredDifference=Module[\"_SquaredDifference\"]=Module[\"asm\"][\"Ha\"]).apply(null,arguments)};var
_Step=Module[\"_Step\"]=function(){return(_Step=Module[\"_Step\"]=Module[\"asm\"][\"Ia\"]).apply(null,arguments)};var
_StridedSlice=Module[\"_StridedSlice\"]=function(){return(_StridedSlice=Module[\"_StridedSlice\"]=Module[\"asm\"][\"Ja\"]).apply(null,arguments)};var
_Sub=Module[\"_Sub\"]=function(){return(_Sub=Module[\"_Sub\"]=Module[\"asm\"][\"Ka\"]).apply(null,arguments)};var
_Sum=Module[\"_Sum\"]=function(){return(_Sum=Module[\"_Sum\"]=Module[\"asm\"][\"La\"]).apply(null,arguments)};var
_Tan=Module[\"_Tan\"]=function(){return(_Tan=Module[\"_Tan\"]=Module[\"asm\"][\"Ma\"]).apply(null,arguments)};var
_Tanh=Module[\"_Tanh\"]=function(){return(_Tanh=Module[\"_Tanh\"]=Module[\"asm\"][\"Na\"]).apply(null,arguments)};var
_Tile=Module[\"_Tile\"]=function(){return(_Tile=Module[\"_Tile\"]=Module[\"asm\"][\"Oa\"]).apply(null,arguments)};var
_TopK=Module[\"_TopK\"]=function(){return(_TopK=Module[\"_TopK\"]=Module[\"asm\"][\"Pa\"]).apply(null,arguments)};var
_Transform=Module[\"_Transform\"]=function(){return(_Transform=Module[\"_Transform\"]=Module[\"asm\"][\"Qa\"]).apply(null,arguments)};var
_Transpose=Module[\"_Transpose\"]=function(){return(_Transpose=Module[\"_Transpose\"]=Module[\"asm\"][\"Ra\"]).apply(null,arguments)};var
__FusedMatMul=Module[\"__FusedMatMul\"]=function(){return(__FusedMatMul=Module[\"__FusedMatMul\"]=Module[\"asm\"][\"Sa\"]).apply(null,arguments)};var
_malloc=Module[\"_malloc\"]=function(){return(_malloc=Module[\"_malloc\"]=Module[\"asm\"][\"Ta\"]).apply(null,arguments)};var
_free=Module[\"_free\"]=function(){return(_free=Module[\"_free\"]=Module[\"asm\"][\"Ua\"]).apply(null,arguments)};var
___errno_location=Module[\"___errno_location\"]=function(){return(___errno_location=Module[\"___errno_location\"]=Module[\"asm\"][\"Va\"]).apply(null,arguments)};var
stackSave=Module[\"stackSave\"]=function(){return(stackSave=Module[\"stackSave\"]=Module[\"asm\"][\"Wa\"]).apply(null,arguments)};var
stackRestore=Module[\"stackRestore\"]=function(){return(stackRestore=Module[\"stackRestore\"]=Module[\"asm\"

][\"Xa\"]).apply(null,arguments)};var
stackAlloc=Module[\"stackAlloc\"]=function(){return(stackAlloc=Module[\"stackAlloc\"]=Module[\"asm\"][\"Ya\"
]).apply(null,arguments)};Module[\"cwrap\"]=cwrap;var calledRun;function
ExitStatus(status){this.name=\"ExitStatus\";this.message=\"Program terminated with
exit(\"+status+\")\";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}preRun();if(runDependencies>0){return}function
doRun(){if(calledRun)return;calledRun=true;Module[\"calledRun\"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module[\"onRuntimeInitialized\"])Module[\"onRuntimeInitialized\"]();postRun(
)}if(Module[\"setStatus\"]){Module[\"setStatus\"](\"Running...\");setTimeout(function(){setTimeout(function(){Mo
dule[\"setStatus\"](\"\")},1);doRun()},1)}else{doRun()}}Module[\"run\"]=run;if(Module[\"preInit\"]){if(typeof
Module[\"preInit\"]==\"function\")Module[\"preInit\"]=[Module[\"preInit\"]];while(Module[\"preInit\"].length>0){
Module[\"preInit\"].pop()()}}run();\n\n\n
 return WasmBackendModule.ready\n}\n);\n})();\nif (typeof exports === 'object' && typeof module === 'object')\n
module.exports = WasmBackendModule;\nelse if (typeof define === 'function' && define['amd'])\n define([],
function() { return WasmBackendModule; });\nelse if (typeof exports === 'object')\n
exports[\"WasmBackendModule\"] = WasmBackendModule;\n","/**\n * @license\n * Copyright 2019 Google
LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY
 KIND, either express or implied.\n * See the License for the specific language governing permissions and\n *
limitations under the License.\n *
==\n
*/\nimport './flags_wasm';\n\nimport {backend_util, BackendTimingInfo, DataStorage, DataType, deprecationWarn,
engine, env, KernelBackend, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasmModule,
WasmFactoryConfig} from '../wasm-out/tfjs-backend-wasm';\nimport {BackendWasmThreadedSimdModule} from
'../wasm-out/tfjs-backend-wasm-threaded-simd';\nimport wasmFactoryThreadedSimd from '../wasm-out/tfjs-
backend-wasm-threaded-simd.js';\n// @ts-ignore\nimport {wasmWorkerContents} from '../wasm-out/tfjs-backend-
wasm-threaded-simd.worker.js';\nimport wasmFactory from '../wasm-out/tfjs-backend-wasm.js';\n\ninterface
TensorData {\n id: number;\n memoryOffset: number;\n shape: number[];\n dtype: DataType;\n refCount:
number;\n /** Only used for string tensors,
 storing encoded bytes. */\n stringBytes?: Uint8Array[];\n}\n\nexport type DataId = object; // object instead of {}
to force non-primitive.\n\nexport class BackendWasm extends KernelBackend {\n // 0 is reserved for null data
ids.\n private dataIdNextNumber = 1;\n dataIdMap: DataStorage<TensorData>;\n\n constructor(public wasm:
BackendWasmModule|BackendWasmThreadedSimdModule) {\n super();\n
this.wasm.tfjs.initWithThreadsCount(threadsCount);\n actualThreadsCount = this.wasm.tfjs.getThreadsCount();\n
 this.dataIdMap = new DataStorage(this, engine());\n }\n\n write(values: backend_util.BackendValues, shape:
number[], dtype: DataType):\n DataId {\n const dataId = {id: this.dataIdNextNumber++};\n
this.move(dataId, values, shape, dtype, 1);\n return dataId;\n }\n\n numDataIds(): number {\n return
this.dataIdMap.numDataIds();\n }\n\n async time(f: () => void): Promise<BackendTimingInfo> {\n const start =
util.now();\n f();\n const kernelMs
 = util.now() - start;\n return {kernelMs};\n }\n\n move(\n dataId: DataId, values:
backend_util.BackendValues, shape: number[],\n dtype: DataType, refCount: number): void {\n const id =
this.dataIdNextNumber++;\n if (dtype === 'string') {\n const stringBytes = values as Uint8Array[];\n
this.dataIdMap.set(\n dataId,\n {id, stringBytes, shape, dtype, memoryOffset: null, refCount});\n
return;\n }\n\n const size = util.sizeFromShape(shape);\n const numBytes = size *

util.bytesPerElement(dtype);\n const memoryOffset = this.wasm._malloc(numBytes);\n\n this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount});\n\n this.wasm.tfjs.registerTensor(id, size, memoryOffset);\n\n if (values != null) {\n this.wasm.HEAPU8.set(\n new Uint8Array(\n (values as backend_util.TypedArray).buffer,\n (values as backend_util.TypedArray).byteOffset, numBytes),\n memoryOffset);\n
}\n }\n\n async read(dataId: DataId): Promise<backend_util.BackendValues> {\n return this.readSync(dataId);\n }\n\n readSync(dataId: DataId): backend_util.BackendValues {\n const {memoryOffset, dtype, shape, stringBytes} =\n this.dataIdMap.get(dataId);\n if (dtype === 'string') {\n return stringBytes;\n }\n const bytes = this.wasm.HEAPU8.slice(\n memoryOffset,\n memoryOffset + util.sizeFromShape(shape) * util.bytesPerElement(dtype));\n return typedArrayFromBuffer(bytes.buffer, dtype);\n }\n\n /**\n * Dispose the memory if the dataId has 0 refCount. Return true if the memory\n * is released, false otherwise.\n * @param dataId\n * @oaram force Optional, remove the data regardless of refCount\n */\n disposeData(dataId: DataId, force = false): boolean {\n if (this.dataIdMap.has(dataId)) {\n const data = this.dataIdMap.get(dataId);\n data.refCount--;\n if (!force && data.refCount > 0) {\n return false;\n }\n\n this.wasm._free(data.memoryOffset);\n this.wasm.tfjs.disposeData(data.id);\n this.dataIdMap.delete(dataId);\n }\n return true;\n }\n\n /** Return refCount of a `TensorData`. */\n refCount(dataId: DataId): number {\n if (this.dataIdMap.has(dataId)) {\n const tensorData = this.dataIdMap.get(dataId);\n return tensorData.refCount;\n }\n return 0;\n }\n\n incRef(dataId: DataId) {\n const data = this.dataIdMap.get(dataId);\n if (data != null) {\n data.refCount++;\n }\n }\n\n floatPrecision(): 32 {\n return 32;\n }\n\n // Returns the memory offset of a tensor. Useful for debugging and unit\n // testing.\n getMemoryOffset(dataId: DataId): number {\n return this.dataIdMap.get(dataId).memoryOffset;\n }\n\n dispose() {\n this.wasm.tfjs.dispose();\n if ('PThread' in this.wasm) {\n this.wasm.PThread.terminateAllThreads();\n }\n this.wasm = null;\n }\n\n memory() {\n return {unreliable: false};\n
}\n\n /**\n * Make a tensor info for the output of an op. If `memoryOffset` is not\n * present, this method allocates memory on the WASM heap. If `memoryOffset`\n * is present, the memory was allocated elsewhere (in c++) and we just record\n * the pointer where that memory lives.\n */\n makeOutput(shape: number[], dtype: DataType, memoryOffset?: number):\n TensorInfo {\n let dataId: {};\n if (memoryOffset == null) {\n dataId = this.write(null /* values */, shape, dtype);\n } else {\n const id = this.dataIdNextNumber++;\n dataId = {id};\n this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount: 1});\n const size = util.sizeFromShape(shape);\n this.wasm.tfjs.registerTensor(id, size, memoryOffset);\n }\n return {dataId, shape, dtype};\n }\n\n typedArrayFromHeap({shape, dtype, dataId}: TensorInfo):\n backend_util.TypedArray {\n const buffer = this.wasm.HEAPU8.buffer;\n const {memoryOffset} = this.dataIdMap.get(dataId);\n const size = util.sizeFromShape(shape);\n switch (dtype) {\n case 'float32':\n return new Float32Array(buffer, memoryOffset, size);\n case 'int32':\n return new Int32Array(buffer, memoryOffset, size);\n case 'bool':\n return new Uint8Array(buffer, memoryOffset, size);\n default:\n throw new Error(`Unknown dtype ${dtype}`);\n }\n }\n}\n\nfunction createInstantiateWasmFunc(path: string) {\n // this will be replace by rollup plugin patchWechatWebAssembly in\n // minprogram's output.\n // tslint:disable-next-line:no-any\n return (imports: any, callback: any) => {\n util.fetch(path, {credentials: 'same-origin'}).then((response) => {\n if (!response['ok']) {\n imports.env.a(`failed to load wasm binary file at '${path}'`);\n }\n response.arrayBuffer().then(binary => {\n WebAssembly.instantiate(binary, imports).then(output => {\n callback(output.instance, output.module);\n });\n });\n });\n return {};\n };\n}\n\n/**\n * Returns the path of the WASM binary.\n * @param simdSupported whether SIMD is supported\n * @param threadsSupported whether multithreading is supported\n * @param wasmModuleFolder the directory containing the WASM binaries.\n */\nfunction getPathToWasmBinary(\n simdSupported: boolean, threadsSupported: boolean,\n wasmModuleFolder: string) {\n if (wasmPath != null) {\n // If wasmPath is defined, the user has supplied a full path to\n // the vanilla .wasm binary.\n return wasmPath;\n }\n\n let path: WasmBinaryName = 'tfjs-backend-wasm.wasm';\n if (simdSupported &&

threadsSupported) {\n path = 'tfjs-backend-wasm-threaded-simd.wasm';\n } else if (simdSupported) {\n path = 'tfjs-backend-wasm-simd.wasm';\n }\n\n if (wasmFileMap != null) {\n if (wasmFileMap[path] != null) {\n return wasmFileMap[path];\n }\n }\n\n return wasmModuleFolder + path;\n}\n\n/**\n * Initializes the wasm module and creates the js <--> wasm bridge.\n *\n * NOTE: We wrap the wasm module in a object with property 'wasm' instead of\n * returning Promise<BackendWasmModule> to avoid freezing Chrome (last tested\n * in Chrome 76).\n */\nexport async function init(): Promise<{wasm: BackendWasmModule}> {\n const [simdSupported, threadsSupported] = await Promise.all([\n env().getAsync('WASM_HAS_SIMD_SUPPORT'),\n env().getAsync('WASM_HAS_MULTITHREAD_SUPPORT')\n]);\n\n return new Promise((resolve, reject) => {\n const factoryConfig: WasmFactoryConfig = {};\n\n /**\n * This function overrides the Emscripten module locateFile utility.\n * @param path The relative path to the file that needs to be loaded.\n * @param prefix The path to the main JavaScript file's directory.\n */\n factoryConfig.locateFile = (path, prefix) => {\n if (path.endsWith('.worker.js')) {\n const response = wasmWorkerContents;\n const blob = new Blob([response], {type: 'application/javascript'});\n return URL.createObjectURL(blob);\n }\n\n if (path.endsWith('.wasm')) {\n return getPathToWasmBinary(\n simdSupported as boolean, threadsSupported as boolean,\n wasmPathPrefix != null ? wasmPathPrefix : prefix);\n }\n return prefix + path;\n };\n\n // Use the instantiateWasm override when system fetch is not available.\n // Reference:\n // https://github.com/emscripten-core/emscripten/blob/2bca083cbbd5a4133db61fbd74d04f7feecfa907/tests/manual_wasm_instantiate.html#L170\n if (customFetch) {\n factoryConfig.instantiateWasm =\n createInstantiateWasmFunc(getPathToWasmBinary(\n simdSupported as boolean, threadsSupported as boolean,\n wasmPathPrefix != null ? wasmPathPrefix : ''));\n }\n\n let initialized = false;\n factoryConfig.onAbort = () => {\n if (initialized) {\n // Emscripten already called console.warn so no need to double log.\n return;\n }\n if (initAborted) {\n // Emscripten calls `onAbort` twice, resulting in double error\n // messages.\n return;\n }\n initAborted = true;\n const rejectMsg =\n 'Make sure the server can serve the `.wasm` file relative to the ' +\n 'bundled js file. For more details see https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers';\n reject({message: rejectMsg});\n };\n\n let wasm: Promise<BackendWasmModule>;\n // If `wasmPath` has been defined we must initialize the vanilla module.\n if (threadsSupported && simdSupported && wasmPath == null) {\n factoryConfig.mainScriptUrlOrBlob = new Blob(\n [`var WasmBackendModuleThreadedSimd = ` +\n wasmFactoryThreadedSimd.toString()],\n {type: 'text/javascript'});\n wasm = wasmFactoryThreadedSimd(factoryConfig);\n } else {\n // The wasmFactory works for both vanilla and SIMD binaries.\n wasm = wasmFactory(factoryConfig);\n }\n\n // The WASM module has been successfully created by the factory.\n // Any error will be caught by the onAbort callback defined above.\n wasm.then((module) => {\n initialized = true;\n initAborted = false;\n\n const voidReturnType: string = null;\n // Using the tfjs namespace to avoid conflict with emscripten's API.\n module.tfjs = {\n init: module.cwrap('init', null, []),\n initWithThreadsCount:\n module.cwrap('init_with_threads_count', null, ['number']),\n getThreadsCount: module.cwrap('get_threads_count', 'number', []),\n registerTensor: module.cwrap(\n 'register_tensor', null,\n [\n 'number', // id\n 'number', // size\n 'number', // memoryOffset\n]),\n disposeData: module.cwrap('dispose_data', voidReturnType, ['number']),\n dispose: module.cwrap('dispose', voidReturnType, []),\n };\n\n resolve({wasm: module});\n });\n });\n}\n\nfunction typedArrayFromBuffer(\n buffer: ArrayBuffer, dtype: DataType): backend_util.TypedArray {\n switch (dtype) {\n case 'float32':\n return new Float32Array(buffer);\n case 'int32':\n return new Int32Array(buffer);\n case 'bool':\n return new Uint8Array(buffer);\n default:\n throw new Error(`Unknown dtype ${dtype}`);\n }\n}\n\nconst wasmBinaryNames = [\n 'tfjs-backend-wasm.wasm', 'tfjs-backend-wasm-simd.wasm',\n 'tfjs-backend-wasm-threaded-simd.wasm'\n] as const ;\ntype WasmBinaryName = typeof wasmBinaryNames[number];\n\nlet wasmPath: string = null;\nlet wasmPathPrefix: string = null;\nlet wasmFileMap: {[key in WasmBinaryName]?:

string} = {};\nlet initAborted = false;\nlet customFetch = false;\n\n/**\n * @deprecated Use `setWasmPaths` instead.\n * Sets the path to the `.wasm` file which will be fetched when the wasm\n * backend is initialized. See\n * https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n * for more details.\n * @param path wasm file path or url\n * @param usePlatformFetch optional boolean to use platform fetch to download\n * the wasm file, default to false.\n *\n * @doc {heading: 'Environment', namespace: 'wasm'}\n */\nexport function setWasmPath(path: string, usePlatformFetch = false): void {\n deprecationWarn(\n 'setWasmPath has been deprecated in favor of setWasmPaths and' +\n ' will be removed in a future release.');\n if (initAborted) {\n throw new Error(\n 'The WASM backend was already initialized. Make sure you call ' +\n '`setWasmPath()` before you call `tf.setBackend()` or `tf.ready()`');\n }\n wasmPath = path;\n customFetch = usePlatformFetch;\n}\n\n/**\n * Configures the locations of the WASM binaries.\n *\n * ```js\n * setWasmPaths({\n * 'tfjs-backend-wasm.wasm': 'renamed.wasm',\n * 'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n * 'tfjs-backend-wasm-threaded-simd.wasm': 'renamed-threaded-simd.wasm'\n * });\n * tf.setBackend('wasm');\n * ```\n *\n * @param prefixOrFileMap This can be either a string or object:\n * - (string) The path to the directory where the WASM binaries are located.\n * Note that this prefix will be used to load each binary (vanilla,\n * SIMD-enabled, threading-enabled, etc.).\n * - (object) Mapping from names of WASM binaries to custom\n * full paths specifying the locations of those binaries. This is useful if\n * your WASM binaries are not all located in the same directory, or if your\n * WASM binaries have been renamed.\n * @param usePlatformFetch optional boolean to use platform fetch to download\n * the wasm file, default to false.\n *\n * @doc {heading: 'Environment', namespace: 'wasm'}\n */\nexport function setWasmPaths(\n prefixOrFileMap: string|{[key in WasmBinaryName]?: string},\n usePlatformFetch = false): void {\n if (initAborted) {\n throw new Error(\n 'The WASM backend was already initialized. Make sure you call ' +\n '`setWasmPaths()` before you call `tf.setBackend()` or ' +\n '`tf.ready()`');\n }\n\n if (typeof prefixOrFileMap === 'string') {\n wasmPathPrefix = prefixOrFileMap;\n } else {\n wasmFileMap = prefixOrFileMap;\n const missingPaths =\n wasmBinaryNames.filter(name => wasmFileMap[name] == null);\n if (missingPaths.length > 0) {\n throw new Error(\n `There were no entries found for the following binaries: ` +\n `${missingPaths.join(',')}. Please either call setWasmPaths with a ` +\n `map providing a path for each binary, or with a string indicating ` +\n `the directory where all the binaries can be found.`);\n }\n }\n\n customFetch = usePlatformFetch;\n}\n\n/** Used in unit tests. */\nexport function resetWasmPath(): void {\n wasmPath = null;\n wasmPathPrefix = null;\n wasmFileMap = {};\n customFetch = false;\n initAborted = false;\n}\n\nlet threadsCount = -1;\nlet actualThreadsCount = -1;\n\n/**\n * Sets the number of threads that will be used by XNNPACK to create\n * threadpool (default to the number of logical CPU cores).\n *\n * This must be called before calling `tf.setBackend('wasm')`.\n */\nexport function setThreadsCount(numThreads: number) {\n threadsCount = numThreads;\n}\n\n/**\n * Gets the actual threads count that is used by XNNPACK.\n *\n * It is set after the backend is intialized.\n */\nexport function getThreadsCount(): number {\n if (actualThreadsCount === -1) {\n throw new Error(`WASM backend not initialized.`);\n }\n return actualThreadsCount;\n}\n","/** @license See the LICENSE file. */\n\n// This code is auto-generated, do not modify this file!\nconst version = '3.11.0';\nexport {version};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance
 with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport './flags_wasm';\n\nimport {registerBackend} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm, init} from './backend_wasm';\n\nexport {BackendWasm, getThreadsCount, setThreadsCount, setWasmPath, setWasmPaths} from './backend_wasm';\nexport {version as version_wasm} from './version';\n\nconst

WASM_PRIORITY = 2;\nregisterBackend('wasm', async () => {\n const {wasm} = await init();\n return new BackendWasm(wasm);\n},
WASM_PRIORITY);\n"],"names":["_FusedMatMul","util","Abs","backend_util","Add","AddN","Identity","setup","Transpose","All","Any","wasmFunc","ArgMax","AvgPool","Reshape","BatchMatMul","slice_util","buffer","sliceImplCPU","Slice","BatchToSpaceND","Cast","Ceil","ClipByValue","concatImplCPU","Concat","Conv2D","Conv2DBackpropInput","Cos","Cosh","CropAndResize","Cumsum","DepthToSpace","DepthwiseConv2dNative","Elu","supportsFullBroadcast","Equal","Exp","ExpandDims","Fill","FlipLeftRight","Floor","FloorDiv","FusedBatchNorm","FusedConv2D","FusedDepthwiseConv2D","GatherNd","GatherV2","Greater","GreaterEqual","setupFunc","LeakyRelu","Less","LessEqual","Log","LogicalAnd","Max","Maximum","MaxPool","Mean","Min","Minimum","MirrorPad","Multiply","Neg","NonMaxSuppressionV3","NonMaxSuppressionV4","NonMaxSuppressionV5","kernelFunc","NotEqual","OneHot","OnesLike","Pack","PadV2","Pow","Prelu","Prod","rangeImplCPU","Range","RealDiv","Relu","Relu6","ResizeBilinear","Reverse","RotateWithOffset","Round","Rsqrt","ScatterNd","Select","Sigmoid","Sin","Softmax","SpaceToBatchND","SplitV","Sqrt","Square","SquaredDifference","Step","StridedSlice","Sub","Sum","Tan","Tanh","Tile","TopK","Transform","Unpack","ZerosLike","registerKernel","env","tslib_1.__extends","DataStorage","engine","KernelBackend","tslib_1.__awaiter","registerBackend"],"mappings":";;;;;;;;;;;;;;;;;;;;AAAA;;;;;;;;;;;;;;;;AAiBA;AACA,IAAY,QAAMX;AAND,WAAY,QAAQ;IAClB,6CAAW,CAAA;IACX,yCAAS,CAAA;IACT,uCAAQ,CAAA;IACR,2CAAU,CAAA;IACV,iDAAa,CAAA;AACf,CAAC,EANW,WAAY,QAAQ;AAOhC,IAAK,QAAMW;AAPK,WAAK,KAAK;IACnB,iCAAQ,CAAA;IACR,iCAAQ,CAAA;IACR,mCAAS,CAAA;IACT,mCAAS,CAAA;IACT,mCAAS,CAAA;IACT

C7C,UAAU,EAAEA,qBAAY;IACxB,WAAW,EAAE,MAAM;IACnB,SAAS,EAAE,KAAK;IAChB,UAAU,EAAE
,gBAAoC;CACjD;;AC7GD;;;;;;;;;;;;;;;;SAuBgB,uBAAuB,CACnC,UAAkB,EAAE,OAAkB;IACxC,IAAI,QAA6D,
CAAC;IAElE,SAAS,SAAS,CAAC,OAAoB;QACrC,QAAQ,GAAG,OAAO,CAAC,IAAI,CAAC,KAAK,CAAC,U
AAU,EAAE,IAAI,aAAa;YACzD,QAAQ;YACR,QAAQ;YACR,QAAQ;SACT,CAAC,CAAC;KACJ;IAED,SAAS,
UAAU,CAAC,IAAiD;QAE5D,IAAA,sBAAO,,EAAW,iBAAC,CAAU;QACpC,IAAM,GAAG,GAAG,OAAO,,CAA
C,SAAS,CAAC,GAAG,CAAC,CAAC,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;QAC/C,IAAM,GAAG,GAAG,OAAO,
,OAAO,CAAC,UAAU,CAAC,CAAC,CAAC,KAAK,EAAE,OAAO,IAAI,CAAC,CAAC,KAAK,CAAC,CAAC;Q
AC5D,IAAM,KAAK,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,E
AAE,CAAC;;QAGnD,IAAIC,aAAI,,CAAC,aAAa,CAAC,GAAG,CAAC,KAAK,CAAC,KAAK,CAAC,EAAE;YA
CvC,OAAO,GAAG,CAAC;SACZ;QAED,QAAQ,GAAG,EAAE,QAAQ,CAAC,GAAG,EAAE,QAAQ,CAAC,CAAC,KAAK,CA
AC,EAAE,KAAK,CAAC,CAAC;QACxC,OAAO,GAAG,CAAC;KACZ;IAED,OAAO,EAAC,UAAU,YAAA,EAAE
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AAoBO,IAAM,SAAS,GAAiB,uBAAuB,CACC,YAAG,CAAC;;ACpBnE;;;;;;;;;;;;;;;;SAuBgB,wBAAwB,CACpC,
UAAkB,EAAE,qBAA8B,EAAC,lD,KAAgB;IAClB,IAAA,QAAQ,GAAG,CAAC;IAEb,SAAS,SAAS,CAAC,OAAoB;QACrC,QAAQ,GAAG,OAAO,CAAC,IAAI,CAAC,KAAK,CAAC,KAAK,CAAC,EAAE,CAAC,UAAU,EAAE,IAAI,aAAa;YACzD,QAAQ;YACR,QAAQ;YACR,OAAO;YACP,QAAQ;YACR,QAAQ;YACR,OAAO;YACP,QAAQ;YACR,QAAQ;YACR,QAAQ;SACT,CAAC,CAAC;KACJ;IAED,SAAS,UAAU,CAAC,IAAiD;QAE5D,IAAA,sBAAO,,EAAW,iBAAC,CAAU;QACpC,IAAM,GAAG,GAAG,OAAO,,CAAC,IAAI,CAAC,KAAK,CAAC,KAAK,CAAC,EAAE,CAAC,UAAU,EAAE,IAAI,aAAa;YACzD,QAAQ;YACR,QAAQ;YACR,OAAO;YACP,QAAQ;YACR

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* @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {backend_util, Conv2D, Conv2DAttrs, Conv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmConv2d: (\n xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number, padTop: number,\n padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n dilationHeight: number, dilationWidth: number, strideHeight: number,\n strideWidth: number, inputChannels: number, outputChannels: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmConv2d = backend.wasm.cwrap(Conv2D, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n}\n\nfunction conv2d(\n args: {inputs: Conv2DInputs, backend: BackendWasm, attrs: Conv2DAttrs}) {\n const {inputs, attrs, backend} = args;\n\n const {x, filter} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const {strides, dilations, pad, dimRoundingMode, dataFormat} = attrs;\n const $dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode, false, $dataFormat);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend Conv2D does not support dataFormat:` +\n `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmConv2d(\n xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n dilationHeight, dilationWidth, strideHeight, strideWidth, inputChannels,\n outputChannels, outId);\n return out;\n}\n\nexport const conv2DConfig: KernelConfig = {\n kernelName: Conv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: conv2d as {} as KernelFunc\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Conv2D.js.map
No license file was found, but licenses were detected in source scan.

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KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {identity} from './Identity';\nimport {CppDType} from './types';\n\nlet wasmTranspose: (\n xId: number, xShape: Uint8Array, xShapeLength: number, dtype: CppDType,\n outId: number, perm: Uint8Array, permLength: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTranspose = backend.wasm.cwrap(Transpose, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // dtype\n 'number', // outId\n 'array', // perm\n 'number', // perm.length\n]);\n}\n\nexport function transpose(\n args:\n {inputs: TransposeInputs, backend: BackendWasm, attrs: TransposeAttrs}):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n // Reduce any dimensions with size one. Lower-rank transpose kernel performs\n // better due to simpler memory access pattern.\n const [reducedShape, perm] = removeOneSizeDims(inputs.x.shape, attrs.perm);\n\n let permIsNoOp = true;\n for (let i = 0; i < perm.length; i++) {\n if (perm[i] !== i) {\n permIsNoOp = false;\n }\n }\n const outShape = computeOutShape(inputs.x.shape, attrs.perm);\n const x = {\n dataId: inputs.x.dataId,\n shape: reducedShape,\n dtype: inputs.x.dtype\n };\n\n if (permIsNoOp) {\n const cloned = identity({inputs, backend});\n cloned.shape = outShape;\n return cloned;\n }\n\n const out = backend.makeOutput(outShape, x.dtype);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n const permBytes = new Uint8Array(new Int32Array(perm).buffer);\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n wasmTranspose(\n xId, xShapeBytes, x.shape.length, CppDType[x.dtype], outId, permBytes,\n perm.length);\n return out;\n}\n\nfunction computeOutShape(inShape: number[], perm: number[]): number[] {\n const outShape = new Array(inShape.length);\n for (let i = 0; i < outShape.length; i++) {\n outShape[i] = inShape[perm[i]];\n }\n return outShape;\n}\n\nfunction removeOneSizeDims(\n shape: number[], perm: number[]): [number[], number[]] {\n const newShape: number[] = [];\n const newPerm: number[] = [];\n for (let i = 0; i < shape.length; ++i) {\n if (shape[i] !== 1) {\n newShape.push(shape[i]);\n }\n if (shape[perm[i]] !== 1) {\n newPerm.push(perm[i]);\n }\n }\n for (let i = 0; i < newPerm.length; ++i) {\n let minValIdx = -1;\n for (let j = 0; j < newPerm.length; ++j) {\n if (newPerm[j] >= i &&\n (minValIdx === -1 || newPerm[minValIdx] > newPerm[j])) {\n minValIdx = j;\n }\n }\n newPerm[minValIdx] = i;\n }\n return [newShape, newPerm];\n}\n\nexport const transposeConfig: KernelConfig = {\n kernelName: Transpose,\n backendName: 'wasm',\n kernelFunc: transpose as {} as KernelFunc,\n setupFunc: setup,\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Transpose.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Identity.js","sourceRoot":"","sources":["../../src/kernels/Identity.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,QAAQ,EAAE2C,MAAM,uBAAuB,CAAC;AAKzF,MAAM,UAAU,QAAQ,CAAC,MAAM,EAAE,CAAC,EAAE,CAAC,EAAE,CAAC

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==========\n
*/\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport
{TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function
identity(args: {inputs: IdentityInputs, backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, backend} =
args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const inVals = backend.typedArrayFromHeap(x);\n
const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n return
 out;\n}\n\nexport const identityConfig: KernelConfig = {\n kernelName: Identity,\n backendName: 'wasm',\n
kernelFunc: identity as {} as KernelFunc,\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Identity.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"NonMaxSuppressionV3.js","sourceRoot":"","sources":["../../src/kernels/NonMaxSuppressionV3
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==========\n
*/\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs,
NonMaxSuppressionV3Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'../backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n
boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number)
=> number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n
NonMaxSuppressionV3,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n
  'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', // scoreThreshold\n
]);\n}\n\nfunction kernelFunc(args: {\n backend: BackendWasm,\n

inputs: NonMaxSuppressionV3Inputs,\n attrs: NonMaxSuppressionV3Attrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold} = attrs;\n const {boxes, scores} = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset =\n   wasmFunc(boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V3, we have to delete it from the heap.\n backend.wasm._free(pSelectedScores);\n backend.wasm._free(pValidOutputs);\n\n const selectedIndicesTensor =\n   backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n return selectedIndicesTensor;\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n kernelName: NonMaxSuppressionV3,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as {} as KernelFunc,\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/NonMaxSuppressionV3.js.map
No license file was found, but licenses were detected in source scan.

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backend.wasm.cwrap(\n NonMaxSuppressionV5,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n 'number', // maxOutputSize\n 'number',
// iouThreshold\n 'number', // scoreThreshold\n 'number', // softNmsSigma\n]);\n}\n\nfunction kernelFunc(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV5Inputs,\n attrs: NonMaxSuppressionV5Attrs\n}): TensorInfo[] {\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold, softNmsSigma} = attrs;\n const {boxes, scores} = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset = wasmFunc(\n boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n softNmsSigma);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using validOutputs for V5, we have to delete it from the\n // heap.\n backend.wasm._free(pValidOutputs);\n\n const selectedIndicesTensor =\n backend.makeOutput([selectedSize], 'int32',
pSelectedIndices);\n const selectedScoresTensor =\n backend.makeOutput([selectedSize], 'float32',
pSelectedScores);\n\n return [selectedIndicesTensor, selectedScoresTensor];\n}\n\nexport const nonMaxSuppressionV5Config: KernelConfig = {\n kernelName: NonMaxSuppressionV5,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as {} as KernelFunc,\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/NonMaxSuppressionV5.js.map
No license file was found, but licenses were detected in source scan.

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isChannelsLast ? dxStrides[1] : dxStrides[2];\n const xColStride = isChannelsLast ? dxStrides[2]
 : 1;\n const xChannelStride = isChannelsLast ? 1 : dxStrides[1];\n const yBatchStride = dyStrides[0];\n const
yRowStride = isChannelsLast ? dyStrides[1] : dyStrides[2];\n const yColStride = isChannelsLast ? dyStrides[2] :
1;\n const yChannelStride = isChannelsLast ? 1 : dyStrides[1];\n\n const out =
backend.makeOutput(convInfo.inShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const
dyId = backend.dataIdMap.get(dy.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n
wasmConv2DBackpropInput(\n   dyId, filterId, batchSize, filterHeight, filterWidth, inHeight, inWidth,\n
inChannels, outHeight, outWidth, outChannels, strideHeight, strideWidth,\n   topPad, leftPad, fltS0, fltS1, fltS2,
xBatchStride, xRowStride,\n   xColStride, xChannelStride, yBatchStride, yRowStride, yColStride,\n
yChannelStride, outId);\n return out;\n}\n\nexport const conv2DBackpropInputConfig: KernelConfig = {\n
kernelName: Conv2DBackpropInput,\n
  backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: conv2DBackpropInput as {} as KernelFunc\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Conv2DBackpropInput.js.map
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* ===
*/

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No license file was found, but licenses were detected in source scan.

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 * ===\n
*/\nimport {KernelConfig, Tan} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const tanConfig: KernelConfig = createUnaryKernelConfig(Tan);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Tan.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"tf-backend-wasm.node.js","sources":["../src/kernels/types.ts","../src/kernels/_FusedMatMul.ts","../src/kernels/unary_kernel.ts","../src/kernels/Abs.ts","../src/kernels/binary_kernel.ts","../src/kernels/Add.ts","../src/kernels/AddN.ts","../src/kernels/Identity.ts","../src/kernels/Transpose.ts","../src/kernels/kernel_utils.ts","../src/kernels/All.ts","../src/kernels/Any.ts","../src/kernels/ArgMax.ts","../src/kernels/AvgPool.ts","../src/kernels/Reshape.ts","../src/kernels/BatchMatMul.ts","../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Concat_impl.js","../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Range_impl.js","../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Slice.js","../src/kernels/Slice.ts","../src/kernels/BatchToSpaceND.ts","../src/kernels/Cast.ts","../src/kernels/Ceil.ts","../src/kernels/ClipByValue.ts","../src/kernels/Concat.ts","../src/kernels/Conv2D.ts","../src/kernels/Conv2DBackpropInput.ts","../src/kernels/Cos.ts","../src/kernels/Cosh.ts","../src/kernels/CropAndResize.ts","../src/kernels/Cumsum.ts","../src/kernels/DepthToSpace.ts","../src/kernels/DepthwiseConv2dNative.ts","../src/kernels/Elu.ts","../src/kernels/Equal.ts","../src/kernels/Exp.ts","../src/kernels/ExpandDims.ts","../src/kernels/Fill.ts","../src/kernels/FlipLeftRight.ts","../src/kernels/Floor.ts","../src/kernels/FloorDiv.ts","../src/kernels/FusedBatchNorm.ts","../src/kernels/FusedConv2D.ts","../src/kernels/FusedDepthwiseConv2D.ts","../src/kernels/GatherNd.ts","../src/kernels/GatherV2.ts","../src/kernels/Greater.ts","../src/kernels/GreaterEqual.ts","../src/kernels/LeakyRelu.ts","../src/kernels/Less.ts","../src/kernels/LessEqual.ts","../src/kernels/Log.ts","../src/kernels/LogicalAnd.ts","../src/kernels/Max.ts","../src/kernels/M

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copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
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WITHOUT
 WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\n// This enum must align with the enum defined in cc/backend.h.\nexport enum CppDType {\n float32 = 0,\n
int32 = 1,\n bool = 2,\n string = 3,\n complex64 = 4\n}\n\n// Must match enum in cc/fusable_activations.h.\nexport
enum FusableActivation {\n linear = 0,\n relu = 1,\n relu6 = 2,\n prelu = 3,\n leakyrelu = 4,\n sigmoid = 5,\n elu
= 6\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache
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may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required
by applicable law or agreed to in writing, software\n
 * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR
CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing
permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {_FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {FusableActivation} from
'./types';\n\nlet wasmFusedMatMul:\n   (aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n
bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n   transposeB: boolean, activation: number,
biasId: number,\n   preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n
void;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedMatMul = backend.wasm.cwrap(_FusedMatMul,
null /* void */, [\n   'number',
  // a_id\n   'array', // a_shape\n   'number', // a_shape.length\n   'number', // b_id\n   'array', // b_shape\n
'number', // b_shape.length\n   'number', // transpose_a\n   'number', // transpose_b\n   'number', // activation\n
'number', // biasId\n   'number', // preluActivationWeightsId\n   'number', // leakyreluAlpha\n   'number' //
out_id\n]);\n}\n\nfunction fusedBatchMatMul(args: {\n inputs: _FusedMatMulInputs,\n backend:
BackendWasm,\n attrs: _FusedMatMulAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {a, b, bias,
preluActivationWeights} = inputs;\n\n if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n   throw new Error(\n
`_FusedMatMul for non non-float32 tensors not yet supported.`);\n }\n\n const {transposeA, transposeB,

activation, leakyreluAlpha} = attrs;\n const aId = backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n\n let biasId = 0;\n if (bias != null) {\n   const biasData = backend.dataIdMap.get(bias.dataId);\n   if (biasData.shape.length !== 1) {\n   throw new Error(\n   `_FusedMatMul only supports rank-1 bias but got ` +\n   `rank ${biasData.shape.length}.`);\n   }\n   biasId = biasData.id;\n }\n const preluActivationWeightsId = preluActivationWeights == null ?\n   0 :\n   backend.dataIdMap.get(preluActivationWeights.dataId).id;\n const fusedActivation =\n   FusableActivation[activation as {} as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n   throw new Error(\n   `${activation} activation not yet supported for FusedConv2D ` +\n   `in the wasm backend.`);\n }\n\n const leftDim = transposeA ? a.shape[2] : a.shape[1];\n const rightDim = transposeB ? b.shape[1] : b.shape[2];\n const batchDim = a.shape[0];\n\n const out = backend.makeOutput([batchDim, leftDim, rightDim], a.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n\n wasmFusedMatMul(\n   aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n   transposeA, transposeB, fusedActivation, biasId, preluActivationWeightsId,\n   leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedMatMulConfig: KernelConfig = {\n kernelName: _FusedMatMul,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchMatMul as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {DataType, KernelConfig, TensorInfo, UnaryInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nexport function createUnaryKernelConfig(\n   kernelName: string, outType?: DataType): KernelConfig {\n let wasmFunc: (xId: number, dtype: number, outId: number) => void;\n\n function setupFunc(backend: BackendWasm): void {\n   wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n   'number', // x_id\n   'number', // dtype\n   'number', // out_id\n   ]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: UnaryInputs}):\n   TensorInfo {\n   const {backend, inputs: {x}} = args;\n   const xId = backend.dataIdMap.get(x.dataId).id;\n   const out = backend.makeOutput(x.shape, outType || x.dtype);\n   const outId = backend.dataIdMap.get(out.dataId).id;\n\n   // Short-circuit zero-sized tensors.\n   if (util.sizeFromShape(out.shape) === 0) {\n   return out;\n   }\n\n   wasmFunc(xId, CppDType[x.dtype], outId);\n   return out;\n }\n\n return {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions
 and\n * limitations under the License.\n *
==========\n */\nimport {Abs, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or

agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nexport function createBinaryKernelConfig(\n kernelName: string, supportsFullBroadcast: boolean,\n dtype?: DataType): KernelConfig {\n let wasmFunc:\n (aId: number, aShape: Uint8Array, aShapeLen: number, bId: number,\n bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) =>\n void;\n\n function setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n 'number', // a_id,\n 'array', // a_shape\n 'number', // a_shape.length\n 'number', // b_id\n 'array', // b_shape\n 'number', // b_shape.length\n 'number', // dtype\n 'number' // out_id\n]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: BinaryInputs}):\n TensorInfo {\n const {backend, inputs} = args;\n const {a, b} = inputs;\n const aId = backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n\n const outputType = dtype != null ? dtype : a.dtype;\n const newShape = backend_util.assertAndGetBroadcastShape(a.shape, b.shape);\n const out = backend.makeOutput(newShape, outputType);\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(newShape) === 0) {\n return out;\n }\n\n const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const kernelFunc = () => wasmFunc(\n aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n CppDType[a.dtype], outId);\n\n // Currently only some float operations support full broadcast.\n if (supportsFullBroadcast && a.dtype === 'float32')\n {\n kernelFunc();\n return out;\n }\n\n const aBroadcastDims = backend_util.getBroadcastDims(a.shape, newShape);\n const bBroadcastDims = backend_util.getBroadcastDims(b.shape, newShape);\n const loopsOverAllOfA = aBroadcastDims.every((v, i) => v === i);\n const loopsOverAllOfB = bBroadcastDims.every((v, i) => v === i);\n if (loopsOverAllOfA && loopsOverAllOfB) {\n kernelFunc();\n return out;\n } else {\n throw new Error(\n `Broadcasting along outer dims is not yet ` +\n `supported for ${a.dtype} ${kernelName}.`);\n }\n }\n\n return {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {Add, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const addConfig: KernelConfig =\n createBinaryKernelConfig(Add, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {AddN, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmFunc:\n (inputIds:

Uint8Array, inputIdsLen: number, dtype: number, outId: number) =>\n void;\n\nfunction setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(AddN, null /* void */, [\n 'array', // input_ids\n 'number', // input_ids.length\n 'number', // dtype\n 'number', // out_id\n]);\n}\n\nfunction addn(args: {inputs: TensorInfo[], backend: BackendWasm}) {\n const {inputs,
backend} = args;\n const out = backend.makeOutput(inputs[0].shape, inputs[0].dtype);\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n const inputIds = inputs.map(x => backend.dataIdMap.get(x.dataId).id);\n const inputIdsBytes = new Uint8Array(new Int32Array(inputIds).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(inputIdsBytes, inputIds.length, CppDType[out.dtype], outId);\n\n return out;\n}\n\nexport const addNConfig: KernelConfig = {\n kernelName: AddN,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: addn as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed
to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function identity(args: {inputs: IdentityInputs, backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const inVals = backend.typedArrayFromHeap(x);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const identityConfig: KernelConfig = {\n kernelName: Identity,\n backendName: 'wasm',\n
kernelFunc: identity as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {identity} from './Identity';\nimport {CppDType}
from './types';\n\nlet wasmTranspose: (\n xId: number, xShape: Uint8Array, xShapeLength: number, dtype: CppDType,\n outId: number, perm: Uint8Array, permLength: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTranspose = backend.wasm.cwrap(Transpose, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // dtype\n 'number', // outId\n 'array', // perm\n 'number', // perm.length\n]);\n}\n\nexport function transpose(\n args:\n {inputs: TransposeInputs, backend: BackendWasm, attrs: TransposeAttrs}):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n // Reduce any dimensions with size one. Lower-rank transpose kernel performs\n // better due to simpler memory access pattern.\n const [reducedShape, perm] = removeOneSizeDims(inputs.x.shape, attrs.perm);\n\n let permIsNoOp = true;\n for (let i = 0; i < perm.length; i++) {\n if (perm[i] !== i) {\n permIsNoOp
= false;\n }\n }\n const outShape = computeOutShape(inputs.x.shape, attrs.perm);\n const x = {\n dataId: inputs.x.dataId,\n shape: reducedShape,\n dtype: inputs.x.dtype\n };\n\n if (permIsNoOp) {\n const cloned = identity({inputs, backend});\n cloned.shape = outShape;\n return cloned;\n }\n\n const out = backend.makeOutput(outShape, x.dtype);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const outId =

backend.dataIdMap.get(out.dataId).id;\n const permBytes = new Uint8Array(new Int32Array(perm).buffer);\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n wasmTranspose(\n   xId, xShapeBytes, x.shape.length, CppDType[x.dtype], outId, permBytes,\n   perm.length);\n return out;\n}\n\nfunction computeOutShape(inShape: number[], perm: number[]): number[] {\n const outShape = new Array(inShape.length);\n for (let i = 0; i < outShape.length; i++) {\n   outShape[i] = inShape[perm[i]];\n }\n return outShape;\n}\n\nfunction
 removeOneSizeDims(\n   shape: number[], perm: number[]): [number[], number[]] {\n const newShape: number[] = [];\n const newPerm: number[] = [];\n for (let i = 0; i < shape.length; ++i) {\n   if (shape[i] !== 1) {\n newShape.push(shape[i]);\n   }\n   if (shape[perm[i]] !== 1) {\n   newPerm.push(perm[i]);\n   }\n }\n for (let i = 0; i < newPerm.length; ++i) {\n   let minValIdx = -1;\n   for (let j = 0; j < newPerm.length; ++j) {\n   if (newPerm[j] >= i &&\n   (minValIdx === -1 || newPerm[minValIdx] > newPerm[j])) {\n   minValIdx = j;\n }\n   }\n   newPerm[minValIdx] = i;\n }\n return [newShape, newPerm];\n}\n\nexport const transposeConfig: KernelConfig = {\n kernelName: Transpose,\n backendName: 'wasm',\n kernelFunc: transpose as {} as KernelFunc,\n setupFunc: setup,\n};\n","/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {backend_util, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {transpose} from './Transpose';\n\n/**\n * Compute permutation axes and do a transpose if necessary.\n *\n * Used by reduction ops.\n * @param x input TensorInfo\n * @param axis reduction axes\n * @param backend wasm backend instance\n */\nexport function permuteAxesAndTranspose(\n   x: TensorInfo, axis: number|number[],
 backend: BackendWasm): {\n transposed: TensorInfo|null,\n axes: number[],\n originalAxes: number[],\n inputWasTransposed: boolean\n} {\n const xShape = x.shape;\n const xRank = x.shape.length;\n\n const originalAxes = util.parseAxisParam(axis, xShape);\n let axes = originalAxes;\n const permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n let xTransposed = null;\n let inputWasTransposed = false;\n if (permutedAxes != null) {\n   const newShape: number[] = new Array(xRank);\n   for (let i = 0; i < newShape.length; i++) {\n   newShape[i] = xShape[permutedAxes[i]];\n   }\n\n   axes = backend_util.getInnerMostAxes(axes.length, xRank);\n   xTransposed =\n   transpose({inputs: {x}, attrs: {perm: permutedAxes}, backend});\n\n   const xId = backend.dataIdMap.get(x.dataId).id;\n   const transposedId = backend.dataIdMap.get(xTransposed.dataId).id;\n   if (transposedId !== xId) {\n   inputWasTransposed = true;\n }\n }\n\n return {transposed:
 xTransposed, originalAxes, axes, inputWasTransposed};\n}\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
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==\n
*/\n\nimport {All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\n\nlet

wasmAll: (xId: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmAll = backend.wasm.cwrap(All, null /*void*/, ['number, number, number']);\n}\n\nfunction all(args: {backend: BackendWasm, inputs: AllInputs, attrs: AllAttrs}):\n   TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n   const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   input = transposed;\n   inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('all', axes, inputRank);\n const [outShape, reduceShape] =\n   backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n   wasmAll(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n return out;\n}\n\nexport const allConfig: KernelConfig = {\n kernelName: All,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: all as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n
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 attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n   const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   input = transposed;\n   inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('any', axes, inputRank);\n const [outShape, reduceShape] =\n   backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n   wasmAny(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n
  }\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n return out;\n}\n\nexport const anyConfig: KernelConfig = {\n kernelName: Any,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: any as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed

on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n
 * ==\n */\n\nimport {ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmFunc: (\n   xId: number, dtype: number, outerSize: number, innerSize: number,\n   outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n   'number', // x_id\n   'number', // dtype\n   'number', // outer_size\n   'number', // inner_size\n   'number'   // out_id\n]);\n}\n\nfunction argmax(\n   args: {inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs}) {\n const {backend, inputs, attrs} = args;\n const {axis} = attrs as {} as ArgMaxAttrs;\n const {x} = inputs as {} as ArgMaxInputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId
 = xId;\n let input = x;\n\n const {transposed, axes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n   const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   if (transposedId !== xId) {\n   // transpose was not a no-op. We will need to dispose of this\n   // once we are done.\n   input = transposed;\n   inputId = transposedId;\n   }\n }\n\n const outShape = input.shape.slice(0, -1);\n const out = backend.makeOutput(outShape, 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const outerSize = util.sizeFromShape(out.shape);\n const innerSize = input.shape[axes[0]];\n wasmFunc(inputId, CppDType[input.dtype], outerSize, innerSize, outId);\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n return out;\n}\n\nexport const argMaxConfig: KernelConfig = {\n kernelName: ArgMax,\n backendName: 'wasm',\n
  kernelFunc: argmax as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n */\n\nimport {AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmAvgPool: (\n   xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n   filterHeight: number, filterWidth: number, padTop: number, padRight: number,\n   padBottom: number, padLeft: number, strideHeight: number,\n   strideWidth: number, channels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmAvgPool = backend.wasm.cwrap(AvgPool, null /* void */, [\n   'number', // xId\n   'number', // batchSize\n   'number', // inputHeight\n   'number', // inputWidth\n   'number', // filterHeight\n   'number', // filterWidth\n   'number', // padTop\n   'number', // padRight\n   'number', // padBottom\n   'number', // padLeft\n   'number', // strideHeight\n   'number', // strideWidth\n   'number', // channels\n   'number', // outId\n]);\n}\n\nfunction avgPool(\n   args: {inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs}) {\n const {inputs, attrs, backend} = args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n
  const {filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo =
      backend_util.computePool2DInfo(\n   x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const channels = convInfo.inChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n

```
 throw new Error(\n      `wasm backend does not support dataFormat:` +\n      `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n  }\n\n  if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n    throw new Error(\n      `was backend only supports average pooling with dilation = [1, 1], ` +\n
      `got [${convInfo.dilationHeight}, ${convInfo.dilationWidth}].`);\n  }\n\n  const out = backend.makeOutput(convInfo.outShape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmAvgPool(\n      xId, x.shape[0], x.shape[1], x.shape[2], filterHeight, filterWidth,\n      padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels,\n      outId);\n  return out;\n}\n\nexport const avgPoolConfig: KernelConfig = {\n  kernelName: AvgPool,\n  backendName: 'wasm',\n  setupFunc: setup,\n kernelFunc: avgPool as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
 on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==========================================================================\n */\n\nimport {KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function reshape(\n    args: {inputs: ReshapeInputs, attrs: ReshapeAttrs, backend: BackendWasm}) {\n  const {inputs, attrs} = args;\n  const {x} = inputs;\n  const {shape} = attrs;\n\n  const xSize = util.sizeFromShape(x.shape);\n  const $shape = util.inferFromImplicitShape(shape, xSize);\n\n  util.assert(\n      xSize === util.sizeFromShape($shape),\n      () => `new shape: ${$shape}, old shape: ${x.shape}. New shape and old ` +\n          `shape must have the same number of elements.`);\n\n  // Backend needs to track refCount
 for the dataId for reshape op\n  args.backend.incRef(x.dataId);\n  return {dataId: x.dataId, shape: $shape, dtype: x.dtype};\n}\n\nexport const reshapeConfig: KernelConfig = {\n  kernelName: Reshape,\n  backendName: 'wasm',\n kernelFunc: reshape as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==========================================================================\n */\n\nimport
 {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from './Reshape';\n\nlet wasmBatchMatMul: (\n    aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n    bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n    transposeB: boolean, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul, null /* void */, [\n    'number',  // a_id\n    'array',   // a_shape\n    'number',  // a_shape.length\n    'number',  // b_id\n    'array',   // b_shape\n    'number',  // b_shape.length\n    'number',  // transpose_a\n    'number',  // transpose_b\n    'number'   // out_id\n  ]);\n}\n\nfunction batchMatMul(args: {\n  inputs: BatchMatMulInputs,\n  backend: BackendWasm,\n  attrs: BatchMatMulAttrs\n}) {\n  const {inputs, backend, attrs} = args;\n  const {a, b} = inputs;\n  const
 {transposeA, transposeB} = attrs;\n\n  if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n    throw new Error(\n        `BatchMatMul for non non-float32 tensors not yet supported.`);\n  }\n\n  const aRank = a.shape.length;\n  const bRank = b.shape.length;\n\n  const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];\n  const
```

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innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];\n\n  const outerShapeA = transposeA ? a.shape[aRank - 1] : a.shape[aRank - 2];\n  const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank - 1];\n\n  const outerDimsA = a.shape.slice(0, -2);\n  const outerDimsB = b.shape.slice(0, -2);\n\n  const batchDimA = util.sizeFromShape(outerDimsA);\n  const batchDimB = util.sizeFromShape(outerDimsB);\n\n  const batchDimsCompatible =\n      batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;\n\n  util.assert(\n      aRank >= 2 && bRank >= 2 && batchDimsCompatible,\n      () => `Error in matMul: the input batch dimensions
 must either be the ` +\n          `same or at least one input batch dimension must be 1. Got input ` +\n          `batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);\n\n  const outShapeOuterDims =\n      batchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);\n  const outShape = outShapeOuterDims.concat([outerShapeA, outerShapeB]);\n\n  util.assert(\n      innerShapeA === innerShapeB,\n      () => `Error in matMul: inner shapes (${innerShapeA}) and (` +\n          `${innerShapeB}) of Tensors with shapes ${a.shape} and ` +\n          `${b.shape} and transposeA=${transposeA}` +\n          ` and transposeB=${transposeB} must match.`);\n\n  const a3dShape = transposeA ? [batchDimA, innerShapeA, outerShapeA] :\n      [batchDimA, outerShapeA, innerShapeA];\n  const b3dShape = transposeB ? [batchDimB, outerShapeB, innerShapeB] :\n                                [batchDimB, innerShapeB, outerShapeB];\n\n  // The rest of the implementation is
 designed to operate on rank-3 tensors\n  const a3d = reshape({inputs: {x: a}, backend, attrs: {shape: a3dShape}});\n  const b3d = reshape({inputs: {x: b}, backend, attrs: {shape: b3dShape}});\n\n  const a3dId = backend.dataIdMap.get(a3d.dataId).id;\n  const b3dId = backend.dataIdMap.get(b3d.dataId).id;\n\n  const leftDim = transposeA ? a3d.shape[2] : a3d.shape[1];\n  const rightDim = transposeB ? b3d.shape[1] : b3d.shape[2];\n  const batchDim = Math.max(batchDimA, batchDimB);\n\n  const out = backend.makeOutput([batchDim, leftDim, rightDim], a3d.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  const aShapeBytes = new Uint8Array(new Int32Array(a3d.shape).buffer);\n  const bShapeBytes = new Uint8Array(new Int32Array(b3d.shape).buffer);\n\n  wasmBatchMatMul(\n      a3dId, aShapeBytes, a3d.shape.length, b3dId, bShapeBytes,\n      b3d.shape.length, transposeA, transposeB, outId);\n\n  backend.disposeData(a3d.dataId);\n  backend.disposeData(b3d.dataId);\n\n  out.shape =
 outShape;\n  return out;\n}\n\nexport const batchMatMulConfig: KernelConfig = {\n  kernelName: BatchMatMul,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: batchMatMul as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\nimport { backend_util, util } from '@tensorflow/tfjs-core';\nexport function
 concatImpl(inputs, outShape, dtype, simplyConcat) {\n    const outVals = util.getArrayFromDType(dtype, util.sizeFromShape(outShape));\n    if (simplyConcat && dtype !== 'string') {\n        // Use built-in TypedArray.set() method for speed.\n        let offset = 0;\n        inputs.forEach(input => {\n            const size = util.sizeFromShape(input.shape);\n            outVals.set(input.vals, offset);\n            offset += size;\n        });\n    }\n    else {\n        let colOffset = 0;\n        inputs.forEach(input => {\n            const decodedData = dtype === 'string' ?\n                backend_util.fromUint8ToStringArray(input.vals) :\n                input.vals;\n            let tIdx = 0;\n            for (let row = 0; row < input.shape[0]; ++row) {\n                const resIdx = row * outShape[1] + colOffset;\n                for (let col = 0; col < input.shape[1]; ++col) {\n                    outVals[resIdx + col] = decodedData[tIdx++];\n                }\n
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}\n colOffset += input.shape[1];\n });\n }\n return outVals;\n}\n//# sourceMappingURL=data:application/json; base64,eyJ2ZXJzaW9uIjozLCJmaWxlIjoiQ29uY2F0X2ltcGwuanMiLCJzb3VyY2VSb290IjoiIiwic291cmNlcyI6WyIuLi8uLi8uLi8uLi8uLi8uLi90ZmpzLWJhY2tlbmQtY3B1L3NyYy9rZXJuZWxzL0NvbmNhdF9pbXBsLnRzIl0sIm5hbWVzIjpbXSwibWFwcGluZ3MiOiJBQUFBOzs7Ozs7Ozs7Ozs7R0FlRztBQUVILE9BQU8sRUFBRSxNQUFNLEVBQUUsTUFBTSxFQUFFLE1BQU0sRUAFBQyxxZQUFZLEVBQXVDLDQUFFLFlBQVksRUFBRSxNQUFNLEVBQUUsTUFBTSxFQUFFLE1BQU0sRUAFBQyxxZQUFZLEVBQXVDLDQUFFLFlBQVksRUFBRSxNQUFNLEVBQUUsTUFBTSxFQUFFLE1BQU0sRUAFBQyxxZQUFZLEVBQXVDLDQUFFLFlBQVksRUFBRSxNQUFNLEVBQUUsTUFBTSxFQUFFLE1BQU0sEAFBQyxxZQUFZLEVBQXVDLDQUFFLFlBQVksRUFBRSxNQUFNLEVBQUUsTUFBTSxFQUFFLE1BQU0sEAFBQyxxZQUFZLEVBQXVDLDQUFFLFlBQVksRUFBRSxNQUFNLEVBQUUsTUFBTSxFQUFFLE1BQU0sEAFBQyxxZQUFZLEVBQXVDLDQUFFLFlBQVksRUFBRSxNQUFNLEVBQUUsTUFBTSxFQUFFLE1BQU0sEAFBQyxxZQUFZLEVBQXVDLDQUFFLFlBQVksRUFBRSxNQUFNLEVBQUUsTUFBTSxFQUFFLE1BQU0sEAFBQyxxZQUFZLEVBQXVDLDQUFFLFlBQVksRUFBRSxNQUFNLEVBQUUsTUFBTSxFQUFFLE1BQU0sEAFBQyxxZQUFZLEVBQXVDLDQUFFLFlBQVksRUFBRSxNQUFNLEVBQUUsTUFBTSxEAFBQyxxZQUFZLEVBQXVDLDQUFFLFlBQVksRUFBRSxNQUFNLEVBQUE="

9KTtcbiAgfSBlbHNlIHtcbiAgICBsZXQgY29sT2Zmc2V0ID0gMDtcblxuICAgIGlucHV0cy5mb3JFYWNoKGluc
HV0ID0+IHtcbiAgICAgIGNvbnN0IGRlY29kZWREYXRhID0gZHR5cGUgPT09ICdzdHJpbmcnID9cbiAgICAgI
CAgICBiYWNrZW5kX3V0aWwuZnJvbVVpbnQ4VG9TdHJpbmdBcnJheShpbnB1dC52YWxzIGFzIFVpbnQ4QX
JyYXlbXSkgOlxuICAgICAgICAgICAgICAgIGlucHV0LnZhbHMgYXMgVHlwZWRBcnJheTtcblxuICAgICAgICAgI
HggPSAwO1xuXG4gICAgICBmb3IgKGxldCByb3cgPSAwOyByb3cgPCBpbnB1dC5zaGFwZVswXTsgKytyb3cp
IHtcbiAgICAgICAgY29uc3QgcmVzSWR4ID0gcm93ICogbV0gKyBjb2xdICogaW5wdXRbaWR4ICsgY
gICAgICAgICAgICAgICAg

SBleGNlcHQgaW4gY29tcGxpYW5jZSB3aXRoIHRoZSBMaWNlbnNlLlxuICogWW91IG1heSBvYnRhaW4gYSBjb3B5IG9mIHRoZSBMaWNlbnNlIGF0XG4gKlxuICogaHR0cDovL3d3dy5hcGFjaGUub3JnL2xpY2Vuc2VzL0xJQ0VOU0UtMi4wXG4gKlxuICogVW5sZXNzIHJlcXVpcmVkIGJ5IGFwcGxpY2FibGUgbGF3IG9yIGFncmVlZCB0byBpbiB3cml0aW5nLCBzb2Z0d2FyZVxuICogZGlzdHJpYnV0ZWQgdW5kZXIgdGhlIExpY2Vuc2UgaXMgZGlzdHJpYnV0ZWQgb24gYW4gXCJBUyBJUyBCQVNJUyxcbiAqIFdJVEhPVVQgV0FSUkFOVElFUyBPUiBDT05ESVRJT05TIE9GIEFOWSBLSU5EIiwgZWl0aGVyIGV4cHJlc3Mgb3IgaW1wbGllZC5cbiAqIFNlZSB0aGUgTGljZW5zZSBmb3IgdGhlIHNwZWNpZmljIGxhbmd1YWdlIGdvdmVybmluZyBwZXJtaXNzaW9uc1xuICogYW5kIGxpbWl0YXRpb25zIHVuZGVyIHRoZSBMaWNlbnNlLlxuICogPT09PT09PT09P

backend.makeTensorInfo($size, x.dtype, outVals);\n}\nexport const sliceConfig = {\n kernelName: Slice,\n backendName: 'cpu',\n kernelFunc: slice\n};\n//#
sourceMappingURL=data:application/json; base64,eyJ2ZXJzaW9uIjozLCJmaWxlIjoiU2xpY2UuanMiLCJzb3VyY2VSb290IjoiIiwic291cmNlcyI6WyIuLi8uLi8uLi8uLi8uLi8uLi90ZmpzLWJhY2tlbmQtY3B1L3NyYy9rZXJuZWxzL1NsaWNlLnRzIl0sIm5hbWVzIjpbXSwibWFwcGluZ3MiOiJBQUFBOzs7Ozs7Ozs7Ozs7R0FlRztBQU8sRUFBQyxXQUFVLElBQUk7QUFBQyxJQUFBLElBQUksQ0FBQyxPQUFPLEdBQUcsSUFBSSxDQUFDLE9BQU8sQ0FBQyxFQUFFLENBQUMsQ0FBQyxDQUFDLENBQUMsQ0FBQyxDQUFDLENBQUMsQ0FBQyxDQUFD

ogVW5sZXNzIHJlcXVpcmVkIGJ5IGFwcGxpY2FibGUgbGF3IG9yIGFncmVlZCB0byBpbiB3cml0aW5nLCBzb2Z0d2FyZVxuICogZGlzdHJpYnV0ZWQgdW5kZXIgdGhlIExpY2Vuc2UgaXMgZGlzdHJpYnV0ZWQgb24gYW4gXCJBUyBJUyBBU1wiIEJBU0lTLFxuICogV0lUSE9VVCBXQVJSQU5USUVTIE9SIENPTkRJVElPTlMgT0YgQU5ZIEtJTkQsIGVpdGhlciBleHBsaWNpdCBvciBpbXBsaWVkLiBTZWUgdGhlIExpY2Vuc2UgZm9yIHRoZSBzcGVjaWZpYyBsYW5ndWFnZSBnb3Zlcm5pbmcgcGVybWlzc2lvbnMgYW5kIGxpbWl0YXRpb25zIHVuZGVyIHRoZSBMaWNlbnNlLiBcbiAqL1xuXG4vKiogQGxpY2Vuc2UgUmVhY3QgdjE2LjEzLjEgKGNyZWF0ZWQgYnkgSW52aWRpZ2F0b3IsIExMQykgTUlUIEBsaWNlbnNlIGh0dHBzOi8vcmF3LmdpdGh1YnVzZXJjb250ZW50LmNvbS9mYWNlYm9vay9yZWFjdC92MTYuMTMuMS9MSUNFTlNFIFxuICovXG5cbi8qKiBAbGljZW5zZSBSZWFjdCB2MTYuMTMuMSBodHRwczovL3JhdyBnaXRodWIgdXNlcmNvbnRlbnQgY29tL2ZhY2Vib29rL3JlYWN0L3YxNi4xMy4xL0xJQ0VOU0UgXG4gKiBDb3B5cmlnaHQgKGMpIEZhY2Vib29rLCBJbmMuIEFsbCBSaWdodHMgUmVzZXJ2ZWQuXG4gKlxuICogVGhpcyBzb3VyY2UgY29kZSBpcyBsaWNlbnNlZCB1bmRlciB0aGUgTUlUIGxpY2Vuc2UgZm91bmQgaW4gdGhlXG4gKiBMSUNFTlNFIGZpbGUgaW4gdGhpcyBzb3VyY2UgdHJlZS5cbiAqXG4gKiBAZW1haWwgcmVhY3QtY29yZUBmYWNlYm9vay5jb20gXG4gKlxuICogQGZsb3cgc3RyaWN0XG4gKiBAcHJvdmlkZXNNb2R1bGUgUmVhY3RcbiAqL1xuXG4vKiogQGxpY2Vuc2UgUmVhY3QgdjE2LjEzLjEgKGNyZWF0ZWQgYnkgSW52aWRpZ2F0b3IsIExMQykgTUlUIEBsaWNlbnNlIGh0dHBzOi8vcmF3LmdpdGh1YnVzZXJjb250ZW50LmNvbS9mYWNlYm9vay9yZWFjdC92MTYuMTMuMS9MSUNFTlNFIFxuICovXG5cbi8qKiBAbGljZW5zZSBSZWFjdCB2MTYuMTMuMSBodHRwczovL3JhdyBnaXRodWIgdXNlcmNvbnRlbnQgY29tL2ZhY2Vib29rL3JlYWN0L3YxNi4xMy4xL0xJQ0VOU0UgXG4gKlxuICogQGZsb3cgc3RyaWN0XG4gKiBAcHJvdmlkZXNNb2R1bGUgUmVhY3RcbiAqL1xuXG4vKiogQGxpY2Vuc2UgUmVhY3QgdjE2LjEzLjEgKGNyZWF0ZWQgYnkgSW52aWRpZ2F0b3IsIExMQykgTUlUIEBsaWNlbnNlIGh0dHBzOi8vcmF3LmdpdGh1YnVzZXJjb250ZW50LmNvbS9mYWNlYm9vay9yZWFjdC92MTYuMTMuMS9MSUNFTlNFIFxuICovXG5cbi8qKiBAbGljZW5zZSBSZWFjdCB2MTYuMTMuMSBodHRwczovL3JhdyBnaXRodWIgdXNlcmNvbnRlbnQgY29tL2ZhY2Vib29rL3JlYWN0L3YxNi4xMy4xL0xJQ0VOU0UgXG4gKlxuICogQGZsb3cgc3RyaWN0XG4gKiBAcHJvdmlkZXNNb2R1bGUgUmVhY3RcbiAqL1xuXG4vKiogQGxpY2Vuc2UgUmVhY3QgdjE2LjEzLjEgKGNyZWF0ZWQgYnkgSW52aWRpZ2F0b3IsIExMQykgTUlUIEBsaWNlbnNlIGh0dHBzOi8vcmF3LmdpdGh1YnVzZXJjb250ZW50LmNvbS9mYWNlYm9vay9yZWFjdC92MTYuMTMuMS9MSUNFTlNFIFxuICovXG5cbi8qKiBAbGljZW5zZSBSZWFjdCB2MTYuMTMuMSBodHRwczovL3JhdyBnaXRodWIgdXNlcmNvbnRlbnQgY29tL2ZhY2Vib29rL3JlYWN0L3YxNi4xMy4xL0xJQ0VOU0UgXG4gKlxuICogQGZsb3cgc3RyaWN0XG4gKiBAcHJvdmlkZXNNb2R1bGUgUmVhY3RcbiAqL1xuXG4vKiogQGxpY2Vuc2UgUmVhY3QgdjE2LjEzLjEgKGNyZWF0ZWQgYnkgSW52aWRpZ2F0b3IsIExMQykgTUlUIEBsaWNlbnNlIGh0dHBzOi8vcmF3LmdpdGh1YnVzZXJjb250ZW50LmNvbS9mYWNlYm9vay9yZWFjdC92MTYuMTMuMS9MSUNFTlNFIFxuICovXG5cbi8qKiBAbGljZW5zZSBSZWFjdCB2MTYuMTMuMSBodHRwczovL3JhdyBnaXRodWIgdXNlcmNvbnRlbnQgY29tL2ZhY2Vib29rL3JlYWN0L3YxNi4xMy4xL0xJQ0VOU0UgXG4gKlxuICogQGZsb3cgc3RyaWN0XG4gKiBAcHJvdmlkZXNNb2R1bGUgUmVhY3RcbiAqL1xuXG4vKiogQGxpY2Vuc2UgUmVhY3QgdjE2LjEzLjEgKGNyZWF0ZWQgYnkgSW52aWRpZ2F0b3IsIExMQykgTUlUIEBsaWNlbnNlIGh0dHBzOi8vcmF3LmdpdGh1YnVzZXJjb250ZW50LmNvbS9mYWNlYm9vay9yZWFjdC92MTYuMTMuMS9MSUNFTlNFIFxuICovXG

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==========\n*/\n\nimport {backend_util, KernelConfig, KernelFunc, Slice, slice_util, SliceAttrs, SliceInputs, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {sliceImplCPU} from '../kernel_utils/shared';\n\nexport function slice(\n  args: {inputs: SliceInputs, attrs: SliceAttrs, backend: BackendWasm}) {\n  const {inputs: {x}, attrs: {begin, size}, backend} = args;\n\n  const [begin_, size_] = slice_util.parseSliceParams(x, begin, size);\n\n  const isContinous = slice_util.isSliceContinous(x.shape, begin_, size_);\n  const xVals = backend.readSync(x.dataId);\n  const out = backend.makeOutput(size_, x.dtype);\n  const xStrides = util.computeStrides(x.shape);\n  const outData = backend.dataIdMap.get(out.dataId);\n\n  if (isContinous) {\n    const flatOffset = slice_util.computeFlatOffset(begin_, xStrides);\n\n    if (x.dtype === 'string') {\n      outData.stringBytes =\n          (xVals as Uint8Array[])\n              .slice(flatOffset, flatOffset + util.sizeFromShape(size_));\n    } else {\n      const outVals = backend.typedArrayFromHeap(out);\n      outVals.set(\n          (xVals as TypedArray)\n              .subarray(flatOffset, flatOffset + util.sizeFromShape(size_)));\n    }\n\n    return out;\n  }\n\n  if (x.dtype === 'string') {\n    const res = sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype);\n    outData.stringBytes = res as Uint8Array[];\n    return out;\n  }\n\n  const outVals = backend.typedArrayFromHeap(out);\n  const rank = x.shape.length;\n  if (rank === 2) {\n    slice2d(\n        xVals as TypedArray, xStrides[0], outVals, begin_ as [number, number],\n        size_ as [number, number]);\n  } else if (rank === 3) {\n    slice3d(\n        xVals as TypedArray, xStrides[0], xStrides[1], outVals,\n        begin_ as [number, number, number], size_ as [number, number, number]);\n  } else if (rank === 4) {\n    slice4d(\n        xVals as TypedArray, xStrides[0], xStrides[1], xStrides[2], outVals,\n        begin_ as [number, number, number, number],\n        size_ as [number, number, number, number]);\n  } else {\n    const res =\n        sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype) as TypedArray;\n    outVals.set(res);\n  }\n\n  return out;\n}\n\nfunction slice2d(\n    xVals: backend_util.TypedArray, xStride: number,\n    outVals: backend_util.TypedArray, begin: [number, number],\n    size: [number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const endI = beginI + size[0];\n  for (let i = beginI; i < endI; i++) {\n    const xOffset = i * xStride + beginJ;\n    outVals.set(xVals.subarray(xOffset, xOffset + size[1]), outOffset);\n    outOffset += size[1];\n  }\n}\n\nfunction slice3d(\n    xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n    outVals: backend_util.TypedArray, begin: [number, number, number],\n    size: [number, number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const beginK = begin[2];\n  const endI = beginI + size[0];\n  const endJ = beginJ + size[1];\n  for (let i = beginI; i < endI; i++) {\n    for (let j = beginJ; j < endJ; j++) {\n      const xOffset = i * xStride1 + j * xStride2 + beginK;\n      outVals.set(xVals.subarray(xOffset, xOffset + size[2]), outOffset);\n      outOffset += size[2];\n    }\n  }\n}\n\nfunction slice4d(\n    xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n    xStride3: number, outVals: backend_util.TypedArray,\n    begin: [number, number, number, number],\n    size: [number, number, number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const beginK = begin[2];\n  const endI = beginI + size[0];\n  const endJ = beginJ + size[1];\n  const endK = beginK + size[2];\n  const beginL = begin[3];\n\n  for (let i = beginI; i < endI; i++) {\n    for (let j = beginJ; j < endJ; j++) {\n      for (let k = beginK; k < endK; k++) {\n        const xOffset = i * xStride1 + j * xStride2 + k * xStride3 + beginL;\n        outVals.set(xVals.subarray(xOffset, xOffset + size[3]), outOffset);\n        outOffset += size[3];\n      }\n    }\n  }\n}\n\nexport const sliceConfig: KernelConfig = {\n  kernelName: Slice,\n  backendName: 'wasm',\n  kernelFunc: slice as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed
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limitations under the License.\n *
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*/\n\nimport {backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from './Reshape';\nimport {slice} from './Slice';\nimport {transpose} from './Transpose';\n\nfunction batchToSpaceND(args: {\n inputs: BatchToSpaceNDInputs,\n backend: BackendWasm,\n attrs: BatchToSpaceNDAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {blockShape, crops} = attrs;\n\n const prod = blockShape.reduce((a, b) => a * b);\n\n const reshaped = backend_util.getReshaped(x.shape, blockShape, prod);\n const
 permuted = backend_util.getPermuted(reshaped.length, blockShape.length);\n const reshapedPermuted =\n backend_util.getReshapedPermuted(x.shape, blockShape, prod);\n const sliceBeginCoords =\n backend_util.getSliceBeginCoords(crops, blockShape.length);\n const sliceSize =\n backend_util.getSliceSize(reshapedPermuted, crops, blockShape.length);\n\n const xReshaped = reshape({inputs: {x}, backend, attrs: {shape: reshaped}});\n const xTransposed =\n   transpose({inputs: {x: xReshaped}, backend, attrs: {perm: permuted}});\n const xTransposedReshaped = reshape(\n   {inputs: {x: xTransposed}, backend, attrs: {shape: reshapedPermuted}});\n const result = slice({\n   inputs: {x: xTransposedReshaped},\n   backend,\n   attrs: {begin: sliceBeginCoords, size: sliceSize}\n });\n\n backend.disposeData(xReshaped.dataId);\n backend.disposeData(xTransposed.dataId);\n backend.disposeData(xReshaped.dataId);\n\n return result;\n}\n\nexport const batchToSpaceNDConfig: KernelConfig
 = {\n kernelName: BatchToSpaceND,\n backendName: 'wasm',\n kernelFunc: batchToSpaceND as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {TensorInfo} from '@tensorflow/tfjs-core';\n\nimport
 {BackendWasm} from '../backend_wasm';\n\nexport function cast(\n   args: {inputs: CastInputs, attrs: CastAttrs, backend: BackendWasm}):\n   TensorInfo {\n const {inputs: {x}, attrs: {dtype}, backend} = args;\n const out = backend.makeOutput(x.shape, dtype);\n const inVals = backend.typedArrayFromHeap(x);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const castConfig: KernelConfig = {\n kernelName: Cast,\n backendName: 'wasm',\n kernelFunc: cast as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\nimport {KernelConfig, Ceil} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable

law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ClipByValue, ClipByValueAttrs, ClipByValueInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmClip: (xId: number, min: number, max: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmClip = backend.wasm.cwrap(ClipByValue, null /* void */, [\n   'number', // x_id\n   'number', // min\n   'number', // max\n   'number'   // out_id\n]);\n}\n\nfunction clip(args: {\n inputs: ClipByValueInputs,\n backend: BackendWasm,\n attrs: ClipByValueAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {clipValueMin, clipValueMax} = attrs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmClip(xId, clipValueMin, clipValueMax, outId);\n return out;\n}\n\nexport const clipByValueConfig: KernelConfig = {\n kernelName: ClipByValue,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: clip as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {concatImplCPU} from '../kernel_utils/shared';\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\n\nexport function concat(\n   args: {inputs: ConcatInputs, backend: BackendWasm, attrs: ConcatAttrs}) {\n const {inputs, backend} = args;\n\n const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];\n\n let outShape = backend_util.computeOutShape(inputs.map(t => t.shape), axis);\n\n // Keep only non-empty tensors (ignore tensors with 0 in their shape).\n const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);\n if ($inputs.length === 1) {\n   return identity({inputs: {x: $inputs[0]}, backend});\n }\n\n const out = backend.makeOutput(outShape, inputs[0].dtype);\n\n if (util.sizeFromShape(outShape) === 0) {\n   return out;\n }\n\n const shapes = $inputs.map(t => t.shape);\n backend_util.assertParamsConsistent(shapes, axis);\n\n if ($inputs[0].dtype === 'string') {\n   // Any concat of n-dimensional tensors across any axis can be reduced to\n   // a concatenation of two-dimensional tensors across the axis 1 by first\n   // partitioning the axes of the original tensors into those less than the\n   // axis to be concatenated and the rest. Then reshape the tensors\n   // into a two-dimensional tensor by collapsing these two sets of axes and\n   // concatenate the resulting matrices across the axis 1, finally reshaping\n   // the result to have the proper shape.\n   const inputs2D = $inputs.map(t => {\n   const innerSize = util.sizeFromShape(t.shape.slice(axis));\n   const shape = [-1, innerSize];\n   return reshape({inputs: {x: t}, backend, attrs: {shape}});\n   });\n\n   const inputsValShapes = inputs2D.map(t => {\n   return {vals: backend.readSync(t.dataId), shape: t.shape};\n   });\n\n   // Concats 2d tensors along axis=1.\n   outShape =\n   backend_util.computeOutShape(inputs2D.map(t => t.shape), 1 /* axis */);\n   const simplyConcat = inputs2D[0].shape[0] === 1;\n   const outVals = concatImplCPU(\n   inputsValShapes, outShape, inputs[0].dtype,\n   simplyConcat) as string[];\n\n   const finalOutShape =\n   backend_util.computeOutShape($inputs.map(t => t.shape), axis);\n\n   out.shape = finalOutShape;\n   const outData = backend.dataIdMap.get(out.dataId);\n   outData.stringBytes =\n   backend_util.fromStringArrayToUint8(outVals);\n\n   inputs2D.forEach(t => backend.disposeData(t.dataId));\n\n

return out;\n }\n\n const batchDim = util.sizeFromShape($inputs[0].shape.slice(0, axis));\n let sumInnerDims = 0;\n const innerDims = $inputs.map(input => {\n   const innerDim = util.sizeFromShape(input.shape.slice(axis));\n   sumInnerDims += innerDim;\n   return innerDim;\n });\n const inVals = $inputs.map(input => backend.typedArrayFromHeap(input));\n
  const outVals = backend.typedArrayFromHeap(out);\n for (let b = 0; b < batchDim; b++) {\n   let outOffset = b * sumInnerDims;\n   for (let i = 0; i < inVals.length; i++) {\n   const innerDim = innerDims[i];\n   const inOffset = b * innerDim;\n   const vals = inVals[i].subarray(inOffset, inOffset + innerDim);\n   outVals.set(vals, outOffset);\n   outOffset += innerDim;\n   }\n }\n return out;\n}\n\nexport const concatConfig: KernelConfig = {\n kernelName: Concat,\n backendName: 'wasm',\n kernelFunc: concat as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is
 distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {backend_util, Conv2D, Conv2DAttrs, Conv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmConv2d: (\n   xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n   filterId: number, filterHeight: number, filterWidth: number, padTop: number,\n   padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n   dilationHeight: number, dilationWidth: number, strideHeight: number,\n   strideWidth: number, inputChannels: number, outputChannels: number,\n   outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmConv2d = backend.wasm.cwrap(Conv2D,
 null /* void */, [\n   'number', // xId\n   'number', // batchSize\n   'number', // inputHeight\n   'number', // inputWidth\n   'number', // filterId\n   'number', // filterHeight\n   'number', // filterWidth\n   'number', // padTop\n   'number', // padRight\n   'number', // padBottom\n   'number', // padLeft\n   'number', // isSamePad\n   'number', // dilationHeight\n   'number', // dilationWidth\n   'number', // strideHeight\n   'number', // strideWidth\n   'number', // inputChannels\n   'number', // outputChannels\n   'number', // outId\n]);\n}\n\nfunction conv2d(\n   args: {inputs: Conv2DInputs, backend: BackendWasm, attrs: Conv2DAttrs}) {\n const {inputs, attrs, backend} = args;\n\n const {x, filter} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const {strides, dilations, pad, dimRoundingMode, dataFormat} = attrs;\n const $dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n
  const convInfo = backend_util.computeConv2DInfo(\n   (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n   pad, dimRoundingMode, false, $dataFormat);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n   throw new Error(\n   `wasm backend Conv2D does not support dataFormat:` +\n   `${convInfo.dataFormat}'. Please
 use 'channelsLast'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmConv2d(\n   xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n   filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n   dilationHeight, dilationWidth, strideHeight, strideWidth, inputChannels,\n   outputChannels, outId);\n return out;\n}\n\nexport

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const conv2DConfig: KernelConfig = {\n  kernelName: Conv2D,\n  backendName: 'wasm',\n  setupFunc: setup,\n kernelFunc: conv2d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under
 the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmConv2DBackpropInput: (\n    dyId: number, filterId: number, batchSize: number, filterHeight: number,\n    filterWidth: number, inHeight: number, inWidth: number, inChannels: number,\n outHeight: number, outWidth: number, outChannels: number,\n    strideHeight: number, strideWidth: number, topPad: number, leftPad: number,\n    fltS0: number, fltS1: number, fltS2: number, xBatchStride: number,\n xRowStride: number, xColStride: number,
 xChannelStride: number,\n    yBatchStride: number, yRowStride: number, yColStride: number,\n    yChannelStride: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmConv2DBackpropInput = backend.wasm.cwrap(Conv2DBackpropInput, null, [\n    'number',  // dyId\n 'number',  // filterId\n    'number',  // batchSize\n    'number',  // filterHeight\n    'number',  // filterWidth\n    'number',  // inHeight\n    'number',  // inWidth\n    'number',  // inChannels\n    'number',  // outHeight\n    'number',  // outWidth\n    'number',  // outChannels\n    'number',  // strideHeight\n    'number',  // strideWidth\n    'number',  // topPad\n    'number',  // leftPad\n    'number',  // fltS0\n    'number',  // fltS1\n    'number',  // fltS2\n    'number',  // xBatchStride\n    'number',  // xRowStride\n    'number',  // xColStride\n    'number',  // xChannelStride\n    'number',  // yBatchStride\n    'number',  // yRowStride\n    'number',  // yColStride\n
 'number',  // yChannelStride\n    'number',  // outId\n  ]);\n}\n\nfunction conv2DBackpropInput(args: {\n  backend: BackendWasm,\n  inputs: Conv2DBackpropInputInputs,\n  attrs: Conv2DBackpropInputAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n  const {dy, filter} = inputs;\n  const {strides, pad, dataFormat, dimRoundingMode, inputShape} = attrs;\n\n  const dilations = 1;\n\n  const $dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n  const convInfo = backend_util.computeConv2DInfo(\n inputShape, filter.shape as [number, number, number, number], strides,\n      dilations, pad, dimRoundingMode, false /* depthwise */, $dataFormat);\n  const {\n    batchSize,\n    filterHeight,\n    filterWidth,\n    inChannels,\n inHeight,\n    inWidth,\n    outChannels,\n    outHeight,\n    outWidth,\n    strideHeight,\n    strideWidth\n  } = convInfo;\n\n  const topPad = filterHeight - 1 - convInfo.padInfo.top;\n  const leftPad = filterWidth - 1 - convInfo.padInfo.left;\n\n
  const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n  const dxStrides = util.computeStrides(convInfo.inShape);\n  const dyStrides = util.computeStrides(dy.shape);\n  const [fltS0, fltS1, fltS2] = util.computeStrides(filter.shape);\n  const xBatchStride = dxStrides[0];\n  const xRowStride = isChannelsLast ? dxStrides[1] : dxStrides[2];\n  const xColStride = isChannelsLast ? dxStrides[2] : 1;\n  const xChannelStride = isChannelsLast ? 1 : dxStrides[1];\n  const yBatchStride = dyStrides[0];\n  const yRowStride = isChannelsLast ? dyStrides[1] : dyStrides[2];\n  const yColStride = isChannelsLast ? dyStrides[2] : 1;\n  const yChannelStride = isChannelsLast ? 1 : dyStrides[1];\n\n  const out = backend.makeOutput(convInfo.inShape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const dyId = backend.dataIdMap.get(dy.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n wasmConv2DBackpropInput(\n      dyId, filterId, batchSize,
 filterHeight, filterWidth, inHeight, inWidth,\n      inChannels, outHeight, outWidth, outChannels, strideHeight, strideWidth,\n      topPad, leftPad, fltS0, fltS1, fltS2, xBatchStride, xRowStride,\n      xColStride, xChannelStride,
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yBatchStride, yRowStride, yColStride,\n yChannelStride, outId);\n return out;\n}\n\nexport const conv2DBackpropInputConfig: KernelConfig = {\n kernelName: Conv2DBackpropInput,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: conv2DBackpropInput as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {Cos, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const cosConfig: KernelConfig = createUnaryKernelConfig(Cos);\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the
specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {Cosh, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from './Cast';\n\n// Must match enum in CropAndResize.cc\nenum InterpolationMethod {\n bilinear = 0,\n nearest = 1\n}\n\nlet wasmCropAndResize: (\n imagesId: number, boxesId: number, boxIndId: number, numBoxes: number,\n imagesShape: Uint8Array, cropHeight: number, cropWidth: number,\n method: number, extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n 'number', // imagesId\n 'number', // boxesId\n 'number', // boxIndId\n 'number', // numBoxes\n 'array', // images shape\n 'number', // cropHeight\n 'number', // cropWidth\n 'number', // method\n
'number', // extrapolation value\n 'number' // out id\n]);\n}\n\nfunction cropAndResize(args: {\n backend: BackendWasm,\n inputs: CropAndResizeInputs,\n attrs: CropAndResizeAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {method, extrapolationValue, cropSize} = attrs;\n const {image, boxes, boxInd} = inputs;\n\n const numBoxes = boxes.shape[0];\n\n const [cropHeight, cropWidth] = cropSize as [number, number];\n const outShape = [numBoxes, cropHeight, cropWidth, image.shape[3]];\n\n let imagesData = backend.dataIdMap.get(image.dataId);\n let castedData;\n if (image.dtype !== 'float32') {\n castedData = cast({backend, inputs: {x: image}, attrs: {dtype: 'float32'}});\n imagesData = backend.dataIdMap.get(castedData.dataId);\n }\n\n const imagesId = imagesData.id;\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const boxIndId = backend.dataIdMap.get(boxInd.dataId).id;\n\n const

out = backend.makeOutput(outShape, 'float32');\n
const outId = backend.dataIdMap.get(out.dataId).id;\n\n const imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n\n wasmCropAndResize(\n imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n cropWidth,\n InterpolationMethod[method as {} as keyof typeof InterpolationMethod],\n extrapolationValue, outId);\n\n if (castedData != null) {\n backend.disposeData(castedData.dataId);\n }\n\n return out;\n}\n\nexport const cropAndResizeConfig: KernelConfig = {\n kernelName: CropAndResize,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: cropAndResize as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
/\n\nimport {backend_util, KernelConfig, KernelFunc, Cumsum, CumsumAttrs, CumsumInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nimport {transpose} from './Transpose';\n\nlet wasmCumsum: (xId: number, exclusive: number, reverse: number,\n finalDim: number, outId: number, dtype: CppDType) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmCumsum = backend.wasm.cwrap(Cumsum, null / void */, [\n 'number', // x_id\n 'number', // exclusive\n 'number', // reverse\n 'number', // final_dim\n
'number', // out_id\n 'number' // dtype\n]);\n}\n\nexport function cumsum(\n args: {inputs: CumsumInputs, backend: BackendWasm, attrs: CumsumAttrs}):\nTensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {axis, exclusive, reverse} = attrs;\n const xRank = x.shape.length;\n\n util.assert(x.dtype === 'float32' || x.dtype === 'int32',\n () => `cumsum does not support ${x.dtype} tensors in the WASM backend`);\n // permute required axis to inner most axis\n const permutation = backend_util.getAxesPermutation([axis], xRank);\n let permutedX = x;\n if (permutation !== null) {\n permutedX = transpose({inputs: {x}, attrs: {perm: permutation}, backend});\n }\n const permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];\n backend_util.assertAxesAreInnerMostDims('cumsum', [permutedAxis], xRank);\n\n const permutedOut = backend.makeOutput(permutedX.shape, permutedX.dtype);\n const finalDim = permutedX.shape[permutedAxis];\n const permutedXId
= backend.dataIdMap.get(permutedX.dataId).id;\n const permutedOutId = backend.dataIdMap.get(permutedOut.dataId).id;\n wasmCumsum(permutedXId, exclusive ? 1 : 0, reverse ? 1 : 0, finalDim,\n permutedOutId, CppDType[x.dtype]);\n\n // transpose data back if permuted\n let out = permutedOut;\n if (permutation !== null) {\n const undoPermutation = backend_util.getUndoAxesPermutation(permutation);\n out = transpose(\n {inputs: {x: permutedOut}, attrs: {perm: undoPermutation}, backend});\n backend.disposeData(permutedX.dataId);\n backend.disposeData(permutedOut.dataId);\n }\n return out;\n}\n\nexport const cumsumConfig: KernelConfig = {\n kernelName: Cumsum,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: cumsum as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo,

util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthToSpace: (\n xId: number, blockSize: number, channelsLast: number, xStrides: Uint8Array,\n xStridesLength: number, outputShape: Uint8Array, outputStrides: Uint8Array,\n outSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmDepthToSpace
= backend.wasm.cwrap(DepthToSpace, null /*void*/, [\n 'number', // xId\n 'number', // blockSize\n 'number', // channelsLast\n 'array', // xStrides\n 'number', // xStridesLength\n 'array', // outputShape\n 'array', // outputStrides\n 'number', // outSize\n 'number', // outId\n]);\n}\n\nexport function depthToSpace(args: {\n backend: BackendWasm,\n inputs: DepthToSpaceInputs,\n attrs: DepthToSpaceAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x} = inputs;\n const {blockSize, dataFormat} = attrs;\n\n const batchSize = x.shape[0];\n const inputHeight = (dataFormat === 'NHWC') ? x.shape[1] : x.shape[2];\n const inputWidth = (dataFormat === 'NHWC') ? x.shape[2] : x.shape[3];\n const inputDepth = (dataFormat === 'NHWC') ? x.shape[3] : x.shape[1];\n\n const outputHeight = inputHeight * blockSize;\n const outputWidth = inputWidth * blockSize;\n const outputDepth = inputDepth / (blockSize * blockSize);\n\n
const outputShape = (dataFormat === 'NHWC') ?\n [batchSize, outputHeight, outputWidth, outputDepth] :\n [batchSize, outputDepth, outputHeight, outputWidth];\n\n const out = backend.makeOutput(outputShape, 'float32');\n\n const xData = backend.dataIdMap.get(x.dataId);\n const xId = xData.id;\n const xStridesBytes =\n new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n\n const outputShapeBytes = new Uint8Array(new Int32Array(outputShape).buffer);\n const outStridesBytes =\n new Uint8Array(new Int32Array(util.computeStrides(outputShape)).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n const channelsLast = dataFormat === 'NHWC' ? 1 : 0;\n wasmDepthToSpace(\n xId, blockSize, channelsLast, xStridesBytes, x.shape.length - 1,\n outputShapeBytes, outStridesBytes, outputShape.length, outId);\n\n return out;\n}\n\nexport const depthToSpaceConfig: KernelConfig = {\n kernelName: DepthToSpace,\n backendName: 'wasm',\n
setupFunc: setup,\n kernelFunc: depthToSpace as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs, DepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'../backend_wasm';\n\nlet wasmDepthwiseConv2d: (\n xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number, padTop: number,\n padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n dilationHeight: number, dilationWidth: number, strideHeight: number,\n strideWidth: number, inputChannels: number, outputChannels: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmDepthwiseConv2d =\n backend.wasm.cwrap(DepthwiseConv2dNative, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number',
// dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n}\n\nfunction depthwiseConv2d(args: {\n inputs: DepthwiseConv2dNativeInputs,\n backend: BackendWasm,\n attrs: DepthwiseConv2dNativeAttrs\n}) {\n const {inputs, attrs, backend} = args;\n\n const {x, filter} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const

{strides, dilations, pad, dimRoundingMode} = attrs;\n\n const $dilations = dilations == null ? [1, 1] : dilations;\n\n const convInfo = backend_util.computeConv2DInfo(\n   (x as Tensor4D).shape, (filter as Tensor4D).shape, strides,\n   ($dilations as number | [number, number]), pad, dimRoundingMode,\n   true /* depthwise */);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth
 = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n   throw new Error(\n   `wasm backend DepthwiseConv2dNative does not support dataFormat:'` +\n   `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmDepthwiseConv2d(\n   xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n   filterWidth,
 padTop, padRight, padBottom, padLeft, isSamePad,\n   dilationHeight, dilationWidth, strideHeight, strideWidth, inputChannels,\n   outputChannels, outId);\n return out;\n}\n\nexport const depthwiseConv2dNativeConfig: KernelConfig = {\n kernelName: DepthwiseConv2dNative,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: depthwiseConv2d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations
 under the License.\n *
==\n */\nimport {Elu, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const eluConfig: KernelConfig = createUnaryKernelConfig(Elu);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\nimport {Equal, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const equalConfig: KernelConfig =\n createBinaryKernelConfig(Equal, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const expConfig: KernelConfig = createUnaryKernelConfig(Exp, 'float32');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version

2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs,
KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from './Reshape';\n\nexport function expandDims(args: {\n inputs: ExpandDimsInputs,\n attrs: ExpandDimsAttrs,\n backend: BackendWasm\n}) {\n const {inputs, attrs, backend} = args;\n const {input} = inputs;\n const {dim} = attrs;\n\n const inputRank = input.shape.length;\n const newShape = input.shape.slice();\n let $dim = dim;\n if (dim < 0) {\n // Negative value is counted from the tail of rank.\n util.assert(\n -(inputRank + 1) <= dim,\n () => `Axis must be in the interval [${- (inputRank + 1)}, ${\n inputRank}]`);\n $dim = inputRank + dim + 1;\n }\n newShape.splice($dim, 0, 1);\n\n return reshape({inputs: {x: input}, backend, attrs: {shape: newShape}});\n}\n\nexport const expandDimsConfig: KernelConfig = {\n kernelName: ExpandDims,\n backendName: 'wasm',\n kernelFunc: expandDims as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {Fill, FillAttrs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function fill(args: {attrs: FillAttrs, backend: BackendWasm}) {\n const {attrs: {shape,
value, dtype}, backend} = args;\n const out = backend.makeOutput(shape, dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(value as number);\n return out;\n}\n\nexport const fillConfig: KernelConfig = {\n kernelName: Fill,\n backendName: 'wasm',\n kernelFunc: fill as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {FlipLeftRight, FlipLeftRightInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFlipLeftRight: (\n xId: number, batch: number, imageHeight: number, imageWidth: number,\n numChannels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmFlipLeftRight = backend.wasm.cwrap(FlipLeftRight, null /* void */, [\n 'number', // xId\n 'number', // batch\n 'number', // imageHeight\n 'number', // imageWidth\n 'number', // numChannels\n 'number', // outId\n]);\n}\n\nexport function flipLeftRight(\n args: {inputs: FlipLeftRightInputs, backend: BackendWasm}): TensorInfo {\n const {inputs, backend} = args;\n const {image} = inputs;\n\n const out = backend.makeOutput(image.shape, image.dtype);\n const imageId = backend.dataIdMap.get(image.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n\n wasmFlipLeftRight(\n imageId, batch, imageHeight, imageWidth, numChannels, outId);\n return out;\n}\n\nexport const flipLeftRightConfig:

KernelConfig = {\n kernelName: FlipLeftRight,\n backendName: 'wasm',\n kernelFunc: flipLeftRight as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the
 License.\n *
==\n */\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const floorDivConfig: KernelConfig =\n createBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmBatchNorm: (\n   xId: number, meanId: number, varianceId: number, offsetId: number,\n   scaleId: number, varianceEpsilon: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmBatchNorm = backend.wasm.cwrap(\n   FusedBatchNorm, null /* void */,\n   ['number', 'number', 'number', 'number', 'number', 'number', 'number']);\n}\n\nfunction fusedBatchNorm(args: {\n backend: BackendWasm,\n inputs: FusedBatchNormInputs,\n attrs: FusedBatchNormAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {varianceEpsilon} = attrs;\n const {x, mean, variance, offset, scale} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const meanId = backend.dataIdMap.get(mean.dataId).id;\n const varianceId = backend.dataIdMap.get(variance.dataId).id;\n const offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n const scaleId = scale != null ? backend.dataIdMap.get(scale.dataId).id : 0;\n\n const out = backend.makeOutput(x.shape, x.dtype);\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(x.shape) === 0) {\n   return out;\n }\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmBatchNorm(\n   xId, meanId, varianceId, offsetId, scaleId, varianceEpsilon, outId);\n return out;\n}\n\nexport const fusedBatchNormConfig: KernelConfig = {\n kernelName: FusedBatchNorm,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchNorm as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n

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=============================================================================\n */\n\nimport {backend_util, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet wasmFusedConv2d:\n  (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n   filterId: number, filterHeight: number, filterWidth: number,\n   biasId: number, padTop: number, padRight: number, padBottom: number,\n   padLeft: number, isSamePad: number, dilationHeight: number,\n   dilationWidth:
 number, strideHeight: number, strideWidth: number,\n   inputChannels: number, outputChannels: number, activation: number,\n   preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n  void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedConv2d = backend.wasm.cwrap(FusedConv2D, null /* void */, [\n    'number',  // xId\n    'number',  // batchSize\n    'number',  // inputHeight\n    'number',  // inputWidth\n    'number',  // filterId\n    'number',  // filterHeight\n    'number',  // filterWidth\n    'number',  // biasId\n    'number',  // padTop\n    'number',  // padRight\n    'number',  // padBottom\n    'number',  // padLeft\n    'number',  // isSamePad\n    'number',  // dilationHeight\n    'number',  // dilationWidth\n    'number',  // strideHeight\n    'number',  // strideWidth\n    'number',  // inputChannels\n    'number',  // outputChannels\n    'number',  // activation\n    'number',  // preluActivationWeightsId\n    'number',  // leakyreluAlpha\n
    'number',  // outId\n  ]);\n}\n\nfunction fusedConv2d(args: {\n  inputs: FusedConv2DInputs,\n  backend: BackendWasm,\n  attrs: FusedConv2DAttrs\n}) {\n  const {inputs, attrs, backend} = args;\n  const {x, filter, bias, preluActivationWeights} = inputs;\n  const {\n    strides,\n    pad,\n    dilations,\n    dataFormat,\n    dimRoundingMode,\n    activation,\n    leakyreluAlpha\n  } = attrs;\n\n  const convInfo = backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n      pad, dimRoundingMode);\n\n  const fusedActivation =\n      FusableActivation[activation as {} as keyof typeof FusableActivation];\n  if (fusedActivation == null) {\n    throw new Error(\n        `${activation} activation not yet supported for FusedConv2D ` +\n        `in the wasm backend.`);\n  }\n\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n  const outputChannels = convInfo.outChannels;\n\n
  let biasId = 0;\n  if (bias != null) {\n    const biasData = backend.dataIdMap.get(bias.dataId);\n    if (biasData.shape.length !== 1) {\n      throw new Error(\n          `FusedConv2D only supports rank-1 bias but got ` +\n          `rank ${biasData.shape.length}.`);\n    }\n    if (biasData.shape[0] !== outputChannels) {\n      throw new Error(\n          `FusedConv2D bias shape (${biasData.shape}) does not ` +\n          `match the number of output channels (${outputChannels})`);\n    }\n    biasId = biasData.id;\n  }\n\n  const filterHeight = convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const padRight = convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft = convInfo.padInfo.left;\n  const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth = convInfo.dilationWidth;\n  const strideHeight = convInfo.strideHeight;\n  const strideWidth = convInfo.strideWidth;\n
  const inputChannels = convInfo.inChannels;\n  const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n  const batchSize = convInfo.batchSize;\n  const inHeight = convInfo.inHeight;\n  const inWidth = convInfo.inWidth;\n\n  if (dataFormat !== 'NHWC') {\n    throw new Error(\n        `wasm backend FusedConv2D does not support dataFormat:` +\n        `${dataFormat}'. Please use 'NHWC'.`);\n  }\n\n  const out = backend.makeOutput(convInfo.outShape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const preluActivationWeightsId = preluActivationWeights == null ?\n      0 :\n      backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n  wasmFusedConv2d(\n      xId, batchSize, inHeight, inWidth, filterId, filterHeight, filterWidth,\n      biasId, padTop, padRight, padBottom, padLeft, isSamePad,
```

dilationHeight,\n dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n fusedActivation, preluActivationWeightsId, leakyreluAlpha ||
0, outId);\n\n return out;\n}\n\nexport const fusedConv2DConfig: KernelConfig = {\n kernelName: FusedConv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedConv2d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {backend_util, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs, FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet wasmFusedDepthwiseConv2d:\n (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number,\n biasId: number, padTop: number, padRight: number, padBottom: number,\n padLeft: number, isSamePad: number, dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels: number, activation: number,\n preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedDepthwiseConv2d =\n backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // biasId\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // activation\n 'number', // preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number', // outId\n]);\n}\n\nfunction fusedDepthwiseConv2d(args: {\n inputs: FusedDepthwiseConv2DInputs,\n backend: BackendWasm,\n attrs: FusedDepthwiseConv2DAttrs\n}) {\n const {inputs, attrs, backend} = args;\n const {x, filter, bias, preluActivationWeights} = inputs;\n const {\n strides,\n pad,\n dilations,\n dataFormat,\n dimRoundingMode,\n activation,\n leakyreluAlpha\n } = attrs;\n\n const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode, true /* depthwise */);\n\n const fusedActivation =\n FusableActivation[activation as {} as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n throw new Error(\n `${activation} activation not yet supported for FusedDepthwiseConv2D ` +\n `in the wasm backend.`);\n }\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n if (bias != null) {\n const biasData = backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n throw new Error(\n `FusedDepthwiseConv2D only supports rank-1 bias but got ` +\n `rank ${biasData.shape.length}.`);\n }\n if (biasData.shape[0] !== outputChannels) {\n throw new Error(\n `FusedDepthwiseConv2D bias shape (${biasData.shape}) does not ` +\n `match the number of output channels (${outputChannels})`);\n }\n biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels =

convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize = convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if (dataFormat !== 'NHWC') {\n   throw new Error(\n   `wasm backend FusedDepthwiseConv2D does not support dataFormat:'` +\n   `${dataFormat}'. Please use 'NHWC'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const preluActivationWeightsId = preluActivationWeights == null ?\n   0 :\n   backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedDepthwiseConv2d(\n   xId, batchSize, inHeight, inWidth, filterId, filterHeight, filterWidth,\n   biasId, padTop, padRight, padBottom, padLeft, isSamePad, dilationHeight,\n   dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n   fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedDepthwiseConv2DConfig: KernelConfig = {\n kernelName: FusedDepthwiseConv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedDepthwiseConv2d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmGatherNd: (\n   xId: number, dtype: CppDType, indicesId: number, numSlices: number,\n   sliceRank: number, sliceSize: number, strides: Uint8Array, outId: number) =>\n   void;\n\nfunction setup(backend: BackendWasm): void {\n wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n   'number', // xId\n   'number', // dtype\n   'number', // indicesId\n   'number', // numSlices\n   'number', // sliceRank\n   'number', // sliceSize\n   'array',   // strides\n   'number'   // outId\n]);\n}\n\nfunction gatherNd(args: {backend: BackendWasm, inputs: GatherNdInputs}):\n   TensorInfo {\n const {backend, inputs} = args;\n const {params, indices} = inputs;\n\n const [resultShape, numSlices, sliceSize, strides] =\n   gather_util.prepareAndValidate(params, indices);\n\n const out = backend.makeOutput(resultShape, params.dtype);\n if (numSlices === 0) {\n   return out;\n }\n\n const indicesShape = indices.shape;\n const sliceRank = indicesShape[indicesShape.length - 1];\n\n const xData = backend.dataIdMap.get(params.dataId);\n const xId = xData.id;\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const stridesBytes = new Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmGatherNd(\n   xId, CppDType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n   stridesBytes, outId);\n\n return out;\n}\n\nexport const gatherNdConfig: KernelConfig = {\n kernelName: GatherNd,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherNd\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc, Tensor, TensorInfo, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from './Reshape';\nimport {CppDType} from './types';\n\nlet wasmGather:

(\n xId: number, dtype: CppDType, xStrides: Uint8Array, stridesSize: number,\n indicesId: number, batchSize: number, outStrides: Uint8Array,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmGather = backend.wasm.cwrap('Gather', null /*void*/, [\n 'number', // xId\n 'number', // dtype\n 'array', // xStrides\n 'number', // stridesSize\n 'number', // indicesId\n 'number', // batchSize\n 'array', // outStrides\n 'number' // outId\n]);\n}\n\nfunction gatherV2(\n args: {backend: BackendWasm, inputs: GatherV2Inputs, attrs: GatherV2Attrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x, indices} = inputs;\n const {axis, batchDims} = attrs;\n\n // Throw error when any index is out of bound.\n const parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n const indicesVals = backend.readSync(indices.dataId) as TypedArray;\n const axisDim = x.shape[parsedAxis];\n for (let i = 0; i < indicesVals.length; ++i) {\n const index = indicesVals[i];\n util.assert(\n index <= axisDim - 1 && index >= 0,\n () =>\n `GatherV2: the index value ${index} is not in [0, ${axisDim - 1}]`);\n }\n\n const shapeInfo = backend_util.segment_util.collectGatherOpShapeInfo(\n x as Tensor, indices as Tensor, parsedAxis, batchDims);\n\n const flattenX = reshape({\n inputs: {x},\n attrs: {\n shape: [\n shapeInfo.batchSize, shapeInfo.outerSize, shapeInfo.dimSize,\n shapeInfo.sliceSize\n]\n },\n backend\n });\n const indicesSize = util.sizeFromShape(indices.shape);\n const flattenIndex = reshape({\n inputs: {x: indices},\n attrs: {shape: [shapeInfo.batchSize, indicesSize / shapeInfo.batchSize]},\n backend\n });\n const flattenOutputShape = [\n shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n shapeInfo.sliceSize\n];\n\n const out = backend.makeOutput(flattenOutputShape, x.dtype);\n if (util.sizeFromShape(x.shape) === 0) {\n return out;\n }\n const stridesSize = flattenX.shape.length - 1;\n\n const xData = backend.dataIdMap.get(flattenX.dataId);\n const xId = xData.id;\n\n const indicesData = backend.dataIdMap.get(flattenIndex.dataId);\n const indicesId = indicesData.id;\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const xStridesBytes = new Uint8Array(\n new Int32Array(util.computeStrides(flattenX.shape)).buffer);\n const outStridesBytes = new Uint8Array(\n new Int32Array(util.computeStrides(flattenOutputShape)).buffer);\n\n wasmGather(\n xId, CppDType[x.dtype], xStridesBytes, stridesSize, indicesId,\n shapeInfo.batchSize, outStridesBytes, outId);\n\n backend.disposeData(flattenX.dataId);\n backend.disposeData(flattenIndex.dataId);\n\n // reshape\n out.shape = shapeInfo.outputShape;\n return out;\n}\n\nexport const gatherV2Config: KernelConfig = {\n kernelName: GatherV2,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherV2 as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed
 under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\nimport {Greater, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterConfig: KernelConfig =\n createBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n
 * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport {GreaterEqual, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterEqualConfig: KernelConfig =\n createBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmFunc: (\n xId: number, dtype: number, leakyreluAlpha: number, outId: number) => void;\n\nfunction setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(LeakyRelu, null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // leakyrelu_alpha\n 'number', // out_id\n]);\n}\n\nexport function leakyRelu(\n args:\n {inputs: LeakyReluInputs, attrs: LeakyReluAttrs, backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, attrs: {alpha}, backend} = args;\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n // According to TF API, LeakyRelu returns float32 when input is either float32\n // or int32.\n const out = backend.makeOutput(x.shape, 'float32');\n\n if (util.sizeFromShape(x.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(xId, CppDType[x.dtype], alpha, outId);\n }\n\n return out;\n}\n\nexport const leakyReluConfig: KernelConfig = {\n kernelName: LeakyRelu,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: leakyRelu as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, Less} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const lessConfig: KernelConfig =\n createBinaryKernelConfig(Less, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, LessEqual} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const lessEqualConfig: KernelConfig =\n createBinaryKernelConfig(LessEqual, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable

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==========\n*/\nimport {KernelConfig, Log} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const logConfig: KernelConfig = createUnaryKernelConfig(Log);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
 on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n*/\nimport {KernelConfig, LogicalAnd} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const logicalAndConfig: KernelConfig =\n createBinaryKernelConfig(LogicalAnd, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License
 is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n*/\n\nimport {backend_util, KernelConfig, KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmMax: (xId: number, dtype: number, reduceSize: number, outId: number) =>\n    void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmMax = backend.wasm.cwrap(Max, null /*void*/, [\n    'number',  // x_id\n    'number',  // dtype\n    'number',  // reduce_size\n    'number',  // out_id\n  ]);\n}\n\nfunction max(args: {backend: BackendWasm, inputs: MaxInputs, attrs: MaxAttrs}):\n    TensorInfo {\n  const
 {backend, inputs, attrs} = args;\n  const {reductionIndices: axis, keepDims} = attrs;\n  const {x} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const {transposed, axes, originalAxes, inputWasTransposed} =\n      permuteAxesAndTranspose(x, axis, backend);\n\n  if (inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    input = transposed;\n    inputId = transposedId;\n  }\n\n  const inputRank = input.shape.length;\n\n  backend_util.assertAxesAreInnerMostDims('max', axes, inputRank);\n  const [outShape, reduceShape] =\n      backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =
 util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, x.dtype);\n  if (util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n    wasmMax(inputId, CppDType[x.dtype], reduceSize, outId);\n  }\n\n  if (inputWasTransposed)
 {\n    // dispose of the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n  return out;\n}\n\nexport const maxConfig: KernelConfig = {\n  kernelName: Max,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: max as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
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permissions and\n * limitations under the License.\n *
==========\n
*/\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\nconst supportsFullBroadcast = false;\nexport const maximumConfig: KernelConfig =\n
createBinaryKernelConfig(Maximum, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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and\n * limitations under the License.\n *
==========\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util}
from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmMaxPool: (\n xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n filterHeight: number, filterWidth:
number, padTop: number, padRight: number,\n padBottom: number, padLeft: number, dilationHeight: number,\n
dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels:
number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmMaxPool =
backend.wasm.cwrap(MaxPool, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', //
inputHeight\n 'number', // inputWidth\n 'number', // filterHeight\n 'number', // filterWidth\n
'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', //
dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number',
// inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n}\n\nfunction maxPool(\n args:
{inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n const {inputs, attrs, backend} =
args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n // TF API
supports int32 input. CPU and WebGL backend also support int32\n // input. WASM backend doesn't support it
because it uses xnnpack which only\n // supports float32.\n //\n // Add the following assert only for the WASM
backend instead of at core op\n // level.\n //\n // TODO: add support for int32 input.\n util.assert(\n x.dtype
=== 'float32',\n () =>\n `Error in MaxPool: only float32 input
is supported. Got ${x.dtype}.`);\n\n const {filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo =
backend_util.computePool2DInfo(\n x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n
const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop =
convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n
const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth =
convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth =
convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels =
convInfo.outChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm
backend does not support dataFormat:` +\n `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n
const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n
wasmMaxPool(\n xId, x.shape[0], x.shape[1], x.shape[2], filterHeight, filterWidth,\n padTop, padRight,
padBottom, padLeft, dilationHeight, dilationWidth,\n strideHeight, strideWidth, inputChannels, outputChannels,
outId);\n return out;\n}\n\nexport const maxPoolConfig: KernelConfig = {\n kernelName: MaxPool,\n
backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: maxPool as {} as KernelFunc\n};\n","/**\n * @license\n
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {cast} from './Cast';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmMean: (xId: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMean =\n backend.wasm.cwrap(Mean, null /*void*/, ['number, number, number']);\n}\n\nexport function mean(\n   args: {backend: BackendWasm, inputs: MeanInputs, attrs: MeanAttrs}):\n   TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n
  let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n   const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   if (transposedId !== xId) {\n   // transpose was not a no-op. We will need to dispose of this\n   // once we are done.\n   input = transposed;\n   inputId = transposedId;\n   reductionAxes = backend_util.getInnerMostAxes(\n   reductionAxes.length, input.shape.length);\n   }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n   'mean', reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize = util.sizeFromShape(reduceShape);\n let castedInput = input;\n if (input.dtype !== 'float32') {\n   castedInput =\n cast({backend, inputs: {x: input}, attrs: {dtype:
  'float32'}});\n   inputId = backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(outShape, 'float32');\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n   wasmMean(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n if (input.dtype !== 'float32') {\n backend.disposeData(castedInput.dataId);\n }\n\n return out;\n}\n\nexport const meanConfig: KernelConfig = {\n kernelName: Mean,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: mean as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
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==========\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmMin: (xId: number, dtype: number, reduceSize: number, outId: number) =>\n   void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMin = backend.wasm.cwrap(Min,
  null /*void*/, [\n   'number', // x_id\n   'number', // dtype\n   'number', // reduce_size\n   'number', // out_id\n]);\n}\n\nfunction min(args: {backend: BackendWasm, inputs: MinInputs, attrs: MinAttrs}):\n   TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId =

backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   if (transposedId !== xId) {\n   // transpose was not a no-op. We will need to dispose of this\n   // once we are done.\n   input = transposed;\n   inputId = transposedId;\n   }\n }\n\n const inputRank = input.shape.length;\n\n backend_util.assertAxesAreInnerMostDims('min', axes, inputRank);\n const [outShape, reduceShape] =\n   backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n wasmMin(inputId, CppDType[x.dtype], reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n return out;\n}\n\nexport const minConfig: KernelConfig = {\n kernelName: Min,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: min as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n
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 * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\n// Must match enum in MirrorPad.cc\nenum MirrorPaddingMode {\n reflect = 0,\n symmetric = 1\n}\n\nlet wasmMirrorPad: (\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n   prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array, mode: number,\n
 outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmMirrorPad = backend.wasm.cwrap(MirrorPad, null /* void */, [\n   'number', // xId\n   'array',   // x.shape\n   'number', // x.shape.length\n   'number', // x.dtype\n   'array',   // pre-paddings\n   'array',   // post-paddings\n   'number', // mode\n   'number', // outId\n]);\n}\n\nfunction mirrorPad(args: {\n inputs: MirrorPadInputs,\n backend: BackendWasm,\n attrs: MirrorPadAttrs\n}) {\n const {inputs: {x}, backend, attrs: {paddings, mode}} = args;\n\n const outShape = paddings.map(\n   (p, i) => p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(outShape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple
 => padTuple[1]);\n const prePaddingsBytes =\n   new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const postPaddingsBytes =\n   new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n

wasmMirrorPad(\n xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n postPaddingsBytes, MirrorPaddingMode[mode], outId);\n return out;\n}\n\nexport const mirrorPadConfig: KernelConfig = {\n kernelName: MirrorPad,\n backendName: 'wasm',\n kernelFunc: mirrorPad as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, Multiply} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = true;\nexport const multiplyConfig: KernelConfig =\n createBinaryKernelConfig(Multiply, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\nimport {KernelConfig, Neg} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const negConfig: KernelConfig = createUnaryKernelConfig(Neg);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n
* See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {BackendWasm} from '../backend_wasm';\n\n// Analogous to `struct Result` in `non_max_suppression_impl.h`.\ninterface Result {\n pSelectedIndices: number;\n selectedSize: number;\n pSelectedScores: number;\n pValidOutputs: number;\n}\n/**\n * Parse the result of the c++ method, which has the shape equivalent to\n * `Result`.\n */\nexport function parseResultStruct(\n backend: BackendWasm, resOffset: number): Result {\n const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);\n const pSelectedIndices = result[0];\n const selectedSize = result[1];\n const pSelectedScores = result[2];\n const pValidOutputs = result[3];\n // Since the result was allocated on the heap, we have to delete it.\n backend.wasm._free(resOffset);\n return {pSelectedIndices, selectedSize,
pSelectedScores, pValidOutputs};\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs, NonMaxSuppressionV3Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from

'../backend_wasm';\n\nimport {parseResultStruct} from
'./NonMaxSuppression_util';\n\nlet wasmFunc: (\n boxesId: number, scoresId: number, maxOutputSize:
number,\n iouThreshold: number, scoreThreshold: number) => number;\n\nfunction setup(backend:
BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n NonMaxSuppressionV3,\n 'number', //
Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n 'number', // maxOutputSize\n
'number', // iouThreshold\n 'number', // scoreThreshold\n]);\n}\n\nfunction kernelFunc(args: {\n backend:
BackendWasm,\n inputs: NonMaxSuppressionV3Inputs,\n attrs: NonMaxSuppressionV3Attrs\n}): TensorInfo {\n
const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold} = attrs;\n const
{boxes, scores} = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const scoresId =
backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset =\n wasmFunc(boxesId, scoresId, maxOutputSize,
iouThreshold,
scoreThreshold);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n
parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V3, we have to delete it from the
heap.\n backend.wasm._free(pSelectedScores);\n backend.wasm._free(pValidOutputs);\n\n const
selectedIndicesTensor =\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n return
selectedIndicesTensor;\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n kernelName:
NonMaxSuppressionV3,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as {} as
KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
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*/\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs,
NonMaxSuppressionV4Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'../backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n
boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number,\n
padToMaxOutputSize: boolean) => number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc =
backend.wasm.cwrap(\n NonMaxSuppressionV4,\n 'number', // Result*\n [\n 'number', // boxesId\n
'number',
// scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', // scoreThreshold\n
'bool', // padToMaxOutputSize\n]);\n}\n\nfunction nonMaxSuppressionV4(args: {\n backend:
BackendWasm,\n inputs: NonMaxSuppressionV4Inputs,\n attrs: NonMaxSuppressionV4Attrs\n}): TensorInfo[]
{\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold,
padToMaxOutputSize} =\n attrs;\n const {boxes, scores} = inputs;\n\n const boxesId =
backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const
resOffset = wasmFunc(\n boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n
padToMaxOutputSize);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n
parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V4, we have to delete it from the
heap.\n backend.wasm._free(pSelectedScores);\n\n
const selectedIndicesTensor =\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n const
validOutputsTensor = backend.makeOutput([], 'int32', pValidOutputs);\n\n return [selectedIndicesTensor,
validOutputsTensor];\n}\n\nexport const nonMaxSuppressionV4Config: KernelConfig = {\n kernelName:
NonMaxSuppressionV4,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: nonMaxSuppressionV4 as {}
as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
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the License for the specific language governing permissions and\n * limitations under the License.\n *
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/\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs, NonMaxSuppressionV5Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc:\n (boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number, softNmsSigma: number) =>\n number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n NonMaxSuppressionV5,\n 'number', // Result\n [\n 'number', // boxesId\n 'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', // scoreThreshold\n 'number', // softNmsSigma\n]);\n}\n\nfunction
kernelFunc(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV5Inputs,\n attrs: NonMaxSuppressionV5Attrs\n}): TensorInfo[] {\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold, softNmsSigma} = attrs;\n const {boxes, scores} = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset = wasmFunc(\n boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n softNmsSigma);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using validOutputs for V5, we have to delete it from the\n // heap.\n backend.wasm._free(pValidOutputs);\n\n const selectedIndicesTensor =\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n const selectedScoresTensor =\n backend.makeOutput([selectedSize], 'float32', pSelectedScores);\n\n
return [selectedIndicesTensor, selectedScoresTensor];\n}\n\nexport const nonMaxSuppressionV5Config: KernelConfig = {\n kernelName: NonMaxSuppressionV5,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport
{KernelConfig, NotEqual} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const notEqualConfig: KernelConfig =\n createBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport
{KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmOneHot: (\n indicesId: number, depth: number, onValue:

number, offValue: number,\n   outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmOneHot = backend.wasm.cwrap(OneHot, null /* void */, [\n   'number', // indices_id\n   'number', // depth,\n 'number', // onValue\n   'number', // offValue\n   'number'   // out_id\n]);\n}\n\nfunction oneHot(\n   args: {inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm}) {\n const {inputs, backend, attrs} = args;\n const {indices} = inputs;\n const {depth, onValue, offValue} = attrs;\n\n const out = backend.makeOutput([...indices.shape, depth], 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n wasmOneHot(indicesId, depth,
 onValue, offValue, outId);\n\n return out;\n}\n\nexport const oneHotConfig: KernelConfig = {\n kernelName: OneHot,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: oneHot as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {KernelConfig, KernelFunc, OnesLike, OnesLikeInputs} from
 '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nfunction onesLike(args: {inputs: OnesLikeInputs, backend: BackendWasm}) {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(1);\n return out;\n}\n\nexport const onesLikeConfig: KernelConfig = {\n kernelName: OnesLike,\n backendName: 'wasm',\n kernelFunc: onesLike as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express
 or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nimport {concat} from './Concat';\nimport {expandDims} from './ExpandDims';\n\nexport function pack(\n   args: {inputs: PackInputs, backend: BackendWasm, attrs: PackAttrs}):\n   TensorInfo {\n const {inputs, backend, attrs} = args;\n const {axis} = attrs;\n\n if (inputs.length === 1) {\n   return expandDims(\n   {inputs: {input: inputs[0]}, backend, attrs: {dim: axis}});\n }\n\n const shape = inputs[0].shape;\n const dtype = inputs[0].dtype;\n\n inputs.forEach(t => {\n util.assertShapesMatch(\n   shape, t.shape,\n   'All tensors passed to stack must have matching shapes');\n util.assert(\n
        dtype === t.dtype,\n   () => 'All tensors passed to stack must have matching dtypes');\n });\n\n const intermediateTensorInfos: TensorInfo[] = [];\n const expandedTensors = inputs.map(t => {\n   const expandedT =\n
    expandDims({inputs: {input: t}, backend, attrs: {dim: axis}});\n   intermediateTensorInfos.push(expandedT);\n return expandedT;\n });\n\n const result = concat({inputs: expandedTensors, backend, attrs: {axis}});\n\n intermediateTensorInfos.forEach(t => backend.disposeData(t.dataId));\n\n return result;\n}\n\nexport const packConfig: KernelConfig = {\n kernelName: Pack,\n backendName: 'wasm',\n kernelFunc: pack as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n

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backend.wasm.cwrap(Prelu, null /* void */, [\n 'number', // x_id\n 'number', // weights_id\n 'number' // out_id\n]);\n}\n\nfunction prelu(args: {inputs: PreluInputs, backend: BackendWasm}) {\n const {inputs, backend} = args;\n const {x, alpha} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const weightsId = backend.dataIdMap.get(alpha.dataId).id;\n\n let inputId = xId;\n const input = x;\n let castedInput = input;\n if (input.dtype !== 'float32') {\n castedInput = cast({backend, inputs: {x}, attrs: {dtype: 'float32'}});\n inputId = backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(x.shape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmPrelu(inputId, weightsId, outId);\n\n if (input.dtype !== 'float32') {\n backend.disposeData(castedInput.dataId);\n }\n return out;\n}\n\nexport const preluConfig: KernelConfig = {\n kernelName: Prelu,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prelu as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\n\nimport {CppDType} from './types';\n\nlet wasmProd: (\n xId: number, reduceSize: number,\n dtype: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmProd = backend.wasm.cwrap(Prod, null /*void*/, [\n 'number',\n 'number',\n 'number',\n 'number'\n]);\n}\n\nfunction prod(args: {\n backend: BackendWasm,\n inputs: ProdInputs,\n attrs: ProdAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was not a no-op. We will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n reductionAxes.length, input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'prod', reductionAxes, input.shape.length);\n const [outShape, reduceShape]\n =\n backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmProd(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return out;\n}\n\nexport const prodConfig: KernelConfig = {\n kernelName: Prod,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prod as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in\n compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language

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==========\n
*/\n\nimport {KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\nimport {rangeImplCPU} from '../kernel_utils/shared';\n\nexport const
range =\n (args: {backend: BackendWasm, attrs: RangeAttrs}): TensorInfo => {\n const {backend, attrs} =
args;\n const {start, stop, step, dtype} = attrs;\n const values = rangeImplCPU(start, stop, step, dtype);\n\n
const
out = backend.makeOutput([values.length], dtype);\n const outVals = backend.typedArrayFromHeap(out);\n
outVals.set(values);\n return out;\n };\n\nexport const rangeConfig: KernelConfig = {\n kernelName: Range,\n
backendName: 'wasm',\n kernelFunc: range as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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==========\n
*/\n\nimport {KernelConfig, RealDiv} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\n\nconst supportsFullBroadcast = true;\nexport const realDivConfig: KernelConfig =\n
createBinaryKernelConfig(RealDiv, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC.
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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==========\n
*/\nimport {KernelConfig, Relu} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const reluConfig: KernelConfig = createUnaryKernelConfig(Relu);\n","/**\n * @license\n
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the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\nimport {KernelConfig, Relu6} from '@tensorflow/tfjs-core';\n\nimport
{createUnaryKernelConfig} from './unary_kernel';\nexport const relu6Config: KernelConfig =
createUnaryKernelConfig(Relu6);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n *
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo,
util} from '@tensorflow/tfjs-core';\n\nimport

{BackendWasm} from '../backend_wasm';\n\nimport {cast} from './Cast';\n\nlet wasmResizeBilinear: (\n xId: number, batch: number, oldHeight: number, oldWidth: number,\n numChannels: number, newHeight: number, newWidth: number,\n alignCorners: number, halfPixelCenters: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmResizeBilinear = backend.wasm.cwrap(ResizeBilinear, null /*void*/, [\n 'number', // xId\n 'number', // batch\n 'number', // oldHeight\n 'number', // oldWidth\n 'number', // numChannels\n 'number', // newHeight\n 'number', // newWidth\n 'number', // alignCorners\n 'number', // halfPixelCenters\n 'number' // outId\n]);\n}\n\nfunction resizeBilinear(args: {\n backend: BackendWasm,\n inputs: ResizeBilinearInputs,\n attrs: ResizeBilinearAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n\n const {images} = inputs;\n const {alignCorners, halfPixelCenters, size} = attrs;\n const [newHeight, newWidth] = size;\n\n const [batch, oldHeight, oldWidth, numChannels] = images.shape;\n const outShape = [batch, newHeight, newWidth, numChannels];\n\n let xData = backend.dataIdMap.get(images.dataId);\n let castedData;\n if (xData.dtype !== 'float32') {\n castedData =\n cast({backend, inputs: {x: images}, attrs: {dtype: 'float32'}});\n xData = backend.dataIdMap.get(castedData.dataId);\n }\n const xId = xData.id;\n\n const out = backend.makeOutput(outShape, 'float32');\n if (util.sizeFromShape(images.shape) === 0) {\n return out;\n }\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmResizeBilinear(\n xId, batch, oldHeight, oldWidth, numChannels, newHeight, newWidth,\n alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId);\n\n if (castedData != null) {\n backend.disposeData(castedData.dataId);\n }\n\n return out;\n}\n\nexport const resizeBilinearConfig: KernelConfig = {\n kernelName: ResizeBilinear,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: resizeBilinear as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\n\nlet wasmReverse: (\n xId: number, axes: Uint8Array, axesLength: number, outShape: Uint8Array,\n outShapeLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmReverse = backend.wasm.cwrap(Reverse, null, [\n 'number', // x_id\n 'array', // axes\n 'number', // axes_length\n 'array', // out_shape\n 'number', // out_shape_length\n 'number' // out_id\n]);\n}\n\nexport function reverse(\n args: {inputs: ReverseInputs, backend: BackendWasm, attrs: ReverseAttrs}):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {dims} = attrs;\n\n const axes = util.parseAxisParam(dims, x.shape);\n\n if (x.shape.length === 0) {\n return identity({inputs: {x}, backend});\n }\n\n const out = backend.makeOutput(x.shape, x.dtype);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const axesBytes = new Uint8Array(new Int32Array(axes).buffer);\n const outShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n wasmReverse(\n xId, axesBytes, axes.length, outShapeBytes, x.shape.length, outId);\n\n const reshaped =\n reshape({inputs: {x: out}, attrs: {shape: x.shape}, backend});\n\n backend.disposeData(out.dataId);\n return reshaped;\n}\n\nexport const reverseConfig: KernelConfig = {\n kernelName: Reverse,\n backendName: 'wasm',\n kernelFunc: reverse as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed

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==========\n */\n\nimport {KernelConfig, KernelFunc, RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmRotate: (\n xId: number, batch: number, imageHeight: number, imageWidth: number,\n numChannels: number, radians: number, centerX: number, centerY: number,\n fillBytes: Uint8Array, fillLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmRotate = backend.wasm.cwrap(RotateWithOffset, null /* void */, [\n 'number', // xId\n 'number', // batch\n 'number', // imageHeight\n 'number', // imageWidth\n
'number', // numChannels\n 'number', // radians\n 'number', // centerX\n 'number', // centerY\n 'array', // fillBytes\n 'number', // fillLength\n 'number', // outId\n]);\n}\n\nexport function rotateWithOffset(args: {\n inputs: RotateWithOffsetInputs,\n backend: BackendWasm,\n attrs: RotateWithOffsetAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {image} = inputs;\n const {radians, fillValue, center} = attrs;\n\n const out = backend.makeOutput(image.shape, image.dtype);\n const imageId = backend.dataIdMap.get(image.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n\n const [centerX, centerY] =\n backend_util.getImageCenter(center, imageHeight, imageWidth);\n\n const fillIsBlack = fillValue === 0;\n const fullOpacityValue = 255;\n\n const fillValues = typeof fillValue === 'number' ?\n [fillValue, fillValue, fillValue, fillIsBlack ? 0 : fullOpacityValue] :\n [...fillValue, fullOpacityValue];\n const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);\n\n wasmRotate(\n imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX,\n centerY, fillBytes, fillValues.length, outId);\n return out;\n}\n\nexport const rotateWithOffsetConfig: KernelConfig = {\n kernelName: RotateWithOffset,\n backendName: 'wasm',\n kernelFunc: rotateWithOffset as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS
OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {KernelConfig, Round} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
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==========\n */\nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable

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==========\n */\n\nimport {KernelConfig, KernelFunc, scatter_util, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmScatterNd: (\n indicesId: number, updatesId: number, dtype: CppDType, sliceRank: number,\n numUpdates: number, sliceSize: number, strides: Uint8Array,\n outputSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmScatterNd = backend.wasm.cwrap(ScatterNd, null /*void*/, [\n 'number', // indicesId\n 'number', // updatesId\n 'number', // dtype\n 'number', // sliceRank\n 'number', // numUpdates\n 'number', // sliceSize\n 'array', // strides\n 'number', // outputSize\n 'number' // outId\n]);\n}\n\nfunction scatterNd(\n args:\n {backend: BackendWasm, inputs: ScatterNdInputs, attrs:
ScatterNdAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {indices, updates} = inputs;\n const {shape} = attrs;\n\n const out = backend.makeOutput(shape, updates.dtype);\n if (util.sizeFromShape(shape) === 0) {\n return out;\n }\n\n const {sliceRank, numUpdates, sliceSize, strides, outputSize} =\n scatter_util.calculateShapes(updates, indices, shape);\n\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const updatesData = backend.dataIdMap.get(updates.dataId);\n const updatesId = updatesData.id;\n\n const stridesBytes = new Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmScatterNd(\n indicesId, updatesId, CppDType[updates.dtype], sliceRank, numUpdates,\n sliceSize, stridesBytes, outputSize, outId);\n\n return out;\n}\n\nexport const scatterNdConfig: KernelConfig = {\n kernelName: ScatterNd,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: scatterNd as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, Select, SelectInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmSelect: (\n conditionId: number, tId: number, eId: number, offset: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmSelect = backend.wasm.cwrap('SelectV2', null, [\n 'number', // conditionId\n 'number', // tId\n 'number', // eId\n 'number', // offset\n 'number', // outId\n]);\n}\n\nfunction select(args: {inputs: SelectInputs, backend: BackendWasm}) {\n const {inputs, backend} = args;\n const {condition, t, e} = inputs;\n\n const conditionId = backend.dataIdMap.get(condition.dataId).id;\n const tId = backend.dataIdMap.get(t.dataId).id;\n const eId = backend.dataIdMap.get(e.dataId).id;\n const out = backend.makeOutput(t.shape, t.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const cRank = condition.shape.length;\n const tRank = t.shape.length;\n\n const offset = cRank === 0 || cRank > 1 || tRank === 1 ?\n 1 :\n util.sizeFromShape(t.shape.slice(1));\n\n wasmSelect(conditionId, tId, eId, offset, outId);\n return out;\n}\n\nexport const selectConfig:
KernelConfig = {\n kernelName: Select,\n backendName: 'wasm',\n kernelFunc: select as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed

on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm}
from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Sigmoid, null /* void */, ['number', 'number']);\n}\n\nfunction sigmoid(args: {backend: BackendWasm, inputs: SigmoidInputs}):\n TensorInfo {\n const {backend, inputs: {x}} = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId, outId);\n return out;\n}\n\nexport const sigmoidConfig: KernelConfig = {\n kernelName: 'Sigmoid',\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sigmoid as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except
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==========\n */\nimport {KernelConfig, Sin} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
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==========\n */\n\nimport {KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number, channels: number, batch: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Softmax, null /* void */, [\n 'number', // xId\n 'number', // outId\n 'number', // channels\n 'number' // batch\n]);\n}\n\nfunction softmax(\n args: {backend: BackendWasm,
inputs: SoftmaxInputs, attrs: SoftmaxAttrs}):\n TensorInfo {\n const {backend, inputs: {logits}, attrs: {dim}} = args;\n const xId = backend.dataIdMap.get(logits.dataId).id;\n const out = backend.makeOutput(logits.shape, logits.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const channels = logits.shape[dim];\n const batch = util.sizeFromShape(logits.shape) / channels;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId, outId, channels, batch);\n return out;\n}\n\nexport const softmaxConfig: KernelConfig = {\n kernelName: Softmax,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: softmax as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {backend_util, KernelConfig, KernelFunc, ReshapeAttrs, ReshapeInputs, SpaceToBatchND, SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, TransposeAttrs, TransposeInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {padV2Config} from './PadV2';\nimport {reshape} from './Reshape';\nimport {transpose} from './Transpose';\n\nfunction spaceToBatchND(args: {\n inputs: SpaceToBatchNDInputs,\n backend: BackendWasm,\n attrs: SpaceToBatchNDAttrs\n}) {\n const {inputs, backend,
  attrs} = args;\n const {x} = inputs;\n const {blockShape, paddings} = attrs;\n\n const prod = util.sizeFromShape(blockShape);\n\n const completePaddings: Array<[number, number]> = [[0, 0]];\n completePaddings.push(...(paddings as Array<[number, number]>));\n\n for (let i = 1 + blockShape.length; i < x.shape.length; ++i) {\n   completePaddings.push([0, 0]);\n }\n\n const paddedX = padV2Config.kernelFunc({\n inputs: {x},\n   backend,\n   attrs: {paddings: completePaddings, constantValue: 0}\n }) as TensorInfo;\n\n const reshapedPaddedShape =\n   backend_util.getReshaped(paddedX.shape, blockShape, prod, false);\n\n const permutedReshapedPaddedPermutation = backend_util.getPermuted(\n   reshapedPaddedShape.length, blockShape.length, false);\n\n const flattenShape =\n   backend_util.getReshapedPermuted(paddedX.shape, blockShape, prod, false);\n\n const reshapeInputs: ReshapeInputs = {x: paddedX};\n const reshapeAttrs: ReshapeAttrs = {shape: reshapedPaddedShape};\n
  const paddedXReshaped =\n   reshape({inputs: reshapeInputs, backend, attrs: reshapeAttrs});\n\n const transposeInputs: TransposeInputs = {x: paddedXReshaped};\n const transposeAttrs:\n   TransposeAttrs = {perm: permutedReshapedPaddedPermutation};\n const paddedXT =\n   transpose({inputs: transposeInputs, backend, attrs: transposeAttrs});\n\n const resultReshapeInputs: ReshapeInputs = {x: paddedXT};\n const resultReshapeAttrs: ReshapeAttrs = {shape: flattenShape};\n const result = reshape(\n   {inputs: resultReshapeInputs, backend, attrs: resultReshapeAttrs});\n\n backend.disposeData(paddedX.dataId);\n backend.disposeData(paddedXReshaped.dataId);\n backend.disposeData(paddedXT.dataId);\n\n return result;\n}\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n kernelName: SpaceToBatchND,\n backendName: 'wasm',\n kernelFunc: spaceToBatchND as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
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==========\n */\n\nimport {KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, util} from '@tensorflow/tfjs-core';\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {slice} from './Slice';\n\nexport function splitV(\n   args: {inputs: SplitVInputs, attrs: SplitVAttrs, backend: BackendWasm}) {\n const {inputs,
  attrs, backend} = args;\n const {x} = inputs;\n const {numOrSizeSplits, axis} = attrs;\n\n const $axis = util.parseAxisParam(axis, x.shape)[0];\n\n const splitSizes = backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n const begin = new Array(x.shape.length).fill(0);\n const size = x.shape.slice();\n return splitSizes.map(s => {\n   const xSliceSize = [...size];\n   xSliceSize[$axis] = s;\n   const xSlice =\n   slice({inputs: {x}, attrs: {begin, size: xSliceSize}, backend});\n   begin[$axis] += s;\n   return xSlice;\n });\n}\n\nexport const splitVConfig: KernelConfig = {\n kernelName: SplitV,\n backendName: 'wasm',\n kernelFunc: splitV as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the

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License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from './Reshape';\nimport {slice} from './Slice';\n\nlet wasmStridedSlice: (\n xId: number, xStridesBytes: Uint8Array, xRank: number,\n beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n outShapeBytes: Uint8Array, outStridesBytes: Uint8Array,\n outShapeLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n 'number', // xId\n 'array', // xStrides\n 'number', // xRank\n 'array', // beginBytes\n 'array', // endBytes\n 'array', // stridesBytes\n 'array', // outShapeBytes\n 'array', // outStridesBytes\n 'number',
// outShapeLength\n 'number', // outId\n]);\n}\n\nexport function stridedSlice(args: {\n backend: BackendWasm,\n inputs: StridedSliceInputs,\n attrs: StridedSliceAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x} = inputs;\n\n const {\n begin,\n end,\n strides,\n beginMask,\n endMask,\n ellipsisMask,\n newAxisMask,\n shrinkAxisMask\n } = attrs;\n\n const {\n finalShapeSparse,\n finalShape,\n isIdentity,\n sliceDim0,\n isSimpleSlice,\n begin: $begin,\n end: $end,\n strides: $strides\n } =\n slice_util.sliceInfo(\n x.shape, begin, end, strides, beginMask, endMask, ellipsisMask,\n newAxisMask, shrinkAxisMask);\n\n let result;\n\n if (isIdentity) {\n // Optimization #1, slice is a no-op plus reshape\n result = reshape({inputs: {x}, backend, attrs: {shape: finalShape}});\n } else if (sliceDim0 || isSimpleSlice) {\n // Optimization #2, slice is memory contiguous
(only occurs in dim 0)\n util.assert(\n x.shape.length >= 1,\n () => `Input must have rank at least 1, got: ${x.shape.length}`);\n\n const size = slice_util.computeOutShape($begin, $end, $strides);\n // To tolerate begin[0] > end[0] (a 0-output slice), we min(begin, end).\n const sliced = slice({inputs: {x}, backend, attrs: {begin: $begin, size}});\n result =\n reshape({inputs: {x: sliced}, backend, attrs: {shape: finalShape}});\n backend.disposeData(sliced.dataId);\n } else {\n const out = backend.makeOutput(finalShapeSparse, 'float32');\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const xStridesBytes =\n new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n const beginBytes = new Uint8Array(new Int32Array($begin).buffer);\n const endBytes = new Uint8Array(new Int32Array($end).buffer);\n const stridesBytes = new Uint8Array(new Int32Array($strides).buffer);\n\n const outputShapeBytes =\n new Uint8Array(new Int32Array(finalShapeSparse).buffer);\n const outStridesBytes = new Uint8Array(\n new Int32Array(util.computeStrides(finalShapeSparse)).buffer);\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n wasmStridedSlice(\n xId, xStridesBytes, x.shape.length, beginBytes, endBytes, stridesBytes,\n outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);\n\n result = reshape({inputs: {x: out}, backend, attrs: {shape: finalShape}});\n\n backend.disposeData(out.dataId);\n }\n\n return result;\n}\n\nexport const stridedSliceConfig: KernelConfig = {\n kernelName: StridedSlice,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: stridedSlice as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License
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*/\nimport {KernelConfig, Sub} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const subConfig: KernelConfig =\n createBinaryKernelConfig(Sub, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n
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==========\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmSum: (xId: number, reduceSize: number, dtype: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmSum = backend.wasm.cwrap(Sum, null /*void*/, [\n 'number', // input_id\n 'number', // reduce_size\n 'number', // dtype\n
'number', // out_id\n]);\n}\n\nfunction sum(args: {backend: BackendWasm, inputs: SumInputs, attrs: SumAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was not a no-op. We will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n reductionAxes.length, input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'sum', reductionAxes, input.shape.length);\n const [outShape, reduceShape]
=\n backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmSum(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return out;\n}\n\nexport const sumConfig: KernelConfig = {\n kernelName: Sum,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sum as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except
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==========\n
*/\nimport {KernelConfig, Tan} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const tanConfig: KernelConfig = createUnaryKernelConfig(Tan);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *

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==========\n */\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, Tile, TileAttrs, TileInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmTile: (\n xId: number, xShape: Uint8Array, xShapeSize: number, newShape: Uint8Array,\n newShapeSize: number, dtype: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTile = backend.wasm.cwrap(Tile, null /* void */, [\n 'number', // x_id\n 'array', // x_shape\n 'number', // x_shape.length\n 'array', // new_shape\n 'number', // new_shape.length\n 'number' // out_id\n]);\n}\n\nfunction tile(\n args: {inputs: TileInputs, backend: BackendWasm, attrs: TileAttrs}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const {reps} = attrs;\n\n const newShape: number[] = new Array(x.shape.length);\n for (let i = 0; i < newShape.length; i++) {\n newShape[i] = x.shape[i] * reps[i];\n }\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n const newShapeBytes = new Uint8Array(new Int32Array(newShape).buffer);\n\n const out = backend.makeOutput(newShape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmTile(\n xId, xShapeBytes, x.shape.length, newShapeBytes, newShape.length,\n CppDType[out.dtype], outId);\n return out;\n}\n\nexport const tileConfig: KernelConfig = {\n kernelName: Tile,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: tile as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {CppDType} from './types';\n\nlet wasmTopK: (\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number,\n xDtype: CppDType, k: number, sorted: boolean, outValuesId:
number,\n outIndicesId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n 'number', // k\n 'bool', // sorted\n 'number', // outValuesId\n 'number', // outIndicesId\n]);\n}\n\nexport const topk:\n (args: {inputs: TopKInputs, backend: BackendWasm, attrs: TopKAttrs}) =>\n TensorInfo[] | TensorInfo = ({inputs, backend, attrs}) => {\n const {x} = inputs;\n const {k, sorted} = attrs;\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n const outputShape = x.shape.slice();\n outputShape[outputShape.length - 1] = k;\n const outValues = backend.makeOutput(outputShape, x.dtype);\n

```
    const outValuesId = backend.dataIdMap.get(outValues.dataId).id;\n
      const outIndices = backend.makeOutput(outputShape, 'int32');\n      const outIndicesId =
backend.dataIdMap.get(outIndices.dataId).id;\n\n      wasmTopK(\n        xId, xShapeBytes, x.shape.length,
CppDType[x.dtype], k, sorted,\n        outValuesId, outIndicesId);\n\n      return [outValues, outIndices];\n
};\n\nexport const topKConfig: KernelConfig = {\n  kernelName: TopK,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: topk as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS
 OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions
and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transform, TransformAttrs, TransformInputs, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmTransform: (\n    imageId:
number, transformsId: number, isBatchTransform: boolean,\n    batch: number, outHeight: number, outWidth:
number, numChannels: number,\n    imageWidth: number, imageHeight: number, strides: Uint8Array,\n
stridesLength: number, interpolationModeId: number, fillModeId: number,\n    fillValue: number, outId: number)
=> void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmTransform = backend.wasm.cwrap(Transform,
null /*void*/, [\n    'number',  // imageId\n    'number',  // transformsId\n    'bool',    // isBatchTransform\n    'number',
  // batch\n    'number',  // outHeight\n    'number',  // outWidth\n    'number',  // numChannels\n    'number',  //
imageWidth\n    'number',  // imageHeight\n    'array',   // strides\n    'number',  // stridesLength\n    'number',  //
interpolationModeId\n    'number',  // fillModeId\n    'number',  // fillValue\n    'number'   // outId\n
]);\n}\n\nfunction transform(\n    args:\n        {backend: BackendWasm, inputs: TransformInputs, attrs:
TransformAttrs}):\n    TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {image, transforms} = inputs;\n
const {interpolation, fillMode, fillValue, outputShape} = attrs;\n\n  const [batch, imageHeight, imageWidth,
numChannels] = image.shape;\n  const [outHeight, outWidth] =\n      outputShape != null ? outputShape :
[imageHeight, imageWidth];\n  const outShape =\n      [batch, outHeight, outWidth,\n       numChannels] as
[number, number, number, number];\n  const strides =\n      new Uint8Array(new
Int32Array(util.computeStrides(image.shape)).buffer);\n\n
  const out = backend.makeOutput(outShape, image.dtype);\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n\n  const imageData = backend.dataIdMap.get(image.dataId);\n  const
imageId = imageData.id;\n\n  const transformsData = backend.dataIdMap.get(transforms.dataId);\n  const
transformsId = transformsData.id;\n\n  const interpolationModeId = interpolation === 'nearest' ? 1 : 2;\n  let
fillModeId;\n  switch (fillMode) {\n    case 'constant':\n      fillModeId = 1;\n      break;\n    case 'reflect':\n
fillModeId = 2;\n      break;\n    case 'wrap':\n      fillModeId = 3;\n      break;\n    case 'nearest':\n      fillModeId =
4;\n      break;\n    default:\n      fillModeId = 1;\n      break;\n  }\n\n  wasmTransform(\n      imageId, transformsId,
(transforms.shape[0] > 1), batch, outHeight,\n      outWidth, numChannels, imageWidth, imageHeight, strides,\n
image.shape.length - 1, interpolationModeId, fillModeId, fillValue,\n      outId);\n\n
  return out;\n}\n\nexport const transformConfig: KernelConfig = {\n  kernelName: Transform,\n  backendName:
'wasm',\n  setupFunc: setup,\n  kernelFunc: transform as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright
2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n *
you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
```

==========\n*/\n\nimport {KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {slice} from './Slice';\n\nfunction unpack(\n args: {inputs: UnpackInputs, backend: BackendWasm, attrs: UnpackAttrs}):\n TensorInfo[] {\n const {inputs, backend, attrs} = args;\n const {value} = inputs;\n let {axis} = attrs;\n\n if (axis < 0) {\n axis += value.shape.length;\n }\n\n const numOutputs = value.shape[axis];\n const rank = value.shape.length;\n const outShape: number[] = new Array(rank - 1);\n let outIndex = 0;\n for (let i = 0; i < rank; i++) {\n if (i !== axis) {\n outShape[outIndex++] = value.shape[i];\n }\n }\n const outs: TensorInfo[] = new Array(numOutputs);\n const begin = new Array(rank).fill(0);\n const size = value.shape.slice();\n size[axis] = 1;\n for (let i = 0; i < outs.length; i++) {\n begin[axis] = i;\n outs[i] = slice({inputs: {x: value}, attrs: {begin, size}, backend});\n }\n return outs.map(({dataId, dtype}) => ({dataId, dtype, shape: outShape}));\n}\n\nexport const unpackConfig: KernelConfig = {\n kernelName: Unpack,\n backendName: 'wasm',\n kernelFunc: unpack as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\n\nimport {KernelConfig, KernelFunc, ZerosLike, ZerosLikeInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nfunction zerosLike(args: {inputs: ZerosLikeInputs, backend: BackendWasm}) {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(0);\n return out;\n}\n\nexport const zerosLikeConfig: KernelConfig = {\n kernelName: ZerosLike,\n backendName: 'wasm',\n kernelFunc: zerosLike as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n */\n\n// We explicitly import the modular kernels so they get registered in the\n// global registry when we compile the library. A modular build would replace\n// the contents of this file and import only the kernels that are needed.\nimport {KernelConfig, registerKernel} from '@tensorflow/tfjs-core';\n\nimport {fusedMatMulConfig} from './kernels/_FusedMatMul';\nimport {absConfig} from './kernels/Abs';\nimport {addConfig} from './kernels/Add';\nimport {addNConfig} from './kernels/AddN';\nimport {allConfig} from './kernels/All';\nimport {anyConfig} from './kernels/Any';\nimport {argMaxConfig} from './kernels/ArgMax';\nimport {avgPoolConfig} from './kernels/AvgPool';\nimport {batchMatMulConfig} from './kernels/BatchMatMul';\nimport {batchToSpaceNDConfig} from './kernels/BatchToSpaceND';\nimport {castConfig} from './kernels/Cast';\nimport {ceilConfig} from './kernels/Ceil';\nimport {clipByValueConfig} from './kernels/ClipByValue';\nimport {concatConfig} from './kernels/Concat';\nimport {conv2DConfig} from './kernels/Conv2D';\nimport {conv2DBackpropInputConfig} from './kernels/Conv2DBackpropInput';\nimport {cosConfig} from './kernels/Cos';\nimport {coshConfig} from './kernels/Cosh';\nimport {cropAndResizeConfig} from './kernels/CropAndResize';\nimport {cumsumConfig} from './kernels/Cumsum';\nimport {depthToSpaceConfig} from './kernels/DepthToSpace';\nimport {depthwiseConv2dNativeConfig} from

'./kernels/DepthwiseConv2dNative';\nimport {eluConfig} from './kernels/Elu';\nimport {equalConfig} from
'./kernels/Equal';\nimport {expConfig} from './kernels/Exp';\nimport {expandDimsConfig} from
'./kernels/ExpandDims';\nimport {fillConfig} from './kernels/Fill';\nimport {flipLeftRightConfig} from
'./kernels/FlipLeftRight';\nimport {floorConfig} from './kernels/Floor';\nimport {floorDivConfig} from
'./kernels/FloorDiv';\nimport
{fusedBatchNormConfig} from './kernels/FusedBatchNorm';\nimport {fusedConv2DConfig} from
'./kernels/FusedConv2D';\nimport {fusedDepthwiseConv2DConfig} from
'./kernels/FusedDepthwiseConv2D';\nimport {gatherNdConfig} from './kernels/GatherNd';\nimport
{gatherV2Config} from './kernels/GatherV2';\nimport {greaterConfig} from './kernels/Greater';\nimport
{greaterEqualConfig} from './kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport
{leakyReluConfig} from './kernels/LeakyRelu';\nimport {lessConfig} from './kernels/Less';\nimport
{lessEqualConfig} from './kernels/LessEqual';\nimport {logConfig} from './kernels/Log';\nimport
{logicalAndConfig} from './kernels/LogicalAnd';\nimport {maxConfig} from './kernels/Max';\nimport
{maximumConfig} from './kernels/Maximum';\nimport {maxPoolConfig} from './kernels/MaxPool';\nimport
{meanConfig} from './kernels/Mean';\nimport {minConfig} from './kernels/Min';\nimport {minimumConfig} from
'./kernels/Minimum';\nimport
{mirrorPadConfig} from './kernels/MirrorPad';\nimport {multiplyConfig} from './kernels/Multiply';\nimport
{negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from
'./kernels/NonMaxSuppressionV3';\nimport {nonMaxSuppressionV4Config} from
'./kernels/NonMaxSuppressionV4';\nimport {nonMaxSuppressionV5Config} from
'./kernels/NonMaxSuppressionV5';\nimport {notEqualConfig} from './kernels/NotEqual';\nimport {oneHotConfig}
from './kernels/OneHot';\nimport {onesLikeConfig} from './kernels/OnesLike';\nimport {packConfig} from
'./kernels/Pack';\nimport {padV2Config} from './kernels/PadV2';\nimport {powConfig} from
'./kernels/Pow';\nimport {preluConfig} from './kernels/Prelu';\nimport {prodConfig} from './kernels/Prod';\nimport
{rangeConfig} from './kernels/Range';\nimport {realDivConfig} from './kernels/RealDiv';\nimport {reluConfig}
from './kernels/Relu';\nimport {relu6Config} from './kernels/Relu6';\nimport {reshapeConfig} from
'./kernels/Reshape';\nimport {resizeBilinearConfig}
from './kernels/ResizeBilinear';\nimport {reverseConfig} from './kernels/Reverse';\nimport
{rotateWithOffsetConfig} from './kernels/RotateWithOffset';\nimport {roundConfig} from
'./kernels/Round';\nimport {rsqrtConfig} from './kernels/Rsqrt';\nimport {scatterNdConfig} from
'./kernels/ScatterNd';\nimport {selectConfig} from './kernels/Select';\nimport {sigmoidConfig} from
'./kernels/Sigmoid';\nimport {sinConfig} from './kernels/Sin';\nimport {sliceConfig} from './kernels/Slice';\nimport
{softmaxConfig} from './kernels/Softmax';\nimport {spaceToBatchNDConfig} from
'./kernels/SpaceToBatchND';\nimport {splitVConfig} from './kernels/SplitV';\nimport {sqrtConfig} from
'./kernels/Sqrt';\nimport {squareConfig} from './kernels/Square';\nimport {squaredDifferenceConfig} from
'./kernels/SquaredDifference';\nimport {stepConfig} from './kernels/Step';\nimport {stridedSliceConfig} from
'./kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig} from
'./kernels/Sum';\nimport
{tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport {tileConfig} from
'./kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transformConfig} from
'./kernels/Transform';\nimport {transposeConfig} from './kernels/Transpose';\nimport {unpackConfig} from
'./kernels/Unpack';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst
kernelConfigs: KernelConfig[] = [\n absConfig,\n addConfig,\n addNConfig,\n allConfig,\n anyConfig,\n
argMaxConfig,\n avgPoolConfig,\n batchMatMulConfig,\n batchToSpaceNDConfig,\n castConfig,\n
ceilConfig,\n clipByValueConfig,\n concatConfig,\n conv2DConfig,\n conv2DBackpropInputConfig,\n
cosConfig,\n coshConfig,\n cropAndResizeConfig,\n cumsumConfig,\n depthToSpaceConfig,\n
depthwiseConv2dNativeConfig,\n eluConfig,\n equalConfig,\n expConfig,\n expandDimsConfig,\n fillConfig,\n
flipLeftRightConfig,\n floorConfig,\n floorDivConfig,\n fusedMatMulConfig,\n

fusedBatchNormConfig,\n fusedConv2DConfig,\n fusedDepthwiseConv2DConfig,\n gatherNdConfig,\n gatherV2Config,\n greaterConfig,\n greaterEqualConfig,\n identityConfig,\n leakyReluConfig,\n lessConfig,\n lessEqualConfig,\n logConfig,\n logicalAndConfig,\n maxConfig,\n maximumConfig,\n maxPoolConfig,\n meanConfig,\n minConfig,\n minimumConfig,\n mirrorPadConfig,\n multiplyConfig,\n negConfig,\n nonMaxSuppressionV3Config,\n nonMaxSuppressionV4Config,\n nonMaxSuppressionV5Config,\n notEqualConfig,\n oneHotConfig,\n onesLikeConfig,\n packConfig,\n padV2Config,\n powConfig,\n preluConfig,\n prodConfig,\n rangeConfig,\n realDivConfig,\n reluConfig,\n relu6Config,\n reshapeConfig,\n resizeBilinearConfig,\n reverseConfig,\n rotateWithOffsetConfig,\n rsqrtConfig,\n roundConfig,\n scatterNdConfig,\n selectConfig,\n sigmoidConfig,\n sinConfig,\n sliceConfig,\n softmaxConfig,\n spaceToBatchNDConfig,\n splitVConfig,\n sqrtConfig,\n squareConfig,\n squaredDifferenceConfig,\n stepConfig,\n stridedSliceConfig,\n subConfig,\n sumConfig,\n tanConfig,\n tanhConfig,\n tileConfig,\n topKConfig,\n transformConfig,\n transposeConfig,\n unpackConfig,\n zerosLikeConfig\n];\n\nfor (const kernelConfig of kernelConfigs) {\n registerKernel(kernelConfig);\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {env} from '@tensorflow/tfjs-core';\n\nconst ENV = env();\n\n/**\n * True if SIMD is supported.\n */\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag(\n // This typed array passed in to WebAssembly.validate is WebAssembly binary\n // code. In this case it is a small program that contains SIMD\n // instructions.\n 'WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new Uint8Array([\n 0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3,\n 2, 1, 0, 10, 9, 1, 7, 0, 65, 0, 253, 15, 26, 11\n])));\n\n/**\n * True if threads are supported.\n */\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag('WASM_HAS_MULTITHREAD_SUPPORT', async () => {\n // TODO(annxingyuan): Enable node support once this is resolved:\n // https://github.com/tensorflow/tfjs/issues/3830\n if (ENV.get('IS_NODE')) {\n return false;\n }\n\n try {\n // Test for transferability of SABs (needed for Firefox)\n // https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkBZlHETpA/dwsMNchWEQAJ\n new MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n // This typed array is a WebAssembly program containing threaded\n // instructions.\n return WebAssembly.validate(new Uint8Array([\n 0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3, 2, 1, 0, 5,\n 4, 1, 3, 1, 1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26, 11\n]));\n } catch (e) {\n return false;\n }\n});\n","\nvar WasmBackendModuleThreadedSimd = (function() {\n var _scriptDir = typeof document !== 'undefined' && document.currentScript ? document.currentScript.src : undefined;\n if (typeof __filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return (\nfunction(WasmBackendModuleThreadedSimd) {\n WasmBackendModuleThreadedSimd = WasmBackendModuleThreadedSimd || {};\n\nfunction GROWABLE_HEAP_I8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAP8}function GROWABLE_HEAP_U8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAPU8}function GROWABLE_HEAP_I32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAP32}function GROWABLE_HEAP_U32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAPU32}function

GROWABLE_HEAP_F64(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAPF64}var Module=typeof WasmBackendModuleThreadedSimd!==\"undefined\"?WasmBackendModuleThreadedSimd:{};var readyPromiseResolve,readyPromiseReject;Module[\"ready\"]=new Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var moduleOverrides={};var key;for(key in Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var thisProgram=\"./this.program\";var quit_=function(status,toThrow){throw toThrow};var ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof window===\"object\";ENVIRONMENT_IS_WORKER=typeof importScripts===\"function\";ENVIRONMENT_IS_NODE=typeof process===\"object\"&&typeof process.versions===\"object\"&&typeof process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONMENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var ENVIRONMENT_IS_PTHREAD=Module[\"ENVIRONMENT_IS_PTHREAD\"]||false;if(ENVIRONMENT_IS_PTHREAD){buffer=Module[\"buffer\"]}var scriptDirectory=\"\";function locateFile(path){if(Module[\"locateFile\"]){return Module[\"locateFile\"](path,scriptDirectory)}return scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\"path\").dirname(scriptDirectory)+\"/\"}else{scriptDirectory=__dirname+\"/\"}read_=function shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=nodePath[\"normalize\"](filename);return nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\")};readBinary=function readBinary(filename){var ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return ret};if(process[\"argv\"].length>1){thisProgram=process[\"argv\"][1].replace(/\\\\/g,\"/\")}arguments_=process[\"argv\"].slice(2);process[\"on\"](\"uncaughtException\",function(ex){if(!(ex instanceof ExitStatus)){throw ex}});process[\"on\"](\"unhandledRejection\",abort);quit_=function(status){process[\"exit\"](status)};Module[\"inspect\"]=function(){return\"[Emscripten Module object]\"};var nodeWorkerThreads;try{nodeWorkerThreads=require(\"worker_threads\")}catch(e){console.error('The \"worker_threads\" module is not supported in this node.js build - perhaps a newer version is needed?');throw e}global.Worker=nodeWorkerThreads.Worker}else if(ENVIRONMENT_IS_SHELL){if(typeof read!=\"undefined\"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var data;if(typeof readbuffer===\"function\"){return new Uint8Array(readbuffer(f))}data=read(f,\"binary\");assert(typeof data===\"object\");return data};if(typeof scriptArgs!=\"undefined\"){arguments_=scriptArgs}else if(typeof arguments!=\"undefined\"){arguments_=arguments}if(typeof quit===\"function\"){quit_=function(status){quit(status)}}if(typeof print!==\"undefined\"){if(typeof console===\"undefined\")console={};console.log=print;console.warn=console.error=typeof printErr!==\"undefined\"?printErr:print}}else if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDirectory=self.location.href}else if(typeof document!==\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(typeof _scriptDir !== \"undefined\" && _scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf(\"blob:\")!==0){scriptDirectory=scriptDirectory.substr(0,scriptDirectory.lastIndexOf(\"/\")+1)}else{scriptDirectory=\"\"}if(ENVIRONMENT_IS_NODE){read_=function

shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=nodePath[\"normalize\"](filename);return nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\")};readBinary=function readBinary(filename){var ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return ret}}else{read_=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.send(null);return xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.responseType=\"arraybuffer\";xhr.send(null);return new Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,true);xhr.responseType=\"arraybuffer\";xhr.onload=function(){if(xhr.status==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror()};xhr.onerror=onerror;xhr.send(null)}}setWindowTitle=function(title){document.title=title}}else{}if(ENVIRONMENT_IS_NODE){if(typeof performance===\"undefined\"){global.performance=require(\"perf_hooks\").performance}}var out=Module[\"print\"]||console.log.bind(console);var err=Module[\"printErr\"]||console.warn.bind(console);for(key in moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverrides=null;if(Module[\"arguments\"])arguments_=Module[\"arguments\"];if(Module[\"thisProgram\"])thisProgram=Module[\"thisProgram\"];if(Module[\"quit\"])quit_=Module[\"quit\"];function warnOnce(text){if(!warnOnce.shown)warnOnce.shown={};if(!warnOnce.shown[text]){warnOnce.shown[text]=1;err(text)}}var Atomics_load=Atomics.load;var Atomics_store=Atomics.store;var Atomics_compareExchange=Atomics.compareExchange;var wasmBinary;if(Module[\"wasmBinary\"])wasmBinary=Module[\"wasmBinary\"];var noExitRuntime=Module[\"noExitRuntime\"]||true;if(typeof WebAssembly!==\"object\"){abort(\"no native wasm support detected\")}var wasmMemory;var wasmModule;var ABORT=false;var EXITSTATUS;function assert(condition,text){if(!condition){abort(\"Assertion failed: \"+text)}}function getCFunc(ident){var func=Module[\"_\"+ident];assert(func,\"Cannot call unknown function \"+ident+\", make sure it is exported\");return func}function ccall(ident,returnType,argTypes,args,opts){var toC={\"string\":function(str){var ret=0;if(str!==null&&str!==undefined&&str!==0){var len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\"array\":function(arr){var ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function convertReturnValue(ret){if(returnType===\"string\")return UTF8ToString(ret);if(returnType===\"boolean\")return Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var i=0;i<args.length;i++){var converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i]=args[i]}}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var numericArgs=argTypes.every(function(type){return type===\"number\"});var numericRet=returnType!==\"string\";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return function(){return ccall(ident,returnType,argTypes,arguments,opts)}}function UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var str=\"\";while(!(idx>=endIdx)){var u0=heap[idx++];if(!u0)return str;if(!(u0&128)){str+=String.fromCharCode(u0);continue}var u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[idx++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function UTF8ToString(ptr,maxBytesToRead){return

ptr?UTF8ArrayToString(GROWABLE_HEAP_U8(),ptr,maxBytesToRead):\"\"}function stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var u=str.charCodeAt(i);if(u>=55296&&u<=57343){var u1=str.charCodeAt(++i);u=65536+((u&1023)<<10)|u1&1023}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function stringToUTF8(str,outPtr,maxBytesToWrite){return stringToUTF8Array(str,GROWABLE_HEAP_U8(),outPtr,maxBytesToWrite)}function lengthBytesUTF8(str){var len=0;for(var i=0;i<str.length;++i){var u=str.charCodeAt(i);if(u>=55296&&u<=57343)u=65536+((u&1023)<<10)|str.charCodeAt(++i)&1023;if(u<=127)++len;else if(u<=2047)len+=2;else if(u<=65535)len+=3;else len+=4}return len}function writeArrayToMemory(array,buffer){GROWABLE_HEAP_I8().set(array,buffer)}function alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function updateGlobalBufferAndViews(buf){buffer=buf;Module[\"HEAP8\"]=HEAP8=new Int8Array(buf);Module[\"HEAP16\"]=HEAP16=new Int16Array(buf);Module[\"HEAP32\"]=HEAP32=new Int32Array(buf);Module[\"HEAPU8\"]=HEAPU8=new Uint8Array(buf);Module[\"HEAPU16\"]=HEAPU16=new Uint16Array(buf);Module[\"HEAPU32\"]=HEAPU32=new Uint32Array(buf);Module[\"HEAPF32\"]=HEAPF32=new Float32Array(buf);Module[\"HEAPF64\"]=HEAPF64=new Float64Array(buf)}var INITIAL_MEMORY=Module[\"INITIAL_MEMORY\"]||16777216;if(ENVIRONMENT_IS_PTHREAD){wasmMemory=Module[\"wasmMemory\"];buffer=Module[\"buffer\"]}else{if(Module[\"wasmMemory\"]){wasmMemory=Module[\"wasmMemory\"]}else{wasmMemory=new WebAssembly.Memory({\"initial\":INITIAL_MEMORY/65536,\"maximum\":2147483648/65536,\"shared\":true});if(!(wasmMemory.buffer instanceof SharedArrayBuffer)){err(\"requested a shared WebAssembly.Memory but the returned buffer is not a SharedArrayBuffer, indicating that while the browser has SharedArrayBuffer it does not have WebAssembly threads support - you may need to set a flag\");if(ENVIRONMENT_IS_NODE){console.log(\"(on node you may need: --experimental-wasm-threads --experimental-wasm-bulk-memory and also use a recent version)\")}throw Error(\"bad memory\")}}}if(wasmMemory){buffer=wasmMemory.buffer}INITIAL_MEMORY=buffer.byteLength;updateGlobalBufferAndViews(buffer);var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var __ATEXIT__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;var runtimeExited=false;if(!ENVIRONMENT_IS_PTHREAD)__ATINIT__.push({func:function(){___wasm_call_ctors()}});function preRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module[\"preRun\"]){if(typeof Module[\"preRun\"]==\"function\")Module[\"preRun\"]=[Module[\"preRun\"]];while(Module[\"preRun\"].length){addOnPreRun(Module[\"preRun\"].shift())}}callRuntimeCallbacks(__ATPRERUN__)}function initRuntime(){runtimeInitialized=true;if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATINIT__)}function preMain(){if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATMAIN__)}function exitRuntime(){if(ENVIRONMENT_IS_PTHREAD)return;runtimeExited=true}function postRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module[\"postRun\"]){if(typeof Module[\"postRun\"]==\"function\")Module[\"postRun\"]=[Module[\"postRun\"]];while(Module[\"postRun\"].length){addOnPostRun(Module[\"postRun\"].shift())}}callRuntimeCallbacks(__ATPOSTRUN__)}function addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var

runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function addRunDependency(id){assert(!ENVIRONMENT_IS_PTHREAD,\"addRunDependency cannot be used in a pthread worker\");runDependencies++;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}}function removeRunDependency(id){runDependencies--;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}if(runDependencies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}if(dependenciesFulfilled){var callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}}Module[\"preloadedImages\"]={};Module[\"preloadedAudios\"]={};function abort(what){if(Module[\"onAbort\"]){Module[\"onAbort\"](what)}if(ENVIRONMENT_IS_PTHREAD)console.error(\"Pthread aborting at \"+(new Error).stack);what+=\"\";err(what);ABORT=true;EXITSTATUS=1;what=\"abort(\"+what+\"). Build with -sASSERTIONS=1 for more info.\";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var dataURIPrefix=\"data:application/octet-stream; base64,\";function isDataURI(filename){return hasPrefix(filename,dataURIPrefix)}var fileURIPrefix=\"file://\";function isFileURI(filename){return hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile=\"tfjs-backend-wasm-threaded-simd.wasm\";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function getBinary(file){try{if(file==wasmBinaryFile&&wasmBinary){return new Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw\"both async and sync fetching of the wasm failed\"}}catch(err){abort(err)}}function getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof fetch===\"function\"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){if(!response[\"ok\"]){throw\"failed to load wasm binary file at '\"+wasmBinaryFile+\"'\"}return response[\"arrayBuffer\"]()}).catch(function(){return getBinary(wasmBinaryFile)})}else{if(readAsync){return new Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new Uint8Array(response))},reject)})}}}return Promise.resolve().then(function(){return getBinary(wasmBinaryFile)})}function createWasm(){var info={\"a\":asmLibraryArg};function receiveInstance(instance,module){var exports=instance.exports;Module[\"asm\"]=exports;wasmTable=Module[\"asm\"][\"I\"];wasmModule=module;if(!ENVIRONMENT_IS_PTHREAD){var numWorkersToLoad=PThread.unusedWorkers.length;PThread.unusedWorkers.forEach(function(w){PThread.loadWasmModuleToWorker(w,function(){if(!--numWorkersToLoad)removeRunDependency(\"wasm-instantiate\")})})}if(!ENVIRONMENT_IS_PTHREAD){addRunDependency(\"wasm-instantiate\")}function receiveInstantiatedSource(output){receiveInstance(output[\"instance\"],output[\"module\"])}function instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err(\"failed to asynchronously prepare wasm: \"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof WebAssembly.instantiateStreaming===\"function\"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFile)&&typeof fetch===\"function\"){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return result.then(receiveInstantiatedSource,function(reason){err(\"wasm streaming compile failed: \"+reason);err(\"falling back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)})})}else{return instantiateArrayBuffer(receiveInstantiatedSource)}}if(Module[\"instantiateWasm\"]){try{var exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports}catch(e){err(\"Module.instantiateWasm

callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}var ASM_CONSTS={10520:function(){throw\"Canceled!\"},10538:function($0,$1){setTimeout(function(){__emscripten_do_dispatch_to_thread($0,$1)},0)}};function initPthreadsJS(){PThread.initRuntime()}function callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof callback==\"function\"){callback(Module);continue}var func=callback.func;if(typeof func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)()}else{wasmTable.get(func)(callback.arg)}}else{func(callback.arg===undefined?null:callback.arg)}}}var ERRNO_CODES={EPERM:63,ENOENT:44,ESRCH:71,EINTR:27,EIO:29,ENXIO:60,E2BIG:1,ENOEXEC:45,EBADF:8,ECHILD:12,EAGAIN:6,EWOULDBLOCK:6,ENOMEM:48,EACCES:2,EFAULT:21,ENOTBLK:105,EBUSY:10,EEXIST:20,EXDEV:75,ENODEV:43,ENOTDIR:54,EISDIR:31,EINVAL:28,ENFILE:41,EMFILE:33,ENOTTY:59,ETXTBSY:74,EFBIG:22,ENOSPC:51,ESPIPE:70,EROFS:69,EMLINK:34,EPIPE:64,EDOM:18,ERANGE:68,ENOMSG:49,EIDRM:24,ECHRNG:106,EL2NSYNC:156,EL3HLT:107,EL3RST:108,ELNRNG:109,EUNATCH:110,ENOCSI:111,EL2HLT:112,EDEADLK:16,ENOLCK:46,EBADE:113,EBADR:114,EXFULL:115,ENOANO:104,EBADRQC:103,EBADSLT:102,EDEADLOCK:16,EBFONT:101,ENOSTR:100,ENODATA:116,ETIME:117,ENOSR:118,ENONET:119,ENOPKG:120,EREMOTE:121,ENOLINK:47,EADV:122,ESRMNT:123,ECOMM:124,EPROTO:65,EMULTIHOP:36,EDOTDOT:125,EBADMSG:9,ENOTUNIQ:126,EBADFD:127,EREMCHG:128,ELIBACC:129,ELIBBAD:130,ELIBSCN:131,ELIBMAX:132,ELIBEXEC:133,ENOSYS:52,ENOTEMPTY:55,ENAMETOOLONG:37,ELOOP:32,EOPNOTSUPP:138,EPFNOSUPPORT:139,ECONNRESET:15,ENOBUFS:42,EAFNOSUPPORT:5,EPROTOTYPE:67,ENOTSOCK:57,ENOPROTOOPT:50,ESHUTDOWN:140,ECONNREFUSED:14,EADDRINUSE:3,ECONNABORTED:13,ENETUNREACH:40,ENETDOWN:38,ETIMEDOUT:73,EHOSTDOWN:142,EHOSTUNREACH:23,EINPROGRESS:26,EALREADY:7,EDESTADDRREQ:17,EMSGSIZE:35,EPROTONOSUPPORT:66,ESOCKTNOSUPPORT:137,EADDRNOTAVAIL:4,ENETRESET:39,EISCONN:30,ENOTCONN:53,ETOOMANYREFS:141,EUSERS:136,EDQUOT:19,ESTALE:72,ENOTSUP:138,ENOMEDIUM:148,EILSEQ:25,EOVERFLOW:61,ECANCELED:11,ENOTRECOVERABLE:56,EOWNERDEAD:62,ESTRPIPE:135};function _emscripten_futex_wake(addr,count){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0||count<0)return-28;if(count==0)return 0;if(count>=2147483647)count=Infinity;var mainThreadWaitAddress=Atomics.load(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2);var mainThreadWoken=0;if(mainThreadWaitAddress==addr){var loadedAddr=Atomics.compareExchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,mainThreadWaitAddress,0);if(loadedAddr==mainThreadWaitAddress){--count;mainThreadWoken=1;if(count<=0)return 1}}var ret=Atomics.notify(GROWABLE_HEAP_I32(),addr>>2,count);if(ret>=0)return ret+mainThreadWoken;throw\"Atomics.notify returned an unexpected value \"+ret}Module[\"_emscripten_futex_wake\"]=_emscripten_futex_wake;function killThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! killThread() can only ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in killThread!\";GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var pthread=PThread.pthreads[pthread_ptr];pthread.worker.terminate();PThread.freeThreadData(pthread);PThread.runningWorkers.splice(PThread.runningWorkers.indexOf(pthread.worker),1);pthread.worker.pthread=undefined}function cancelThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cancelThread() can only ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in cancelThread!\";var pthread=PThread.pthreads[pthread_ptr];pthread.worker.postMessage({\"cmd\":\"cancel\"})}function cleanupThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cleanupThread() can only ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in cleanupThread!\";var pthread=PThread.pthreads[pthread_ptr];if(pthread){GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var worker=pthread.worker;PThread.returnWorkerToPool(worker)}}var

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PThread={unusedWorkers:[],runningWorkers:[],initMainThreadBlock:function(){var
 pthreadPoolSize=8;for(var
i=0;i<pthreadPoolSize;++i){PThread.allocateUnusedWorker()}},initRuntime:function(){var
tb=_malloc(228);for(var
i=0;i<228/4;++i)GROWABLE_HEAP_U32()[tb/4+i]=0;GROWABLE_HEAP_I32()[tb+12>>2]=tb;var
headPtr=tb+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var tlsMemory=_malloc(512);for(var
i=0;i<128;++i)GROWABLE_HEAP_U32()[tlsMemory/4+i]=0;Atomics.store(GROWABLE_HEAP_U32(),tb+100
>>2,tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tb+40>>2,tb);__emscripten_thread_init(tb,!ENVIRON
MENT_IS_WORKER,1);_emscripten_register_main_browser_thread_id(tb)},initWorker:function(){},pthreads:{},t
hreadExitHandlers:[],setThreadStatus:function(){},runExitHandlers:function(){while(PThread.threadExitHandlers.l
ength>0){PThread.threadExitHandlers.pop()()}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self())___pthread
_tsd_run_dtors()},runExitHandlersAndDeinitThread:function(tb,exitCode){Atomics.store(GROWABLE_HEAP_U
32(),tb+56>>2,1);Atomics.store(GROWABLE_HEAP_U32(),tb+60>>2,0);PThread.runExitHandlers();Atomics.stor
e(GROWABLE_HEAP_U32(),tb+4>>2,exitCode);Atomics.store(GROWABLE_HEAP_U32(),tb+0>>2,1);_emscri
pten_futex_wake(tb+0,2147483647);__emscripten_thread_init(0,0,0)},threadExit:function(exitCode){var
tb=_pthread_self();if(tb){PThread.runExitHandlersAndDeinitThread(tb,exitCode);if(ENVIRONMENT_IS_PTHRE
AD){postMessage({\"cmd\":\"exit\"})}}},threadCancel:function(){PThread.runExitHandlersAndDeinitThread(_pthr
ead_self(),-1);postMessage({\"cmd\":\"cancelDone\"})},terminateAllThreads:function(){for(var t in
PThread.pthreads){var
pthread=PThread.pthreads[t];if(pthread&&pthread.worker){PThread.returnWorkerToPool(pthread.worker)}}PThre
ad.pthreads={};for(var i=0;i<PThread.unusedWorkers.length;++i){var
worker=PThread.unusedWorkers[i];worker.terminate()}PThread.unusedWorkers=[];for(var
i=0;i<PThread.runningWorkers.length;++i){var worker=PThread.runningWorkers[i];var
pthread=worker.pthread;PThread.freeThreadData(pthread);worker.terminate()}PThread.runningWorkers=[]},freeTh
readData:function(pthread){if(!pthread)return;if(pthread.threadInfoStruct){var
tlsMemory=GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2];GROWABLE_HEAP_I32()[pthread.thr
eadInfoStruct+100>>2]=0;_free(tlsMemory);_free(pthread.threadInfoStruct)}pthread.threadInfoStruct=0;if(pthread.
allocatedOwnStack&&pthread.stackBase)_free(pthread.stackBase);pthread.stackBase=0;if(pthread.worker)pthread.
worker.pthread=null},returnWorkerToPool:function(worker){PThread.runWithoutMainThreadQueuedCalls(functio
n(){delete
PThread.pthreads[worker.pthread.threadInfoStruct];PThread.unusedWorkers.push(worker);PThread.runningWorker
s.splice(PThread.runningWorkers.indexOf(worker),1);PThread.freeThreadData(worker.pthread);worker.pthread=un
defined})},runWithoutMainThreadQueuedCalls:function(func){GROWABLE_HEAP_I32()[__emscripten_allow_m
ain_runtime_queued_calls>>2]=0;try{func()}finally{GROWABLE_HEAP_I32()[__emscripten_allow_main_runti
me_queued_calls>>2]=1}},receiveObjectTransfer:function(data){},loadWasmModuleToWorker:function(worker,o
nFinishedLoading){worker.onmessage=function(e){var
 d=e[\"data\"];var
cmd=d[\"cmd\"];if(worker.pthread)PThread.currentProxiedOperationCallerThread=worker.pthread.threadInfoStruct;
if(d[\"targetThread\"]&&d[\"targetThread\"]!=_pthread_self()){var
thread=PThread.pthreads[d.targetThread];if(thread){thread.worker.postMessage(e.data,d[\"transferList\"])}else{con
sole.error('Internal error! Worker sent a message \"'+cmd+'\" to target pthread '+d[\"targetThread\"]+\", but that
thread no longer
exists!\")}PThread.currentProxiedOperationCallerThread=undefined;return}if(cmd===\"processQueuedMainThread
Work\"){_emscripten_main_thread_process_queued_calls()}else
if(cmd===\"spawnThread\"){spawnThread(e.data)}else
if(cmd===\"cleanupThread\"){cleanupThread(d[\"thread\"])}else
if(cmd===\"killThread\"){killThread(d[\"thread\"])}else
if(cmd===\"cancelThread\"){cancelThread(d[\"thread\"])}else
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if(cmd===\"loaded\"){worker.loaded=true;if(onFinishedLoading)onFinishedLoading(worker);if(worker.runPthread){worker.runPthread();delete worker.runPthread}}else if(cmd===\"print\"){out(\"Thread \"+d[\"threadId\"]+\": \"+d[\"text\"])}else if(cmd===\"printErr\"){err(\"Thread \"+d[\"threadId\"]+\": \"+d[\"text\"])}else if(cmd===\"alert\"){alert(\"Thread \"+d[\"threadId\"]+\": \"+d[\"text\"])}else if(cmd===\"exit\"){var detached=worker.pthread&&Atomics.load(GROWABLE_HEAP_U32(),worker.pthread.threadInfoStruct+64>>2);if(detached){PThread.returnWorkerToPool(worker)}}else if(cmd===\"exitProcess\"){try{exit(d[\"returnCode\"])}catch(e){if(e instanceof ExitStatus)return;throw e}}else if(cmd===\"cancelDone\"){PThread.returnWorkerToPool(worker)}else if(cmd===\"objectTransfer\"){PThread.receiveObjectTransfer(e.data)}else if(e.data.target===\"setimmediate\"){worker.postMessage(e.data)}else{err(\"worker sent an unknown command \"+cmd)}PThread.currentProxiedOperationCallerThread=undefined};worker.onerror=function(e){err(\"pthread sent an error! \"+e.filename+\":\"+e.lineno+\": \"+e.message)};if(ENVIRONMENT_IS_NODE){worker.on(\"message\",function(data){worker.onmessage({data:data})});worker.on(\"error\",function(data){worker.onerror(data)});worker.on(\"exit\",function(data){})}worker.postMessage({\"cmd\":\"load\",\"urlOrBlob\":Module[\"mainScriptUrlOrBlob\"]||_scriptDir,\"wasmMemory\":wasmMemory,\"wasmModule\":wasmModule})},allocateUnusedWorker:function(){var pthreadMainJs=locateFile(\"tfjs-backend-wasm-threaded-simd.worker.js\");PThread.unusedWorkers.push(new Worker(pthreadMainJs))},getNewWorker:function(){if(PThread.unusedWorkers.length==0){PThread.allocateUnusedWorker();PThread.loadWasmModuleToWorker(PThread.unusedWorkers[0])}if(PThread.unusedWorkers.length>0)return PThread.unusedWorkers.pop();else return null},busySpinWait:function(msecs){var t=performance.now()+msecs;while(performance.now()<t){}}};function establishStackSpace(stackTop,stackMax){_emscripten_stack_set_limits(stackTop,stackMax);stackRestore(stackTop)}Module[\"establishStackSpace\"]=establishStackSpace;function getNoExitRuntime(){return noExitRuntime}Module[\"getNoExitRuntime\"]=getNoExitRuntime;function invokeEntryPoint(ptr,arg){return wasmTable.get(ptr)(arg)}Module[\"invokeEntryPoint\"]=invokeEntryPoint;function ___assert_fail(condition,filename,line,func){abort(\"Assertion failed: \"+UTF8ToString(condition)+\", at: \"+[filename?UTF8ToString(filename):\"unknown filename\",line,func?UTF8ToString(func):\"unknown function\"])}function ___call_main(argc,argv){var returnCode=_main(argc,argv)}var _emscripten_get_now;if(ENVIRONMENT_IS_NODE){_emscripten_get_now=function(){var t=process[\"hrtime\"]();return t[0]*1e3+t[1]/1e6}}else if(ENVIRONMENT_IS_PTHREAD){_emscripten_get_now=function(){return performance.now()-Module[\"__performance_now_clock_drift\"]}}else if(typeof dateNow!==\"undefined\"){_emscripten_get_now=dateNow}else _emscripten_get_now=function(){return performance.now()};function setErrNo(value){GROWABLE_HEAP_I32()[___errno_location()>>2]=value;return value}function _atexit(func,arg){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(1,1,func,arg)}function __emscripten_notify_thread_queue(targetThreadId,mainThreadId){if(targetThreadId==mainThreadId){postMessage({\"cmd\":\"processQueuedMainThreadWork\"})}else if(ENVIRONMENT_IS_PTHREAD){postMessage({\"targetThread\":targetThreadId,\"cmd\":\"processThreadQueue\"})}else{var pthread=PThread.pthreads[targetThreadId];var worker=pthread&&pthread.worker;if(!worker){return}worker.postMessage({\"cmd\":\"processThreadQueue\"})}return 1}function _abort(){abort()}function _emscripten_asm_const_int(code,sigPtr,argbuf){var args=readAsmConstArgs(sigPtr,argbuf);return ASM_CONSTS[code].apply(null,args)}function _emscripten_conditional_set_current_thread_status(expectedStatus,newStatus){}function _emscripten_futex_wait(addr,val,timeout){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0)return-28;if(!ENVIRONMENT_IS_WEB){var ret=Atomics.wait(GROWABLE_HEAP_I32(),addr>>2,val,timeout);if(ret===\"timed-out\")return-

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73;if(ret===\"not-equal\")return-6;if(ret===\"ok\")return
 0;throw\"Atomics.wait returned an unexpected value
\"+ret}else{if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}var
tNow=performance.now();var tEnd=tNow+timeout;var
lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr);while(1){tNo
w=performance.now();if(tNow>tEnd){lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_mai
n_thread_futex>>2,0);return-
73}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,0);if(lastAddr==
0){break}_emscripten_main_thread_process_queued_calls();if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!
=val){return-
6}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr)}return
0}}function
_emscripten_memcpy_big(dest,src,num){GROWABLE_HEAP_U8().copyWithin(dest,src,src+num)}function
_emscripten_num_logical_cores(){if(ENVIRONMENT_IS_NODE)return require(\"os\").cpus().length;return
navigator[\"hardwareConcurrency\"]}function
 _emscripten_proxy_to_main_thread_js(index,sync){var numCallArgs=arguments.length-2;var
stack=stackSave();var serializedNumCallArgs=numCallArgs;var args=stackAlloc(serializedNumCallArgs*8);var
b=args>>3;for(var i=0;i<numCallArgs;i++){var arg=arguments[2+i];GROWABLE_HEAP_F64()[b+i]=arg}var
ret=_emscripten_run_in_main_runtime_thread_js(index,serializedNumCallArgs,args,sync);stackRestore(stack);retur
n ret}var _emscripten_receive_on_main_thread_js_callArgs=[];var readAsmConstArgsArray=[];function
readAsmConstArgs(sigPtr,buf){readAsmConstArgsArray.length=0;var
ch;buf>>=2;while(ch=GROWABLE_HEAP_U8()[sigPtr++]){var
double=ch<105;if(double&&buf&1)buf++;readAsmConstArgsArray.push(double?GROWABLE_HEAP_F64()[buf
++>>1]:GROWABLE_HEAP_I32()[buf]);++buf}return readAsmConstArgsArray}function
_emscripten_receive_on_main_thread_js(index,numCallArgs,args){_emscripten_receive_on_main_thread_js_callA
rgs.length=numCallArgs;var b=args>>3;for(var
i=0;i<numCallArgs;i++){_emscripten_receive_on_main_thread_js_callArgs[i]=GROWABLE_HEAP_F64()[b+i]}v
ar
 isEmAsmConst=index<0;var func=!isEmAsmConst?proxiedFunctionTable[index]:ASM_CONSTS[-index-
1];return func.apply(null,_emscripten_receive_on_main_thread_js_callArgs)}function
_emscripten_get_heap_size(){return GROWABLE_HEAP_U8().length}function
emscripten_realloc_buffer(size){try{wasmMemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return
1}catch(e){}}function _emscripten_resize_heap(requestedSize){var
oldSize=_emscripten_get_heap_size();if(requestedSize<=oldSize){return false}var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
JSEvents={inEventHandler:0,removeAllEventListeners:function(){for(var
 i=JSEvents.eventHandlers.length-1;i>=0;--
i){JSEvents._removeHandler(i)}JSEvents.eventHandlers=[];JSEvents.deferredCalls=[]},registerRemoveEventListen
ers:function(){if(!JSEvents.removeEventListenersRegistered){__ATEXIT__.push(JSEvents.removeAllEventListene
rs);JSEvents.removeEventListenersRegistered=true}},deferredCalls:[],deferCall:function(targetFunction,precedence
,argsList){function arraysHaveEqualContent(arrA,arrB){if(arrA.length!=arrB.length)return false;for(var i in
arrA){if(arrA[i]!=arrB[i])return false}return true}for(var i in JSEvents.deferredCalls){var
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call=JSEvents.deferredCalls[i];if(call.targetFunction==targetFunction&&arraysHaveEqualContent(call.argsList,argsList)){return}}JSEvents.deferredCalls.push({targetFunction:targetFunction,precedence:precedence,argsList:argsList});JSEvents.deferredCalls.sort(function(x,y){return x.precedence<y.precedence})},removeDeferredCalls:function(targetFunction){for(var i=0;i<JSEvents.deferredCalls.length;++i){if(JSEvents.deferredCalls[i].targetFunction==targetFunction){JSEvents.deferredCalls.splice(i,1);--i}}},canPerformEventHandlerRequests:function(){return JSEvents.inEventHandler&&JSEvents.currentEventHandler.allowsDeferredCalls},runDeferredCalls:function(){if(!JSEvents.canPerformEventHandlerRequests()){return}for(var i=0;i<JSEvents.deferredCalls.length;++i){var call=JSEvents.deferredCalls[i];JSEvents.deferredCalls.splice(i,1);--i;call.targetFunction.apply(null,call.argsList)}},eventHandlers:[],removeAllHandlersOnTarget:function(target,eventTypeString){for(var i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==target&&(!eventTypeString||eventTypeString==JSEvents.eventHandlers[i].eventTypeString)){JSEvents._removeHandler(i--)}}},_removeHandler:function(i){var h=JSEvents.eventHandlers[i];h.target.removeEventListener(h.eventTypeString,h.eventListenerFunc,h.useCapture);JSEvents.eventHandlers.splice(i,1)},registerOrRemoveHandler:function(eventHandler){var jsEventHandler=function jsEventHandler(event){++JSEvents.inEventHandler;JSEvents.currentEventHandler=eventHandler;JSEvents.runDeferredCalls();eventHandler.handlerFunc(event);JSEvents.runDeferredCalls();--JSEvents.inEventHandler};if(eventHandler.callbackfunc){eventHandler.eventListenerFunc=jsEventHandler;eventHandler.target.addEventListener(eventHandler.eventTypeString,jsEventHandler,eventHandler.useCapture);JSEvents.eventHandlers.push(eventHandler);JSEvents.registerRemoveEventListeners()}else{for(var i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==eventHandler.target&&JSEvents.eventHandlers[i].eventTypeString==eventHandler.eventTypeString){JSEvents._removeHandler(i--)}}}},queueEventHandlerOnThread_iiii:function(targetThread,eventHandlerFunc,eventTypeId,eventData,userData){var stackTop=stackSave();var varargs=stackAlloc(12);GROWABLE_HEAP_I32()[varargs>>2]=eventTypeId;GROWABLE_HEAP_I32()[varargs+4>>2]=eventData;GROWABLE_HEAP_I32()[varargs+8>>2]=userData;__emscripten_call_on_thread(0,targetThread,637534208,eventHandlerFunc,eventData,varargs);stackRestore(stackTop)},getTargetThreadForEventCallback:function(targetThread){switch(targetThread){case 1:return 0;case 2:return PThread.currentProxiedOperationCallerThread;default:return targetThread}},getNodeNameForTarget:function(target){if(!target)return\"\";if(target==window)return\"#window\";if(target==screen)return\"#screen\";return target&&target.nodeName?target.nodeName:\"\"},fullscreenEnabled:function(){return document.fullscreenEnabled||document.webkitFullscreenEnabled}};function stringToNewUTF8(jsString){var length=lengthBytesUTF8(jsString)+1;var cString=_malloc(length);stringToUTF8(jsString,cString,length);return cString}function _emscripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height){var stackTop=stackSave();var varargs=stackAlloc(12);var targetCanvasPtr=0;if(targetCanvas){targetCanvasPtr=stringToNewUTF8(targetCanvas)}GROWABLE_HEAP_I32()[varargs>>2]=targetCanvasPtr;GROWABLE_HEAP_I32()[varargs+4>>2]=width;GROWABLE_HEAP_I32()[varargs+8>>2]=height;__emscripten_call_on_thread(0,targetThread,657457152,0,targetCanvasPtr,varargs);stackRestore(stackTop)}function _emscripten_set_offscreencanvas_size_on_target_thread(targetThread,targetCanvas,width,height){targetCanvas=targetCanvas?UTF8ToString(targetCanvas):\"\";_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height)}function maybeCStringToJsString(cString){return cString>2?UTF8ToString(cString):cString}var specialHTMLTargets=[0,typeof document!==\"undefined\"?document:0,typeof window!==\"undefined\"?window:0];function

findEventTarget(target){target=maybeCStringToJsString(target);var
domElement=specialHTMLTargets[target]||(typeof
document!==\"undefined\"?document.querySelector(target):undefined);return domElement}function
findCanvasEventTarget(target){return findEventTarget(target)}function
_emscripten_set_canvas_element_size_calling_thread(target,width,height){var
canvas=findCanvasEventTarget(target);if(!canvas)return-
4;if(canvas.canvasSharedPtr){GROWABLE_HEAP_I32()[canvas.canvasSharedPtr>>2]=width;GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+4>>2]=height}if(canvas.offscreenCanvas||!canvas.controlTransferredOffscreen){if(canvas.offscreenCanvas)canvas=canvas.offscreenCanvas;var
autoResizeViewport=false;if(canvas.GLctxObject&&canvas.GLctxObject.GLctx){var
prevViewport=canvas.GLctxObject.GLctx.getParameter(2978);autoResizeViewport=prevViewport[0]===0&&prevViewport[1]===0&&prevViewport[2]===canvas.width&&prevViewport[3]===canvas.height}canvas.width=width;canvas.height=height;if(autoResizeViewport){canvas.GLctxObject.GLctx.viewport(0,0,width,height)}}else
if(canvas.canvasSharedPtr){var
targetThread=GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+8>>2];_emscripten_set_offscreencanvas_size_on_target_thread(targetThread,target,width,height);return 1}else{return-4}return 0}function
_emscripten_set_canvas_element_size_main_thread(target,width,height){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(2,1,target,width,height);return
_emscripten_set_canvas_element_size_calling_thread(target,width,height)}function
_emscripten_set_canvas_element_size(target,width,height){var
canvas=findCanvasEventTarget(target);if(canvas){return
_emscripten_set_canvas_element_size_calling_thread(target,width,height)}else{return
_emscripten_set_canvas_element_size_main_thread(target,width,height)}}function
_emscripten_set_current_thread_status(newStatus){}function
_emscripten_set_thread_name(threadId,name){}function __webgl_enable_ANGLE_instanced_arrays(ctx){var
ext=ctx.getExtension(\"ANGLE_instanced_arrays\");if(ext){ctx[\"vertexAttribDivisor\"]=function(index,divisor){ext[\"vertexAttribDivisorANGLE\"](index,divisor)};ctx[\"drawArraysInstanced\"]=function(mode,first,count,primcount){ext[\"drawArraysInstancedANGLE\"](mode,first,count,primcount)};ctx[\"drawElementsInstanced\"]=function(mode,count,type,indices,primcount){ext[\"drawElementsInstancedANGLE\"](mode,count,type,indices,primcount)};return
1}}function __webgl_enable_OES_vertex_array_object(ctx){var
ext=ctx.getExtension(\"OES_vertex_array_object\");if(ext){ctx[\"createVertexArray\"]=function(){return
ext[\"createVertexArrayOES\"]()};ctx[\"deleteVertexArray\"]=function(vao){ext[\"deleteVertexArrayOES\"](vao)};ctx[\"bindVertexArray\"]=function(vao){ext[\"bindVertexArrayOES\"](vao)};ctx[\"isVertexArray\"]=function(vao){return ext[\"isVertexArrayOES\"](vao)};return 1}}function __webgl_enable_WEBGL_draw_buffers(ctx){var
ext=ctx.getExtension(\"WEBGL_draw_buffers\");if(ext){ctx[\"drawBuffers\"]=function(n,bufs){ext[\"drawBuffersWEBGL\"](n,bufs)};return 1}}function
__webgl_enable_WEBGL_multi_draw(ctx){return!!(ctx.multiDrawWebgl=ctx.getExtension(\"WEBGL_multi_draw\"))}var
GL={counter:1,buffers:[],programs:[],framebuffers:[],renderbuffers:[],textures:[],uniforms:[],shaders:[],vaos:[],contexts:{},offscreenCanvases:{},timerQueriesEXT:[],programInfos:{},stringCache:{},unpackAlignment:4,recordError:function
recordError(errorCode){if(!GL.lastError){GL.lastError=errorCode}},getNewId:function(table){var
ret=GL.counter++;for(var i=table.length;i<ret;i++){table[i]=null}return
ret},getSource:function(shader,count,string,length){var source=\"\";for(var i=0;i<count;++i){var
len=length?GROWABLE_HEAP_I32()[length+i*4>>2]:-
1;source+=UTF8ToString(GROWABLE_HEAP_I32()[string+i*4>>2],len<0?undefined:len)}return

source},createContext:function(canvas,webGLContextAttributes){var
ctx=canvas.getContext(\"webgl\",webGLContextAttributes);if(!ctx)return 0;var
handle=GL.registerContext(ctx,webGLContextAttributes);return
handle},registerContext:function(ctx,webGLContextAttributes){var
handle=_malloc(8);GROWABLE_HEAP_I32()[handle+4>>2]=_pthread_self();var
context={handle:handle,attributes:webGLContextAttributes,version:webGLContextAttributes.majorVersion,GLctx:
ctx};if(ctx.canvas)ctx.canvas.GLctxObject=context;GL.contexts[handle]=context;if(typeof
webGLContextAttributes.enableExtensionsByDefault===\"undefined\"||webGLContextAttributes.enableExtensions
ByDefault){GL.initExtensions(context)}return
handle},makeContextCurrent:function(contextHandle){GL.currentContext=GL.contexts[contextHandle];Module.ctx
=GLctx=GL.currentContext&&GL.currentContext.GLctx;return!(contextHandle&&!GLctx)},getContext:function(c
ontextHandle){return
GL.contexts[contextHandle]},deleteContext:function(contextHandle){if(GL.currentContext===GL.contexts[context
Handle])GL.currentContext=null;if(typeof
JSEvents===\"object\")JSEvents.removeAllHandlersOnTarget(GL.contexts[contextHandle].GLctx.canvas);if(GL.co
ntexts[contextHandle]&&GL.contexts[contextHandle].GLctx.canvas)GL.contexts[contextHandle].GLctx.canvas.GL
ctxObject=undefined;_free(GL.contexts[contextHandle].handle);GL.contexts[contextHandle]=null},initExtensions:f
unction(context){if(!context)context=GL.currentContext;if(context.initExtensionsDone)return;context.initExtension
sDone=true;var
GLctx=context.GLctx;__webgl_enable_ANGLE_instanced_arrays(GLctx);__webgl_enable_OES_vertex_array_obj
ect(GLctx);__webgl_enable_WEBGL_draw_buffers(GLctx);GLctx.disjointTimerQueryExt=GLctx.getExtension(\"
EXT_disjoint_timer_query\");__webgl_enable_WEBGL_multi_draw(GLctx);var
exts=GLctx.getSupportedExtensions()||[];exts.forEach(function(ext){if(ext.indexOf(\"lose_context\")<0&&ext.inde
xOf(\"debug\")<0){GLctx.getExtension(ext)}})},populateUniformTable:function(program){var
p=GL.programs[program];var
ptable=GL.programInfos[program]={uniforms:{},maxUniformLength:0,maxAttributeLength:-
1,maxUniformBlockNameLength:-1};var utable=ptable.uniforms;var
numUniforms=GLctx.getProgramParameter(p,35718);for(var i=0;i<numUniforms;++i){var
u=GLctx.getActiveUniform(p,i);var
name=u.name;ptable.maxUniformLength=Math.max(ptable.maxUniformLength,name.length+1);if(name.slice(-
1)==\"]\"){name=name.slice(0,name.lastIndexOf(\"[\"))}var loc=GLctx.getUniformLocation(p,name);if(loc){var
id=GL.getNewId(GL.uniforms);utable[name]=[u.size,id];GL.uniforms[id]=loc;for(var
j=1;j<u.size;++j){var
n=name+\"[\"+j+\"]\";loc=GLctx.getUniformLocation(p,n);id=GL.getNewId(GL.uniforms);GL.uniforms[id]=loc}}
}};var __emscripten_webgl_power_preferences=[\"default\",\"low-power\",\"high-performance\"];function
_emscripten_webgl_do_create_context(target,attributes){var a=attributes>>2;var
powerPreference=GROWABLE_HEAP_I32()[a+(24>>2)];var
contextAttributes={\"alpha\":!!GROWABLE_HEAP_I32()[a+(0>>2)],\"depth\":!!GROWABLE_HEAP_I32()[a+(4
>>2)],\"stencil\":!!GROWABLE_HEAP_I32()[a+(8>>2)],\"antialias\":!!GROWABLE_HEAP_I32()[a+(12>>2)],\"p
remultipliedAlpha\":!!GROWABLE_HEAP_I32()[a+(16>>2)],\"preserveDrawingBuffer\":!!GROWABLE_HEAP_
I32()[a+(20>>2)],\"powerPreference\":__emscripten_webgl_power_preferences[powerPreference],\"failIfMajorPerf
ormanceCaveat\":!!GROWABLE_HEAP_I32()[a+(28>>2)],majorVersion:GROWABLE_HEAP_I32()[a+(32>>2)],
minorVersion:GROWABLE_HEAP_I32()[a+(36>>2)],enableExtensionsByDefault:GROWABLE_HEAP_I32()[a+(
40>>2)],explicitSwapControl:GROWABLE_HEAP_I32()[a+(44>>2)],proxyContextToMainThread:GROWABLE_
HEAP_I32()[a+(48>>2)],renderViaOffscreenBackBuffer:GROWABLE_HEAP_I32()[a+(52>>2)]};var
canvas=findCanvasEventTarget(target);if(!canvas){return 0}if(contextAttributes.explicitSwapControl){return
0}var contextHandle=GL.createContext(canvas,contextAttributes);return contextHandle}function
_emscripten_webgl_create_context(a0,a1){return _emscripten_webgl_do_create_context(a0,a1)}var

SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var ret=GROWABLE_HEAP_I32()[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function _fd_close(fd){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(3,1,fd);return 0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(4,1,fd,offset_low,offset_high,whence,newOffset)}function _fd_write(fd,iov,iovcnt,pnum){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(5,1,fd,iov,iovcnt,pnum);var num=0;for(var i=0;i<iovcnt;i++){var ptr=GROWABLE_HEAP_I32()[iov+i*8>>2];var len=GROWABLE_HEAP_I32()[iov+(i*8+4)>>2];for(var j=0;j<len;j++){SYSCALLS.printChar(fd,GROWABLE_HEAP_U8()[ptr+j])}num+=len}GROWABLE_HEAP_I32()[pnum>>2]=num;return 0}function _pthread_cleanup_pop(execute){var routine=PThread.threadExitHandlers.pop();if(execute)routine()}function _pthread_cleanup_push(routine,arg){PThread.threadExitHandlers.push(function(){wasmTable.get(routine)(arg)})}function spawnThread(threadParams){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! spawnThread() can only ever be called from main application thread!\";var worker=PThread.getNewWorker();if(worker.pthread!==undefined)throw\"Internal error!\";if(!threadParams.pthread_ptr)throw\"Internal error, no pthread ptr!\";PThread.runningWorkers.push(worker);var tlsMemory=_malloc(128*4);for(var i=0;i<128;++i){GROWABLE_HEAP_I32()[tlsMemory+i*4>>2]=0}var stackHigh=threadParams.stackBase+threadParams.stackSize;var pthread=PThread.pthreads[threadParams.pthread_ptr]={worker:worker,stackBase:threadParams.stackBase,stackSize:threadParams.stackSize,allocatedOwnStack:threadParams.allocatedOwnStack,threadInfoStruct:threadParams.pthread_ptr};var tis=pthread.threadInfoStruct>>2;Atomics.store(GROWABLE_HEAP_U32(),tis+(64>>2),threadParams.detached);Atomics.store(GROWABLE_HEAP_U32(),tis+(100>>2),tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tis+(40>>2),pthread.threadInfoStruct);Atomics.store(GROWABLE_HEAP_U32(),tis+(80>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(76>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),tis+(104>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+8>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+12>>2),threadParams.detached);var global_libc=_emscripten_get_global_libc();var global_locale=global_libc+40;Atomics.store(GROWABLE_HEAP_U32(),tis+(172>>2),global_locale);worker.pthread=pthread;var msg={\"cmd\":\"run\",\"start_routine\":threadParams.startRoutine,\"arg\":threadParams.arg,\"threadInfoStruct\":threadParams.pthread_ptr,\"stackBase\":threadParams.stackBase,\"stackSize\":threadParams.stackSize};worker.runPthread=function(){msg.time=performance.now();worker.postMessage(msg,threadParams.transferList)};if(worker.loaded){worker.runPthread();delete worker.runPthread}}function _pthread_create(pthread_ptr,attr,start_routine,arg){if(typeof SharedArrayBuffer===\"undefined\"){err(\"Current environment does not support SharedArrayBuffer, pthreads are not available!\");return 6}if(!pthread_ptr){err(\"pthread_create called with a null thread pointer!\");return 28}var transferList=[];var error=0;if(ENVIRONMENT_IS_PTHREAD&&(transferList.length===0||error)){return _emscripten_sync_run_in_main_thread_4(687865856,pthread_ptr,attr,start_routine,arg)}if(error)return error;var stackSize=0;var stackBase=0;var detached=0;if(attr&&attr!=-1){stackSize=GROWABLE_HEAP_I32()[attr>>2];stackSize+=81920;stackBase=GROWABLE_HEAP_I32()[attr+8>>2];detached=GROWABLE_HEAP_I32()[attr+12>>2]!==0}else{stackSize=2097152}var allocatedOwnStack=stackBase==0;if(allocatedOwnStack){stackBase=_memalign(16,stackSize)}else{stackBase-=stackSize;assert(stackBase>0)}var threadInfoStruct=_malloc(228);for(var

i=0;i<228>>2;++i)GROWABLE_HEAP_U32()[(threadInfoStruct>>2)+i]=0;GROWABLE_HEAP_I32()[pthread_ptr>>2]=threadInfoStruct;GROWABLE_HEAP_I32()[threadInfoStruct+12>>2]=threadInfoStruct;var headPtr=threadInfoStruct+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var threadParams={stackBase:stackBase,stackSize:stackSize,allocatedOwnStack:allocatedOwnStack,detached:detached,startRoutine:start_routine,pthread_ptr:threadInfoStruct,arg:arg,transferList:transferList};if(ENVIRONMENT_IS_PTHREAD){threadParams.cmd=\"spawnThread\";postMessage(threadParams,transferList)}else{spawnThread(threadParams)}return
0}function __pthread_testcancel_js(){if(!ENVIRONMENT_IS_PTHREAD)return;var tb=_pthread_self();if(!tb)return;var cancelDisabled=Atomics.load(GROWABLE_HEAP_U32(),tb+56>>2);if(cancelDisabled)return;var canceled=Atomics.load(GROWABLE_HEAP_U32(),tb+0>>2);if(canceled==2)throw\"Canceled!\"}function _emscripten_check_blocking_allowed(){if(ENVIRONMENT_IS_NODE)return;if(ENVIRONMENT_IS_WORKER)return;warnOnce(\"Blocking on the main thread is very dangerous, see https://emscripten.org/docs/porting/pthreads.html#blocking-on-the-main-browser-thread\")}function __emscripten_do_pthread_join(thread,status,block){if(!thread){err(\"pthread_join attempted on a null thread pointer!\");return ERRNO_CODES.ESRCH}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self()==thread){err(\"PThread \"+thread+\" is attempting to join to itself!\");return ERRNO_CODES.EDEADLK}else if(!ENVIRONMENT_IS_PTHREAD&&_emscripten_main_browser_thread_id()==thread){err(\"Main thread \"+thread+\" is attempting to join to itself!\");return ERRNO_CODES.EDEADLK}var self=GROWABLE_HEAP_I32()[thread+12>>2];if(self!==thread){err(\"pthread_join attempted on thread \"+thread+\", which does not point to a valid thread, or does not exist anymore!\");return ERRNO_CODES.ESRCH}var detached=Atomics.load(GROWABLE_HEAP_U32(),thread+64>>2);if(detached){err(\"Attempted to join thread \"+thread+\", which was already detached!\");return ERRNO_CODES.EINVAL}if(block){_emscripten_check_blocking_allowed()}for(;;){var threadStatus=Atomics.load(GROWABLE_HEAP_U32(),thread+0>>2);if(threadStatus==1){var threadExitCode=Atomics.load(GROWABLE_HEAP_U32(),thread+4>>2);if(status)GROWABLE_HEAP_I32()[status>>2]=threadExitCode;Atomics.store(GROWABLE_HEAP_U32(),thread+64>>2,1);if(!ENVIRONMENT_IS_PTHREAD)cleanupThread(thread);else postMessage({\"cmd\":\"cleanupThread\",\"thread\":thread});return 0}if(!block){return ERRNO_CODES.EBUSY}__pthread_testcancel_js();if(!ENVIRONMENT_IS_PTHREAD)_emscripten_main_thread_process_queued_calls();_emscripten_futex_wait(thread+0,threadStatus,ENVIRONMENT_IS_PTHREAD?100:1)}}function _pthread_join(thread,status){return __emscripten_do_pthread_join(thread,status,true)}function _sysconf(name){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(6,1,name);switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case

71:return 256;case 40:return 255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-1}if(!ENVIRONMENT_IS_PTHREAD)PThread.initMainThreadBlock();var GLctx;var proxiedFunctionTable=[null,_atexit,_emscripten_set_canvas_element_size_main_thread,_fd_close,_fd_seek,_fd_write,_sysconf];var asmLibraryArg={\"e\":___assert_fail,\"r\":___call_main,\"x\":__emscripten_notify_thread_queue,\"b\":_abort,\"y\":_emscripten_asm_const_int,\"j\":_emscripten_conditional_set_current_thread_status,\"d\":_emscripten_futex_wait,\"c\":_emscripten_futex_wake,\"f\":_emscripten_get_now,\"p\":_emscripten_memcpy_big,\"A\":_emscripten_num_logical_cores,\"u\":_emscripten_receive_on_main_thread_js,\"q\":_emscripten_resize_heap,\"v\":_emscripten_set_canvas_element_size,\"i\":_emscripten_set_current_thread_status,\"s\":_emscripten_set_thread_name,\"w\":_emscripten_webgl_create_context,\"l\":_fd_close,\"n\":_fd_seek,\"g\":_fd_write,\"o\":initPthreadsJS,\"a\":wasmMemory||Module[\"wasmMemory\"],\"z\":_pthread_cleanup_pop,\"k\":_pthread_cleanup_push,\"h\":_pthread_create,\"m\":_pthread_join,\"t\":_sysconf};var asm=createWasm();var ___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=function(){return(___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=Module[\"asm\"][\"B\"]).apply(null,arguments)};var _init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"C\"]).apply(null,arguments)};var _init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Module[\"_init_with_threads_count\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var _get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads_count\"]=Module[\"asm\"][\"E\"]).apply(null,arguments)};var _register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=Module[\"asm\"][\"F\"]).apply(null,arguments)};var _dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"asm\"][\"G\"]).apply(null,arguments)};var _dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"H\"]).apply(null,arguments)};var _Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"J\"]).apply(null,arguments)};var _Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"K\"]).apply(null,arguments)};var _AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"L\"]).apply(null,arguments)};var _All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"M\"]).apply(null,arguments)};var _Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"N\"]).apply(null,arguments)};var _ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"O\"]).apply(null,arguments)};var _AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"P\"]).apply(null,arguments)};var _BatchMatMul=Module[\"_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\"_BatchMatMul\"]=Module[\"asm\"][\"Q\"]).apply(null,arguments)};var _Ceil=Module[\"_Ceil\"]=function(){return(_Ceil=Module[\"_Ceil\"]=Module[\"asm\"][\"R\"]).apply(null,arguments)};var _ClipByValue=Module[\"_ClipByValue\"]=function(){return(_ClipByValue=Module[\"_ClipByValue\"]=Module[\"asm\"][\"S\"]).apply(null,arguments)};var

_Conv2D=Module[\"_Conv2D\"]=function(){return(_Conv2D=Module[\"_Conv2D\"]=Module[\"asm\"][\"T\"]).apply(null,arguments)};var
_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=function(){return(_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=Module[\"asm\"][\"U\"]).apply(null,arguments)};var
_Cos=Module[\"_Cos\"]=function(){return(_Cos=Module[\"_Cos\"]=Module[\"asm\"][\"V\"]).apply(null,arguments)};var
_Cosh=Module[\"_Cosh\"]=function(){return(_Cosh=Module[\"_Cosh\"]=Module[\"asm\"][\"W\"]).apply(null,arguments)};var
_CropAndResize=Module[\"_CropAndResize\"]=function(){return(_CropAndResize=Module[\"_CropAndResize\"]=Module[\"asm\"][\"X\"]).apply(null,arguments)};var
_Cumsum=Module[\"_Cumsum\"]=function(){return(_Cumsum=Module[\"_Cumsum\"]=Module[\"asm\"][\"Y\"]).apply(null,arguments)};var
_DepthToSpace=Module[\"_DepthToSpace\"]=function(){return(_DepthToSpace=Module[\"_DepthToSpace\"]=Module[\"asm\"][\"Z\"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=function(){return(_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=Module[\"asm\"][\"_\"]).apply(null,arguments)};var
_Elu=Module[\"_Elu\"]=function(){return(_Elu=Module[\"_Elu\"]=Module[\"asm\"][\"$\"]).apply(null,arguments)};var
_Equal=Module[\"_Equal\"]=function(){return(_Equal=Module[\"_Equal\"]=Module[\"asm\"][\"aa\"]).apply(null,arguments)};var
_Exp=Module[\"_Exp\"]=function(){return(_Exp=Module[\"_Exp\"]=Module[\"asm\"][\"ba\"]).apply(null,arguments)};var
_FlipLeftRight=Module[\"_FlipLeftRight\"]=function(){return(_FlipLeftRight=Module[\"_FlipLeftRight\"]=Module[\"asm\"][\"ca\"]).apply(null,arguments)};var
_Floor=Module[\"_Floor\"]=function(){return(_Floor=Module[\"_Floor\"]=Module[\"asm\"][\"da\"]).apply(null,arguments)};var
_FloorDiv=Module[\"_FloorDiv\"]=function(){return(_FloorDiv=Module[\"_FloorDiv\"]=Module[\"asm\"][\"ea\"]).apply(null,arguments)};var
_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=function(){return(_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=Module[\"asm\"][\"fa\"]).apply(null,arguments)};var
_FusedConv2D=Module[\"_FusedConv2D\"]=function(){return(_FusedConv2D=Module[\"_FusedConv2D\"]=Module[\"asm\"][\"ga\"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=function(){return(_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=Module[\"asm\"][\"ha\"]).apply(null,arguments)};var
_Gather=Module[\"_Gather\"]=function(){return(_Gather=Module[\"_Gather\"]=Module[\"asm\"][\"ia\"]).apply(null,arguments)};var
_GatherNd=Module[\"_GatherNd\"]=function(){return(_GatherNd=Module[\"_GatherNd\"]=Module[\"asm\"][\"ja\"]).apply(null,arguments)};var
_Greater=Module[\"_Greater\"]=function(){return(_Greater=Module[\"_Greater\"]=Module[\"asm\"][\"ka\"]).apply(null,arguments)};var
_GreaterEqual=Module[\"_GreaterEqual\"]=function(){return(_GreaterEqual=Module[\"_GreaterEqual\"]=Module[\"asm\"][\"la\"]).apply(null,arguments)};var
_LeakyRelu=Module[\"_LeakyRelu\"]=function(){return(_LeakyRelu=Module[\"_LeakyRelu\"]=Module[\"asm\"][\"ma\"]).apply(null,arguments)};var
_Less=Module[\"_Less\"]=function(){return(_Less=Module[\"_Less\"]=Module[\"asm\"][\"na\"]).apply(null,arguments)};var
_LessEqual=Module[\"_LessEqual\"]=function(){return(_LessEqual=Module[\"_LessEqual\"]=Module[\"asm\"][\"oa\"]).apply(null,arguments)};var

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_Log=Module[\"_Log\"]=function(){return(_Log=Module[\"_Log\"]=Module[\"asm\"][\"pa\"]).apply(null,arguments)};var
_LogicalAnd=Module[\"_LogicalAnd\"]=function(){return(_LogicalAnd=Module[\"_LogicalAnd\"]=Module[\"asm\"][\"qa\"]).apply(null,arguments)};var
_Max=Module[\"_Max\"]=function(){return(_Max=Module[\"_Max\"]=Module[\"asm\"][\"ra\"]).apply(null,arguments)};var
_MaxPool=Module[\"_MaxPool\"]=function(){return(_MaxPool=Module[\"_MaxPool\"]=Module[\"asm\"][\"sa\"]).apply(null,arguments)};var
_Maximum=Module[\"_Maximum\"]=function(){return(_Maximum=Module[\"_Maximum\"]=Module[\"asm\"][\"ta\"]).apply(null,arguments)};var
_Mean=Module[\"_Mean\"]=function(){return(_Mean=Module[\"_Mean\"]=Module[\"asm\"][\"ua\"]).apply(null,arguments)};var
_Min=Module[\"_Min\"]=function(){return(_Min=Module[\"_Min\"]=Module[\"asm\"][\"va\"]).apply(null,arguments)};var
_Minimum=Module[\"_Minimum\"]=function(){return(_Minimum=Module[\"_Minimum\"]=Module[\"asm\"][\"wa\"]).apply(null,arguments)};var
_MirrorPad=Module[\"_MirrorPad\"]=function(){return(_MirrorPad=Module[\"_MirrorPad\"]=Module[\"asm\"][\"xa\"]).apply(null,arguments)};var
_Multiply=Module[\"_Multiply\"]=function(){return(_Multiply=Module[\"_Multiply\"]=Module[\"asm\"][\"ya\"]).apply(null,arguments)};var
_Neg=Module[\"_Neg\"]=function(){return(_Neg=Module[\"_Neg\"]=Module[\"asm\"][\"za\"]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module[\"_NonMaxSuppressionV3\"]=function(){return(_NonMaxSuppressionV3=Module[\"_NonMaxSuppressionV3\"]=Module[\"asm\"][\"Aa\"]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module[\"_NonMaxSuppressionV4\"]=function(){return(_NonMaxSuppressionV4=Module[\"_NonMaxSuppressionV4\"]=Module[\"asm\"][\"Ba\"]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module[\"_NonMaxSuppressionV5\"]=function(){return(_NonMaxSuppressionV5=Module[\"_NonMaxSuppressionV5\"]=Module[\"asm\"][\"Ca\"]).apply(null,arguments)};var
_NotEqual=Module[\"_NotEqual\"]=function(){return(_NotEqual=Module[\"_NotEqual\"]=Module[\"asm\"][\"Da\"]).apply(null,arguments)};var
_OneHot=Module[\"_OneHot\"]=function(){return(_OneHot=Module[\"_OneHot\"]=Module[\"asm\"][\"Ea\"]).apply(null,arguments)};var
_PadV2=Module[\"_PadV2\"]=function(){return(_PadV2=Module[\"_PadV2\"]=Module[\"asm\"][\"Fa\"]).apply(null,arguments)};var
_Pow=Module[\"_Pow\"]=function(){return(_Pow=Module[\"_Pow\"]=Module[\"asm\"][\"Ga\"]).apply(null,arguments)};var
_Prelu=Module[\"_Prelu\"]=function(){return(_Prelu=Module[\"_Prelu\"]=Module[\"asm\"][\"Ha\"]).apply(null,arguments)};var
_Prod=Module[\"_Prod\"]=function(){return(_Prod=Module[\"_Prod\"]=Module[\"asm\"][\"Ia\"]).apply(null,arguments)};var
_RealDiv=Module[\"_RealDiv\"]=function(){return(_RealDiv=Module[\"_RealDiv\"]=Module[\"asm\"][\"Ja\"]).apply(null,arguments)};var
_Relu=Module[\"_Relu\"]=function(){return(_Relu=Module[\"_Relu\"]=Module[\"asm\"][\"Ka\"]).apply(null,arguments)};var
_Relu6=Module[\"_Relu6\"]=function(){return(_Relu6=Module[\"_Relu6\"]=Module[\"asm\"][\"La\"]).apply(null,arguments)};var
_ResizeBilinear=Module[\"_ResizeBilinear\"]=function(){return(_ResizeBilinear=Module[\"_ResizeBilinear\"]=Module[\"asm\"][\"Ma\"]).apply(null,arguments)};var
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_Reverse=Module[\"_Reverse\"]=function(){return(_Reverse=Module[\"_Reverse\"]=Module[\"asm\"][\"Na\"]).apply(null,arguments)};var
_RotateWithOffset=Module[\"_RotateWithOffset\"]=function(){return(_RotateWithOffset=Module[\"_RotateWithOffset\"]=Module[\"asm\"][\"Oa\"]).apply(null,arguments)};var
_Round=Module[\"_Round\"]=function(){return(_Round=Module[\"_Round\"]=Module[\"asm\"][\"Pa\"]).apply(null,arguments)};var
_Rsqrt=Module[\"_Rsqrt\"]=function(){return(_Rsqrt=Module[\"_Rsqrt\"]=Module[\"asm\"][\"Qa\"]).apply(null,arguments)};var
_ScatterNd=Module[\"_ScatterNd\"]=function(){return(_ScatterNd=Module[\"_ScatterNd\"]=Module[\"asm\"][\"Ra\"]).apply(null,arguments)};var
_SelectV2=Module[\"_SelectV2\"]=function(){return(_SelectV2=Module[\"_SelectV2\"]=Module[\"asm\"][\"Sa\"]).apply(null,arguments)};var
_Sigmoid=Module[\"_Sigmoid\"]=function(){return(_Sigmoid=Module[\"_Sigmoid\"]=Module[\"asm\"][\"Ta\"]).apply(null,arguments)};var
_Sin=Module[\"_Sin\"]=function(){return(_Sin=Module[\"_Sin\"]=Module[\"asm\"][\"Ua\"]).apply(null,arguments)};var
_Softmax=Module[\"_Softmax\"]=function(){return(_Softmax=Module[\"_Softmax\"]=Module[\"asm\"][\"Va\"]).apply(null,arguments)};var
_Sqrt=Module[\"_Sqrt\"]=function(){return(_Sqrt=Module[\"_Sqrt\"]=Module[\"asm\"][\"Wa\"]).apply(null,arguments)};var
_Square=Module[\"_Square\"]=function(){return(_Square=Module[\"_Square\"]=Module[\"asm\"][\"Xa\"]).apply(null,arguments)};var
_SquaredDifference=Module[\"_SquaredDifference\"]=function(){return(_SquaredDifference=Module[\"_SquaredDifference\"]=Module[\"asm\"][\"Ya\"]).apply(null,arguments)};var
_Step=Module[\"_Step\"]=function(){return(_Step=Module[\"_Step\"]=Module[\"asm\"][\"Za\"]).apply(null,arguments)};var
_StridedSlice=Module[\"_StridedSlice\"]=function(){return(_StridedSlice=Module[\"_StridedSlice\"]=Module[\"asm\"][\"_a\"]).apply(null,arguments)};var
_Sub=Module[\"_Sub\"]=function(){return(_Sub=Module[\"_Sub\"]=Module[\"asm\"][\"$a\"]).apply(null,arguments)};var
_Sum=Module[\"_Sum\"]=function(){return(_Sum=Module[\"_Sum\"]=Module[\"asm\"][\"ab\"]).apply(null,arguments)};var
_Tan=Module[\"_Tan\"]=function(){return(_Tan=Module[\"_Tan\"]=Module[\"asm\"][\"bb\"]).apply(null,arguments)};var
_Tanh=Module[\"_Tanh\"]=function(){return(_Tanh=Module[\"_Tanh\"]=Module[\"asm\"][\"cb\"]).apply(null,arguments)};var
_Tile=Module[\"_Tile\"]=function(){return(_Tile=Module[\"_Tile\"]=Module[\"asm\"][\"db\"]).apply(null,arguments)};var
_TopK=Module[\"_TopK\"]=function(){return(_TopK=Module[\"_TopK\"]=Module[\"asm\"][\"eb\"]).apply(null,arguments)};var
_Transform=Module[\"_Transform\"]=function(){return(_Transform=Module[\"_Transform\"]=Module[\"asm\"][\"fb\"]).apply(null,arguments)};var
_Transpose=Module[\"_Transpose\"]=function(){return(_Transpose=Module[\"_Transpose\"]=Module[\"asm\"][\"gb\"]).apply(null,arguments)};var
__FusedMatMul=Module[\"__FusedMatMul\"]=function(){return(__FusedMatMul=Module[\"__FusedMatMul\"]=Module[\"asm\"][\"hb\"]).apply(null,arguments)};var
_malloc=Module[\"_malloc\"]=function(){return(_malloc=Module[\"_malloc\"]=Module[\"asm\"][\"ib\"]).apply(null,arguments)};var

_free=Module[\"_free\"]=function(){return(_free=Module[\"_free\"]=Module[\"asm\"][\"jb\"]).apply(null,arguments)};var
___errno_location=Module[\"___errno_location\"]=function(){return(___errno_location=Module[\"___errno_location\"]=Module[\"asm\"][\"kb\"]).apply(null,arguments)};var
_emscripten_get_global_libc=Module[\"_emscripten_get_global_libc\"]=function(){return(_emscripten_get_global_libc=Module[\"_emscripten_get_global_libc\"]=Module[\"asm\"][\"lb\"]).apply(null,arguments)};var
_pthread_self=Module[\"_pthread_self\"]=function(){return(_pthread_self=Module[\"_pthread_self\"]=Module[\"asm\"][\"mb\"]).apply(null,arguments)};var
___pthread_tsd_run_dtors=Module[\"___pthread_tsd_run_dtors\"]=function(){return(___pthread_tsd_run_dtors=Module[\"___pthread_tsd_run_dtors\"]=Module[\"asm\"][\"nb\"]).apply(null,arguments)};var
_emscripten_main_thread_process_queued_calls=Module[\"_emscripten_main_thread_process_queued_calls\"]=function(){return(_emscripten_main_thread_process_queued_calls=Module[\"_emscripten_main_thread_process_queued_calls\"]=Module[\"asm\"][\"ob\"]).apply(null,arguments)};var
_emscripten_current_thread_process_queued_calls=Module[\"_emscripten_current_thread_process_queued_calls\"]=function(){return(_emscripten_current_thread_process_queued_calls=Module[\"_emscripten_current_thread_process_queued_calls\"]=Module[\"asm\"][\"pb\"]).apply(null,arguments)};var
_emscripten_register_main_browser_thread_id=Module[\"_emscripten_register_main_browser_thread_id\"]=function(){return(_emscripten_register_main_browser_thread_id=Module[\"_emscripten_register_main_browser_thread_id\"]=Module[\"asm\"][\"qb\"]).apply(null,arguments)};var
_emscripten_main_browser_thread_id=Module[\"_emscripten_main_browser_thread_id\"]=function(){return(_emscripten_main_browser_thread_id=Module[\"_emscripten_main_browser_thread_id\"]=Module[\"asm\"][\"rb\"]).apply(null,arguments)};var
__emscripten_do_dispatch_to_thread=Module[\"__emscripten_do_dispatch_to_thread\"]=function(){return(__emscripten_do_dispatch_to_thread=Module[\"__emscripten_do_dispatch_to_thread\"]=Module[\"asm\"][\"sb\"]).apply(null,arguments)};var
_emscripten_sync_run_in_main_thread_4=Module[\"_emscripten_sync_run_in_main_thread_4\"]=function(){return(_emscripten_sync_run_in_main_thread_4=Module[\"_emscripten_sync_run_in_main_thread_4\"]=Module[\"asm\"][\"tb\"]).apply(null,arguments)};var
_emscripten_run_in_main_runtime_thread_js=Module[\"_emscripten_run_in_main_runtime_thread_js\"]=function(){return(_emscripten_run_in_main_runtime_thread_js=Module[\"_emscripten_run_in_main_runtime_thread_js\"]=Module[\"asm\"][\"ub\"]).apply(null,arguments)};var
__emscripten_call_on_thread=Module[\"__emscripten_call_on_thread\"]=function(){return(__emscripten_call_on_thread=Module[\"__emscripten_call_on_thread\"]=Module[\"asm\"][\"vb\"]).apply(null,arguments)};var
_emscripten_tls_init=Module[\"_emscripten_tls_init\"]=function(){return(_emscripten_tls_init=Module[\"_emscripten_tls_init\"]=Module[\"asm\"][\"wb\"]).apply(null,arguments)};var
__emscripten_thread_init=Module[\"__emscripten_thread_init\"]=function(){return(__emscripten_thread_init=Module[\"__emscripten_thread_init\"]=Module[\"asm\"][\"xb\"]).apply(null,arguments)};var
stackSave=Module[\"stackSave\"]=function(){return(stackSave=Module[\"stackSave\"]=Module[\"asm\"][\"yb\"]).apply(null,arguments)};var
stackRestore=Module[\"stackRestore\"]=function(){return(stackRestore=Module[\"stackRestore\"]=Module[\"asm\"][\"zb\"]).apply(null,arguments)};var
stackAlloc=Module[\"stackAlloc\"]=function(){return(stackAlloc=Module[\"stackAlloc\"]=Module[\"asm\"][\"Ab\"]).apply(null,arguments)};var
_emscripten_stack_set_limits=Module[\"_emscripten_stack_set_limits\"]=function(){return(_emscripten_stack_set_limits=Module[\"_emscripten_stack_set_limits\"]=Module[\"asm\"][\"Bb\"]).apply(null,arguments)};var
_memalign=Module[\"_memalign\"]=function(){return(_memalign=Module[\"_memalign\"]=Module[\"asm\"][\"Cb\"]).apply(null,arguments)};var
__emscripten_allow_main_runtime_queued_calls=Module[\"__emscripten_allow_main_runtime_queued_calls\"]=1

0512;var
__emscripten_main_thread_futex=Module[\"__emscripten_main_thread_futex\"]=12148;Module[\"cwrap\"]=cwrap
;Module[\"PThread\"]=PThread;Module[\"PThread\"]=PThread;Module[\"wasmMemory\"]=wasmMemory;Module
[\"ExitStatus\"]=ExitStatus;var
calledRun;function ExitStatus(status){this.name=\"ExitStatus\";this.message=\"Program terminated with
exit(\"+status+\")\";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}if(ENVIRONMENT_IS_PTHREAD){readyPromis
eResolve(Module);initRuntime();postMessage({\"cmd\":\"loaded\"});return}preRun();if(runDependencies>0){retur
n}function
doRun(){if(calledRun)return;calledRun=true;Module[\"calledRun\"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module[\"onRuntimeInitialized\"])Module[\"onRuntimeInitialized\"]();postRun(
)}if(Module[\"setStatus\"]){Module[\"setStatus\"](\"Running...\");setTimeout(function(){setTimeout(function(){Mo
dule[\"setStatus\"](\"\")},1);doRun()},1)}else{doRun()}}Module[\"run\"]=run;function
exit(status,implicit){if(implicit&&noExitRuntime&&status===0){return}if(!implicit){if(ENVIRONMENT_IS_PT
HREAD){postMessage({\"cmd\":\"exitProcess\",\"returnCode\":status});throw
new
ExitStatus(status)}else{}}if(noExitRuntime){}else{PThread.terminateAllThreads();EXITSTATUS=status;exitRunti
me();if(Module[\"onExit\"])Module[\"onExit\"](status);ABORT=true}quit_(status,new
ExitStatus(status))}if(Module[\"preInit\"]){if(typeof
Module[\"preInit\"]==\"function\")Module[\"preInit\"]=[Module[\"preInit\"]];while(Module[\"preInit\"].length>0){
Module[\"preInit\"].pop()()}}if(ENVIRONMENT_IS_PTHREAD){noExitRuntime=false;PThread.initWorker()}run
();\n\n\n return WasmBackendModuleThreadedSimd.ready\n}\n);\n})();\nif (typeof exports === 'object' && typeof
module === 'object')\n module.exports = WasmBackendModuleThreadedSimd;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModuleThreadedSimd; });\nelse if
(typeof exports === 'object')\n exports[\"WasmBackendModuleThreadedSimd\"]
= WasmBackendModuleThreadedSimd;\n","export const wasmWorkerContents = 'var Module={};function
threadPrintErr(){var text=Array.prototype.slice.call(arguments).join(\" \");console.error(text)}function
threadAlert(){var text=Array.prototype.slice.call(arguments).join(\"
\");postMessage({cmd:\"alert\",text:text,threadId:Module[\"_pthread_self\"]()})}var
err=threadPrintErr;this.alert=threadAlert;Module[\"instantiateWasm\"]=function(info,receiveInstance){var
instance=new
WebAssembly.Instance(Module[\"wasmModule\"],info);Module[\"wasmModule\"]=null;receiveInstance(instance);r
eturn instance.exports};function
moduleLoaded(){}this.onmessage=function(e){try{if(e.data.cmd===\"load\"){Module[\"wasmModule\"]=e.data.wa
smModule;Module[\"wasmMemory\"]=e.data.wasmMemory;Module[\"buffer\"]=Module[\"wasmMemory\"].buffer;
Module[\"ENVIRONMENT_IS_PTHREAD\"]=true;if(typeof
e.data.urlOrBlob===\"string\"){importScripts(e.data.urlOrBlob)}else{var
objectUrl=URL.createObjectURL(e.data.urlOrBlob);importScripts(objectUrl);URL.revokeObjectURL(objectUrl)}
WasmBackendModuleThreadedSimd(Module).then(function(instance){Module=instance;moduleLoaded()})}else
if(e.data.cmd===\"objectTransfer\"){Module[\"PThread\"].receiveObjectTransfer(e.data)}else
if(e.data.cmd===\"run\"){Module[\"__performance_now_clock_drift\"]=performance.now()-
e.data.time;Module[\"__emscripten_thread_init\"](e.data.threadInfoStruct,0,0);var max=e.data.stackBase;var
top=e.data.stackBase+e.data.stackSize;Module[\"establishStackSpace\"](top,max);Module[\"_emscripten_tls_init\"](
);Module[\"PThread\"].receiveObjectTransfer(e.data);Module[\"PThread\"].setThreadStatus(Module[\"_pthread_self
\"](),1);try{var
result=Module[\"invokeEntryPoint\"](e.data.start_routine,e.data.arg);if(!Module[\"getNoExitRuntime\"]())Module[\
\"PThread\"].threadExit(result)}catch(ex){if(ex===\"Canceled!\"){Module[\"PThread\"].threadCancel()}else

if(ex!=\"unwind\"){if(ex instanceof
Module[\"ExitStatus\"]){if(Module[\"getNoExitRuntime\"]()){}else{Module[\"PThread\"].threadExit(ex.status)}}el
se{Module[\"PThread\"].threadExit(-2);throw
ex}}}}else
if(e.data.cmd===\"cancel\"){if(Module[\"_pthread_self\"]()){Module[\"PThread\"].threadCancel()}}else
if(e.data.target===\"setimmediate\"){}else
if(e.data.cmd===\"processThreadQueue\"){if(Module[\"_pthread_self\"]()){Module[\"_emscripten_current_thread_
process_queued_calls\"]()}}else{err(\"worker.js received unknown command
\"+e.data.cmd);err(e.data)}}catch(ex){err(\"worker.js onmessage() captured an uncaught exception:
\"+ex);if(ex&&ex.stack)err(ex.stack);throw ex}};if(typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof process.versions.node===\"string\"){self={location:{href:__filename}};var
onmessage=this.onmessage;var
nodeWorkerThreads=require(\"worker_threads\");global.Worker=nodeWorkerThreads.Worker;var
parentPort=nodeWorkerThreads.parentPort;parentPort.on(\"message\",function(data){onmessage({data:data})});var
nodeFS=require(\"fs\");var nodeRead=function(filename){return
nodeFS.readFileSync(filename,\"utf8\")};function
globalEval(x){global.require=require;global.Module=Module;eval.call(null,x)}importScripts=function(f){globalEva
l(nodeRead(f))};postMessage=function(msg){parentPort.postMessage(msg)};if(typeof
performance===\"undefined\"){performance={now:function(){return Date.now()}}}';","\nvar
WasmBackendModule = (function() {\n var _scriptDir = typeof document !== 'undefined' &&
document.currentScript ? document.currentScript.src : undefined;\n if (typeof __filename !== 'undefined')
_scriptDir = _scriptDir || __filename;\n return (\nfunction(WasmBackendModule) {\n WasmBackendModule =
WasmBackendModule || {};\n\nvar Module=typeof
WasmBackendModule!==\"undefined\"?WasmBackendModule:{};var
readyPromiseResolve,readyPromiseReject;Module[\"ready\"]=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var
arguments_=[];var thisProgram=\"./this.program\";var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window===\"object\";ENVIRONMENT_IS_WORKER=typeof
importScripts===\"function\";ENVIRONMENT_IS_NODE=typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof
process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var scriptDirectory=\"\";function
locateFile(path){if(Module[\"locateFile\"]){return Module[\"locateFile\"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\"path\").
dirname(scriptDirectory)+\"/\"}else{scriptDirectory=__dirname+\"/\"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=n
odePath[\"normalize\"](filename);return
nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\")};readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process[\"argv\"].length>1){thisProgram=process[\"argv\"][1].replace(/\\\\/g,\"/\")}arguments_=process[\"arg
v\"].slice(2);process[\"on\"](\"uncaughtException\",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process[\"on\"](\"unhandledRejection\",abort);quit_=function(status){process[\"exit\"](status)};Module[\"insp
ect\"]=function(){return\"[Emscripten Module object]\"}}else if(ENVIRONMENT_IS_SHELL){if(typeof

read!=\"undefined\"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var data;if(typeof readbuffer===\"function\"){return new Uint8Array(readbuffer(f))}data=read(f,\"binary\");assert(typeof data===\"object\");return data};if(typeof scriptArgs!=\"undefined\"){arguments_=scriptArgs}else if(typeof arguments!=\"undefined\"){arguments_=arguments}if(typeof quit===\"function\"){quit_=function(status){quit(status)}}if(typeof print!==\"undefined\"){if(typeof console===\"undefined\")console={};console.log=print;console.warn=console.error=typeof printErr!==\"undefined\"?printErr:print}}else if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDirectory=self.location.href}else if(typeof document!==\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(_scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf(\"blob:\")!==0){scriptDirectory=scriptDirectory.substr(0,scriptDirectory.lastIndexOf(\"/\")+1)}else{scriptDirectory=\"\"}{read_=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.send(null);return xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.responseType=\"arraybuffer\";xhr.send(null);return new Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,true);xhr.responseType=\"arraybuffer\";xhr.onload=function(){if(xhr.status==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror()};xhr.onerror=onerror;xhr.send(null)}}setWindowTitle=function(title){document.title=title}}else{}var out=Module[\"print\"]||console.log.bind(console);var err=Module[\"printErr\"]||console.warn.bind(console);for(key in moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverrides=null;if(Module[\"arguments\"])arguments_=Module[\"arguments\"];if(Module[\"thisProgram\"])thisProgram=Module[\"thisProgram\"];if(Module[\"quit\"])quit_=Module[\"quit\"];var wasmBinary;if(Module[\"wasmBinary\"])wasmBinary=Module[\"wasmBinary\"];var noExitRuntime=Module[\"noExitRuntime\"]||true;if(typeof WebAssembly!==\"object\"){abort(\"no native wasm support detected\")}var wasmMemory;var ABORT=false;var EXITSTATUS;function assert(condition,text){if(!condition){abort(\"Assertion failed: \"+text)}}function getCFunc(ident){var func=Module[\"_\"+ident];assert(func,\"Cannot call unknown function \"+ident+\", make sure it is exported\");return func}function ccall(ident,returnType,argTypes,args,opts){var toC={\"string\":function(str){var ret=0;if(str!==null&&str!==undefined&&str!==0){var len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\"array\":function(arr){var ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function convertReturnValue(ret){if(returnType===\"string\")return UTF8ToString(ret);if(returnType===\"boolean\")return Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var i=0;i<args.length;i++){var converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i]=args[i]}}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var numericArgs=argTypes.every(function(type){return type===\"number\"});var numericRet=returnType!==\"string\";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return function(){return ccall(ident,returnType,argTypes,arguments,opts)}}var UTF8Decoder=typeof TextDecoder!==\"undefined\"?new TextDecoder(\"utf8\"):undefined;function UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var endPtr=idx;while(heap[endPtr]&&!(endPtr>=endIdx))++endPtr;if(endPtr-idx>16&&heap.subarray&&UTF8Decoder){return UTF8Decoder.decode(heap.subarray(idx,endPtr))}else{var str=\"\";while(idx<endPtr){var u0=heap[idx++];if(!(u0&128)){str+=String.fromCharCode(u0);continue}var

u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[idx++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}}return str}function UTF8ToString(ptr,maxBytesToRead){return ptr?UTF8ArrayToString(HEAPU8,ptr,maxBytesToRead):\"\"}function stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var u=str.charCodeAt(i);if(u>=55296&&u<=57343){var u1=str.charCodeAt(++i);u=65536+((u&1023)<<10)|u1&1023}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function stringToUTF8(str,outPtr,maxBytesToWrite){return stringToUTF8Array(str,HEAPU8,outPtr,maxBytesToWrite)}function writeArrayToMemory(array,buffer){HEAP8.set(array,buffer)}function alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function updateGlobalBufferAndViews(buf){buffer=buf;Module[\"HEAP8\"]=HEAP8=new Int8Array(buf);Module[\"HEAP16\"]=HEAP16=new Int16Array(buf);Module[\"HEAP32\"]=HEAP32=new Int32Array(buf);Module[\"HEAPU8\"]=HEAPU8=new Uint8Array(buf);Module[\"HEAPU16\"]=HEAPU16=new Uint16Array(buf);Module[\"HEAPU32\"]=HEAPU32=new Uint32Array(buf);Module[\"HEAPF32\"]=HEAPF32=new Float32Array(buf);Module[\"HEAPF64\"]=HEAPF64=new Float64Array(buf)}var INITIAL_MEMORY=Module[\"INITIAL_MEMORY\"]||16777216;var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;__ATINIT__.push({func:function(){___wasm_call_ctors()}});function preRun(){if(Module[\"preRun\"]){if(typeof Module[\"preRun\"]==\"function\")Module[\"preRun\"]=[Module[\"preRun\"]];while(Module[\"preRun\"].length){addOnPreRun(Module[\"preRun\"].shift())}}callRuntimeCallbacks(__ATPRERUN__)}function initRuntime(){runtimeInitialized=true;callRuntimeCallbacks(__ATINIT__)}function preMain(){callRuntimeCallbacks(__ATMAIN__)}function postRun(){if(Module[\"postRun\"]){if(typeof Module[\"postRun\"]==\"function\")Module[\"postRun\"]=[Module[\"postRun\"]];while(Module[\"postRun\"].length){addOnPostRun(Module[\"postRun\"].shift())}}callRuntimeCallbacks(__ATPOSTRUN__)}function addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function addRunDependency(id){runDependencies++;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}}function removeRunDependency(id){runDependencies--;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}if(runDependencies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}if(dependenciesFulfilled){var callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}}Module[\"preloadedImages\"]={};Module[\"preloadedAudios\"]={};function abort(what){if(Module[\"onAbort\"]){Module[\"onAbort\"](what)}what+=\"\";err(what);ABORT=true;EXITSTATUS=1;what=\"abort(\"+what+\"). Build with -s ASSERTIONS=1 for more info.\";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var

dataURIPrefix=\"data:application/octet-stream; base64,\";function isDataURI(filename){return hasPrefix(filename,dataURIPrefix)}var fileURIPrefix=\"file://\";function isFileURI(filename){return hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile=\"tfjs-backend-wasm.wasm\";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function getBinary(file){try{if(file==wasmBinaryFile&&wasmBinary){return new Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw\"both async and sync fetching of the wasm failed\"}}catch(err){abort(err)}}function getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof fetch===\"function\"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){if(!response[\"ok\"]){throw\"failed to load wasm binary file at '\"+wasmBinaryFile+\"'\"}return response[\"arrayBuffer\"]()}).catch(function(){return getBinary(wasmBinaryFile)})}else{if(readAsync){return new Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new Uint8Array(response))},reject)})}}}return Promise.resolve().then(function(){return getBinary(wasmBinaryFile)})}function createWasm(){var info={\"a\":asmLibraryArg};function receiveInstance(instance,module){var exports=instance.exports;Module[\"asm\"]=exports;wasmMemory=Module[\"asm\"][\"j\"];updateGlobalBufferAndViews(wasmMemory.buffer);wasmTable=Module[\"asm\"][\"r\"];removeRunDependency(\"wasm-instantiate\")}addRunDependency(\"wasm-instantiate\");function receiveInstantiatedSource(output){receiveInstance(output[\"instance\"])}function instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err(\"failed to asynchronously prepare wasm: \"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof WebAssembly.instantiateStreaming===\"function\"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFile)&&typeof fetch===\"function\"){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return result.then(receiveInstantiatedSource,function(reason){err(\"wasm streaming compile failed: \"+reason);err(\"falling back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)})})}else{return instantiateArrayBuffer(receiveInstantiatedSource)}}if(Module[\"instantiateWasm\"]){try{var exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports}catch(e){err(\"Module.instantiateWasm callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}function callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof callback==\"function\"){callback(Module);continue}var func=callback.func;if(typeof func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)()}else{wasmTable.get(func)(callback.arg)}}else{func(callback.arg===undefined?null:callback.arg)}}}function _abort(){abort()}function _emscripten_memcpy_big(dest,src,num){HEAPU8.copyWithin(dest,src,src+num)}function _emscripten_get_heap_size(){return HEAPU8.length}function emscripten_realloc_buffer(size){try{wasmMemory.grow(size-buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return 1}catch(e){}}function _emscripten_resize_heap(requestedSize){var oldSize=_emscripten_get_heap_size();var maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var cutDown=1;cutDown<=4;cutDown*=2){var overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize+100663296);var newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var

buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var ret=HEAP32[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function _fd_close(fd){return 0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){}function _fd_write(fd,iov,iovcnt,pnum){var num=0;for(var i=0;i<iovcnt;i++){var ptr=HEAP32[iov+i*8>>2];var len=HEAP32[iov+(i*8+4)>>2];for(var j=0;j<len;j++){SYSCALLS.printChar(fd,HEAPU8[ptr+j])}num+=len}HEAP32[pnum>>2]=num;return 0}function _pthread_create(){return 6}function _pthread_join(){return 28}function setErrNo(value){HEAP32[___errno_location()>>2]=value;return value}function _sysconf(name){switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-1};var asmLibraryArg={\"a\":_abort,\"d\":_emscripten_memcpy_big,\"e\":_emscripten_resize_heap,\"f\":_fd_close,\"c\":_fd_seek,\"b\":_fd_write,\"h\":_pthread_create,\"g\":_pthread_join,\"i\":_sysconf};var asm=createWasm();var ___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=function(){return(___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=Module[\"asm\"][\"k\"]).apply(null,arguments)};var _init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"l\"]).apply(null,arguments)};var _init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Module[\"_init_with_threads_count\"]=Module[\"asm\"][\"m\"]).apply(null,arguments)};var _get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads_count\"]=Module[\"asm\"][\"n\"]).apply(null,arguments)};var _register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=Module[\"asm\"][\"o\"]).apply(null,arguments)};var _dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"asm\"][\"p\"]).apply(null,arguments)};var _dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"q\"]).apply(null,arguments)};var _Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"s\"]).apply(null,arguments)};var _Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"t\"]).apply(null,arguments)};var _AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"u\"]).apply(null,arguments)};var _All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"v\"]).apply(null,arguments)};

var
_Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"w\"]).apply(null,argumen
ts)};var
_ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"x\"]).app
ly(null,arguments)};var
_AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"y\"]).a
pply(null,arguments)};var
_BatchMatMul=Module[\"_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\"_BatchMatMul\"]=Modu
le[\"asm\"][\"z\"]).apply(null,arguments)};var
_Ceil=Module[\"_Ceil\"]=function(){return(_Ceil=Module[\"_Ceil\"]=Module[\"asm\"][\"A\"]).apply(null,argument
s)};var
_ClipByValue=Module[\"_ClipByValue\"]=function(){return(_ClipByValue=Module[\"_ClipByValue\"]=Module[\
"asm\"][\"B\"]).apply(null,arguments)};var
_Conv2D=Module[\"_Conv2D\"]=function(){return(_Conv2D=Module[\"_Conv2D\"]=Module[\"asm\"][\"C\"]).ap
ply(null,arguments)};var
_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=function(){return(_Conv2DBackpropInput=Modul
e[\"_Conv2DBackpropInput\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var
_Cos=Module[\"_Cos\"]=function(){return(_Cos=Module[\"_Cos\"]=Module[\"asm\"][\"E\"]).apply(null,arguments
)};var
_Cosh=Module[\"_Cosh\"]=function(){return(_Cosh=Module[\"_Cosh\"]=Module[\"asm\"][\"F\"]).apply(null,argu
ments)};var
_CropAndResize=Module[\"_CropAndResize\"]=function(){return(_CropAndResize=Module[\"_CropAndResize\"]
=Module[\"asm\"][\"G\"]).apply(null,arguments)};var
_Cumsum=Module[\"_Cumsum\"]=function(){return(_Cumsum=Module[\"_Cumsum\"]=Module[\"asm\"][\"H\"]).a
pply(null,arguments)};var
_DepthToSpace=Module[\"_DepthToSpace\"]=function(){return(_DepthToSpace=Module[\"_DepthToSpace\"]=M
odule[\"asm\"][\"I\"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=function(){return(_DepthwiseConv2dNative=M
odule[\"_DepthwiseConv2dNative\"]=Module[\"asm\"][\"J\"]).apply(null,arguments)};var
_Elu=Module[\"_Elu\"]=function(){return(_Elu=Module[\"_Elu\"]=Module[\"asm\"][\"K\"]).apply(null,arguments)}
;var
_Equal=Module[\"_Equal\"]=function(){return(_Equal=Module[\"_Equal\"]=Module[\"asm\"][\"L\"]).apply(null,arg
uments)};var
_Exp=Module[\"_Exp\"]=function(){return(_Exp=Module[\"_Exp\"]=Module[\"asm\"][\"M\"]).apply(null,argument
s)};var
_FlipLeftRight=Module[\"_FlipLeftRight\"]=function(){return(_FlipLeftRight=Module[\"_FlipLeftRight\"]=Modul
e[\"asm\"][\"N\"]).apply(null,arguments)};var
_Floor=Module[\"_Floor\"]=function(){return(_Floor=Module[\"_Floor\"]=Module[\"asm\"][\"O\"]).apply(null,argu
ments)};var
_FloorDiv=Module[\"_FloorDiv\"]=function(){return(_FloorDiv=Module[\"_FloorDiv\"]=Module[\"asm\"][\"P\"]).
apply(null,arguments)};var
_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=function(){return(_FusedBatchNorm=Module[\"_FusedBatchN
orm\"]=Module[\"asm\"][\"Q\"]).apply(null,arguments)};var
_FusedConv2D=Module[\"_FusedConv2D\"]=function(){return(_FusedConv2D=Module[\"_FusedConv2D\"]=Mod
ule[\"asm\"][\"R\"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=function(){return(_FusedDepthwiseConv2D=M
odule[\"_FusedDepthwiseConv2D\"]=Module[\"asm\"][\"S\"]).apply(null,arguments)};var
_Gather=Module[\"_Gather\"]=function(){return(_Gather=Module[\"_Gather\"]=Module[\"asm\"][\"T\"]).apply(null

,arguments)};var
_GatherNd=Module[\"_GatherNd\"]=function(){return(_GatherNd=Module[\"_GatherNd\"]=Module[\"asm\"][\"U\"
]).apply(null,arguments)};var
_Greater=Module[\"_Greater\"]=function(){return(_Greater=Module[\"_Greater\"]=Module[\"asm\"][\"V\"]).apply(
null,arguments)};var
_GreaterEqual=Module[\"_GreaterEqual\"]=function(){return(_GreaterEqual=Module[\"_GreaterEqual\"]=Module[\
"asm\"][\"W\"]).apply(null,arguments)};var
_LeakyRelu=Module[\"_LeakyRelu\"]=function(){return(_LeakyRelu=Module[\"_LeakyRelu\"]=Module[\"asm\"][\
"X\"]).apply(null,arguments)};var
_Less=Module[\"_Less\"]=function(){return(_Less=Module[\"_Less\"]=Module[\"asm\"][\"Y\"]).apply(null,argume
nts)};var
_LessEqual=Module[\"_LessEqual\"]=function(){return(_LessEqual=Module[\"_LessEqual\"]=Module[\"asm\"][\"
Z\"]).apply(null,arguments)};var
_Log=Module[\"_Log\"]=function(){return(_Log=Module[\"_Log\"]=Module[\"asm\"][\"_\"]).apply(null,arguments
)};var
_LogicalAnd=Module[\"_LogicalAnd\"]=function(){return(_LogicalAnd=Module[\"_LogicalAnd\"]=Module[\"asm
\"][\"$\"]).apply(null,arguments)};var
_Max=Module[\"_Max\"]=function(){return(_Max=Module[\"_Max\"]=Module[\"asm\"][\"aa\"]).apply(null,argume
nts)};var
_MaxPool=Module[\"_MaxPool\"]=function(){return(_MaxPool=Module[\"_MaxPool\"]=Module[\"asm\"][\"ba\"]).
apply(null,arguments)};var
_Maximum=Module[\"_Maximum\"]=function(){return(_Maximum=Module[\"_Maximum\"]=Module[\"asm\"][\"ca\"]).apply(null,arguments)};var
_Mean=Module[\"_Mean\"]=function(){return(_Mean=Module[\"_Mean\"]=Module[\"asm\"][\"da\"]).apply(null,ar
guments)};var
_Min=Module[\"_Min\"]=function(){return(_Min=Module[\"_Min\"]=Module[\"asm\"][\"ea\"]).apply(null,argumen
ts)};var
_Minimum=Module[\"_Minimum\"]=function(){return(_Minimum=Module[\"_Minimum\"]=Module[\"asm\"][\"fa\
"]).apply(null,arguments)};var
_MirrorPad=Module[\"_MirrorPad\"]=function(){return(_MirrorPad=Module[\"_MirrorPad\"]=Module[\"asm\"][\"g
a\"]).apply(null,arguments)};var
_Multiply=Module[\"_Multiply\"]=function(){return(_Multiply=Module[\"_Multiply\"]=Module[\"asm\"][\"ha\"]).a
pply(null,arguments)};var
_Neg=Module[\"_Neg\"]=function(){return(_Neg=Module[\"_Neg\"]=Module[\"asm\"][\"ia\"]).apply(null,argument
s)};var
_NonMaxSuppressionV3=Module[\"_NonMaxSuppressionV3\"]=function(){return(_NonMaxSuppressionV3=Mod
ule[\"_NonMaxSuppressionV3\"]=Module[\"asm\"][\"ja\"]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module[\"_NonMaxSuppressionV4\"]=function(){return(_NonMaxSuppressionV4=Mod
ule[\"_NonMaxSuppressionV4\"]=Module[\"asm\"][\"ka\"]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module[\"_NonMaxSuppressionV5\"]=function(){return(_NonMaxSuppressionV5=Mod
ule[\"_NonMaxSuppressionV5\"]=Module[\"asm\"][\"la\"]).apply(null,arguments)};var
_NotEqual=Module[\"_NotEqual\"]=function(){return(_NotEqual=Module[\"_NotEqual\"]=Module[\"asm\"][\"ma\"
]).apply(null,arguments)};var
_OneHot=Module[\"_OneHot\"]=function(){return(_OneHot=Module[\"_OneHot\"]=Module[\"asm\"][\"na\"]).appl
y(null,arguments)};var
_PadV2=Module[\"_PadV2\"]=function(){return(_PadV2=Module[\"_PadV2\"]=Module[\"asm\"][\"oa\"]).apply(nul
l,arguments)};var
_Pow=Module[\"_Pow\"]=function(){return(_Pow=Module[\"_Pow\"]=Module[\"asm\"][\"pa\"]).apply(null,argume

nts)};var
_Prelu=Module[\"_Prelu\"]=function(){return(_Prelu=Module[\"_Prelu\"]=Module[\"asm\"][\"qa\"]).apply(null,argu
ments)};var
_Prod=Module[\"_Prod\"]=function(){return(_Prod=Module[\"_Prod\"]=Module[\"asm\"][\"ra\"]).apply(null,argum
ents)};var
_RealDiv=Module[\"_RealDiv\"]=function(){return(_RealDiv=Module[\"_RealDiv\"]=Module[\"asm\"][\"sa\"]).app
ly(null,arguments)};var
_Relu=Module[\"_Relu\"]=function(){return(_Relu=Module[\"_Relu\"]=Module[\"asm\"][\"ta\"]).apply(null,argume
nts)};var
_Relu6=Module[\"_Relu6\"]=function(){return(_Relu6=Module[\"_Relu6\"]=Module[\"asm\"][\"ua\"]).apply(null,ar
guments)};var
_ResizeBilinear=Module[\"_ResizeBilinear\"]=function(){return(_ResizeBilinear=Module[\"_ResizeBilinear\"]=Mo
dule[\"asm\"][\"va\"]).apply(null,arguments)};var
_Reverse=Module[\"_Reverse\"]=function(){return(_Reverse=Module[\"_Reverse\"]=Module[\"asm\"][\"wa\"]).app
ly(null,arguments)};var
_RotateWithOffset=Module[\"_RotateWithOffset\"]=function(){return(_RotateWithOffset=Module[\"_RotateWith
Offset\"]=Module[\"asm\"][\"xa\"]).apply(null,arguments)};var
_Round=Module[\"_Round\"]=function(){return(_Round=Module[\"_Round\"]=Module[\"asm\"][\"ya\"]).apply(nul
l,arguments)};var
_Rsqrt=Module[\"_Rsqrt\"]=function(){return(_Rsqrt=Module[\"_Rsqrt\"]=Module[\"asm\"][\"za\"]).apply(null,arg
uments)};var
_ScatterNd=Module[\"_ScatterNd\"]=function(){return(_ScatterNd=Module[\"_ScatterNd\"]=Module[\"asm\"][\"Aa
\"]).apply(null,arguments)};var
_SelectV2=Module[\"_SelectV2\"]=function(){return(_SelectV2=Module[\"_SelectV2\"]=Module[\"asm\"][\"Ba\"])
.apply(null,arguments)};var
_Sigmoid=Module[\"_Sigmoid\"]=function(){return(_Sigmoid=Module[\"_Sigmoid\"]=Module[\"asm\"][\"Ca\"]).ap
ply(null,arguments)};var
_Sin=Module[\"_Sin\"]=function(){return(_Sin=Module[\"_Sin\"]=Module[\"asm\"][\"Da\"]).apply(null,arguments)
};var
_Softmax=Module[\"_Softmax\"]=function(){return(_Softmax=Module[\"_Softmax\"]=Module[\"asm\"][\"Ea\"]).ap
ply(null,arguments)};var
_Sqrt=Module[\"_Sqrt\"]=function(){return(_Sqrt=Module[\"_Sqrt\"]=Module[\"asm\"][\"Fa\"]).apply(null,argumen
ts)};var
_Square=Module[\"_Square\"]=function(){return(_Square=Module[\"_Square\"]=Module[\"asm\"][\"Ga\"]).apply(n
ull,arguments)};var
_SquaredDifference=Module[\"_SquaredDifference\"]=function(){return(_SquaredDifference=Module[\"_Squared
Difference\"]=Module[\"asm\"][\"Ha\"]).apply(null,arguments)};var
_Step=Module[\"_Step\"]=function(){return(_Step=Module[\"_Step\"]=Module[\"asm\"][\"Ia\"]).apply(null,argume
nts)};var
_StridedSlice=Module[\"_StridedSlice\"]=function(){return(_StridedSlice=Module[\"_StridedSlice\"]=Module[\"as
m\"][\"Ja\"]).apply(null,arguments)};var
_Sub=Module[\"_Sub\"]=function(){return(_Sub=Module[\"_Sub\"]=Module[\"asm\"][\"Ka\"]).apply(null,argument
s)};var
_Sum=Module[\"_Sum\"]=function(){return(_Sum=Module[\"_Sum\"]=Module[\"asm\"][\"La\"]).apply(null,argum
ents)};var
_Tan=Module[\"_Tan\"]=function(){return(_Tan=Module[\"_Tan\"]=Module[\"asm\"][\"Ma\"]).apply(null,argumen
ts)};var
_Tanh=Module[\"_Tanh\"]=function(){return(_Tanh=Module[\"_Tanh\"]=Module[\"asm\"][\"Na\"]).apply(null,argu

ments)};var
_Tile=Module[\"_Tile\"]=function(){return(_Tile=Module[\"_Tile\"]=Module[\"asm\"][\"Oa\"]).apply(null,argumen
ts)};var
_TopK=Module[\"_TopK\"]=function(){return(_TopK=Module[\"_TopK\"]=Module[\"asm\"][\"Pa\"]).apply(null,ar
guments)};var
_Transform=Module[\"_Transform\"]=function(){return(_Transform=Module[\"_Transform\"]=Module[\"asm\"][\"
Qa\"]).apply(null,arguments)};var
_Transpose=Module[\"_Transpose\"]=function(){return(_Transpose=Module[\"_Transpose\"]=Module[\"asm\"][\"R
a\"]).apply(null,arguments)};var
__FusedMatMul=Module[\"__FusedMatMul\"]=function(){return(__FusedMatMul=Module[\"__FusedMatMul\"]=
Module[\"asm\"][\"Sa\"]).apply(null,arguments)};var
_malloc=Module[\"_malloc\"]=function(){return(_malloc=Module[\"_malloc\"]=Module[\"asm\"][\"Ta\"]).apply(nu
ll,arguments)};var
_free=Module[\"_free\"]=function(){return(_free=Module[\"_free\"]=Module[\"asm\"][\"Ua\"]).apply(null,argument
s)};var
___errno_location=Module[\"___errno_location\"]=function(){return(___errno_location=Module[\"___errno_locati
on\"]=Module[\"asm\"][\"Va\"]).apply(null,arguments)};var
stackSave=Module[\"stackSave\"]=function(){return(stackSave=Module[\"stackSave\"]=Module[\"asm\"][\"Wa\"]).
apply(null,arguments)};var
stackRestore=Module[\"stackRestore\"]=function(){return(stackRestore=Module[\"stackRestore\"]=Module[\"asm\"
][\"Xa\"]).apply(null,arguments)};var
stackAlloc=Module[\"stackAlloc\"]=function(){return(stackAlloc=Module[\"stackAlloc\"]=Module[\"asm\"][\"Ya\"
]).apply(null,arguments)};Module[\"cwrap\"]=cwrap;var calledRun;function
ExitStatus(status){this.name=\"ExitStatus\";this.message=\"Program terminated with
exit(\"+status+\")\";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}preRun();if(runDependencies>0){return}function
doRun(){if(calledRun)return;calledRun=true;Module[\"calledRun\"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module[\"onRuntimeInitialized\"])Module[\"onRuntimeInitialized\"]();postRun(
)}if(Module[\"setStatus\"]){Module[\"setStatus\"](\"Running...\");setTimeout(function(){setTimeout(function(){Mo
dule[\"setStatus\"](\"\")},1);doRun()},1)}else{doRun()}}Module[\"run\"]=run;if(Module[\"preInit\"]){if(typeof
Module[\"preInit\"]==\"function\")Module[\"preInit\"]=[Module[\"preInit\"]];while(Module[\"preInit\"].length>0){
Module[\"preInit\"].pop()()}}run();\n\n\n return WasmBackendModule.ready\n}\n);\n})();\nif (typeof exports ===
'object' && typeof module === 'object')\n module.exports = WasmBackendModule;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModule; });\nelse if (typeof exports ===
'object')\n exports[\"WasmBackendModule\"] = WasmBackendModule;\n","/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==\n
*/\nimport './flags_wasm';\n\nimport {backend_util, BackendTimingInfo, DataStorage, DataType, deprecationWarn,
engine, env, KernelBackend, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasmModule,
WasmFactoryConfig} from '../wasm-out/tfjs-backend-wasm';\nimport {BackendWasmThreadedSimdModule} from
'../wasm-out/tfjs-backend-wasm-threaded-simd';\nimport wasmFactoryThreadedSimd from '../wasm-out/tfjs-
backend-wasm-threaded-simd.js';\n// @ts-ignore\nimport {wasmWorkerContents} from '../wasm-out/tfjs-backend-

```
wasm-threaded-simd.worker.js';\nimport wasmFactory from '../wasm-out/tfjs-backend-wasm.js';\n\ninterface TensorData {\n  id: number;\n  memoryOffset: number;\n  shape: number[];\n  dtype: DataType;\n  refCount: number;\n  /** Only used for string tensors, storing encoded bytes. */\n  stringBytes?: Uint8Array[];\n}\n\nexport type DataId = object;  // object instead of {} to force non-primitive.\n\nexport class BackendWasm extends KernelBackend {\n  // 0 is reserved for null data ids.\n  private dataIdNextNumber = 1;\n  dataIdMap: DataStorage<TensorData>;\n\n  constructor(public
 wasm: BackendWasmModule|BackendWasmThreadedSimdModule) {\n    super();\n
this.wasm.tfjs.initWithThreadsCount(threadsCount);\n    actualThreadsCount = this.wasm.tfjs.getThreadsCount();\n
 this.dataIdMap = new DataStorage(this, engine());\n  }\n\n  write(values: backend_util.BackendValues, shape:
number[], dtype: DataType):\n      DataId {\n    const dataId = {id: this.dataIdNextNumber++};\n
this.move(dataId, values, shape, dtype, 1);\n    return dataId;\n  }\n\n  numDataIds(): number {\n    return
this.dataIdMap.numDataIds();\n  }\n\n  async time(f: () => void): Promise<BackendTimingInfo> {\n    const start =
util.now();\n    f();\n    const kernelMs = util.now() - start;\n    return {kernelMs};\n  }\n\n  move(\n      dataId:
DataId, values: backend_util.BackendValues, shape: number[],\n      dtype: DataType, refCount: number): void {\n
const id = this.dataIdNextNumber++;\n    if (dtype === 'string') {\n      const stringBytes = values as Uint8Array[];\n
    this.dataIdMap.set(\n
        dataId,\n          {id, stringBytes, shape, dtype, memoryOffset: null, refCount});\n      return;\n    }\n\n    const
size = util.sizeFromShape(shape);\n    const numBytes = size * util.bytesPerElement(dtype);\n    const
memoryOffset = this.wasm._malloc(numBytes);\n\n    this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype,
refCount});\n\n    this.wasm.tfjs.registerTensor(id, size, memoryOffset);\n\n    if (values != null) {\n
this.wasm.HEAPU8.set(\n          new Uint8Array(\n              (values as backend_util.TypedArray).buffer,\n
(values as backend_util.TypedArray).byteOffset, numBytes),\n          memoryOffset);\n    }\n  }\n\n  async
read(dataId: DataId): Promise<backend_util.BackendValues> {\n    return this.readSync(dataId);\n  }\n\n
readSync(dataId: DataId): backend_util.BackendValues {\n    const {memoryOffset, dtype, shape, stringBytes} =\n
    this.dataIdMap.get(dataId);\n    if (dtype === 'string') {\n      return
 stringBytes;\n    }\n    const bytes = this.wasm.HEAPU8.slice(\n        memoryOffset,\n        memoryOffset +
util.sizeFromShape(shape) * util.bytesPerElement(dtype));\n    return typedArrayFromBuffer(bytes.buffer, dtype);\n
}\n\n  /**\n   * Dispose the memory if the dataId has 0 refCount. Return true if the memory\n   * is released, false
otherwise.\n   * @param dataId\n   * @oaram force Optional, remove the data regardless of refCount\n   */\n
disposeData(dataId: DataId, force = false): boolean {\n    if (this.dataIdMap.has(dataId)) {\n      const data =
this.dataIdMap.get(dataId);\n      data.refCount--;\n      if (!force && data.refCount > 0) {\n        return false;\n
}\n\n      this.wasm._free(data.memoryOffset);\n      this.wasm.tfjs.disposeData(data.id);\n
this.dataIdMap.delete(dataId);\n    }\n    return true;\n  }\n\n  /** Return refCount of a `TensorData`. */\n
refCount(dataId: DataId): number {\n    if (this.dataIdMap.has(dataId)) {\n      const tensorData =
this.dataIdMap.get(dataId);\n
      return tensorData.refCount;\n    }\n    return 0;\n  }\n\n  incRef(dataId: DataId) {\n    const data =
this.dataIdMap.get(dataId);\n    if (data != null) {\n      data.refCount++;\n    }\n  }\n\n  floatPrecision(): 32 {\n
return 32;\n  }\n\n  // Returns the memory offset of a tensor. Useful for debugging and unit\n  // testing.\n
getMemoryOffset(dataId: DataId): number {\n    return this.dataIdMap.get(dataId).memoryOffset;\n  }\n\n
dispose() {\n    this.wasm.tfjs.dispose();\n    if ('PThread' in this.wasm) {\n
this.wasm.PThread.terminateAllThreads();\n    }\n    this.wasm = null;\n  }\n\n  memory() {\n    return {unreliable:
false};\n  }\n\n  /**\n   * Make a tensor info for the output of an op. If `memoryOffset` is not\n   * present, this
method allocates memory on the WASM heap. If `memoryOffset`\n   * is present, the memory was allocated
elsewhere (in c++) and we just record\n   * the pointer where that memory lives.\n   */\n  makeOutput(shape:
 number[], dtype: DataType, memoryOffset?: number):\n      TensorInfo {\n    let dataId: {};\n    if (memoryOffset
== null) {\n      dataId = this.write(null /* values */, shape, dtype);\n    } else {\n      const id =
this.dataIdNextNumber++;\n      dataId = {id};\n      this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype,
refCount: 1});\n      const size = util.sizeFromShape(shape);\n      this.wasm.tfjs.registerTensor(id, size,
```

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memoryOffset);\n    }\n    return {dataId, shape, dtype};\n  }\n\n  typedArrayFromHeap({shape, dtype, dataId}:
TensorInfo):\n      backend_util.TypedArray {\n    const buffer = this.wasm.HEAPU8.buffer;\n    const
{memoryOffset} = this.dataIdMap.get(dataId);\n    const size = util.sizeFromShape(shape);\n    switch (dtype) {\n
case 'float32':\n        return new Float32Array(buffer, memoryOffset, size);\n      case 'int32':\n        return new
Int32Array(buffer, memoryOffset, size);\n      case 'bool':\n        return new Uint8Array(buffer, memoryOffset,
 size);\n      default:\n        throw new Error(`Unknown dtype ${dtype}`);\n    }\n  }\n}\n\nfunction
createInstantiateWasmFunc(path: string) {\n  // this will be replace by rollup plugin patchWechatWebAssembly in\n
// minprogram's output.\n  // tslint:disable-next-line:no-any\n  return (imports: any, callback: any) => {\n
util.fetch(path, {credentials: 'same-origin'}).then((response) => {\n      if (!response['ok']) {\n
imports.env.a(`failed to load wasm binary file at '${path}'`);\n      }\n      response.arrayBuffer().then(binary => {\n
   WebAssembly.instantiate(binary, imports).then(output => {\n          callback(output.instance, output.module);\n
 });\n      });\n    });\n    return {};\n  };\n}\n\n/**\n * Returns the path of the WASM binary.\n * @param
simdSupported whether SIMD is supported\n * @param threadsSupported whether multithreading is supported\n *
@param wasmModuleFolder the directory containing the WASM binaries.\n */\nfunction getPathToWasmBinary(\n
    simdSupported: boolean, threadsSupported: boolean,\n    wasmModuleFolder: string) {\n  if (wasmPath != null)
{\n    // If wasmPath is defined, the user has supplied a full path to\n    // the vanilla .wasm binary.\n    return
wasmPath;\n  }\n\n  let path: WasmBinaryName = 'tfjs-backend-wasm.wasm';\n  if (simdSupported &&
threadsSupported) {\n    path = 'tfjs-backend-wasm-threaded-simd.wasm';\n  } else if (simdSupported) {\n    path =
'tfjs-backend-wasm-simd.wasm';\n  }\n\n  if (wasmFileMap != null) {\n    if (wasmFileMap[path] != null) {\n
return wasmFileMap[path];\n    }\n  }\n\n  return wasmModuleFolder + path;\n}\n\n/**\n * Initializes the wasm
module and creates the js <--> wasm bridge.\n *\n * NOTE: We wrap the wasm module in a object with property
'wasm' instead of\n * returning Promise<BackendWasmModule> to avoid freezing Chrome (last tested\n *
in Chrome 76).\n */\nexport async function init(): Promise<{wasm: BackendWasmModule}> {\n  const
[simdSupported,
 threadsSupported] = await Promise.all([\n    env().getAsync('WASM_HAS_SIMD_SUPPORT'),\n
env().getAsync('WASM_HAS_MULTITHREAD_SUPPORT')\n  ]);\n\n  return new Promise((resolve, reject) =>
{\n    const factoryConfig: WasmFactoryConfig = {};\n\n    /**\n     * This function overrides the Emscripten
module locateFile utility.\n     * @param path The relative path to the file that needs to be loaded.\n     * @param
prefix The path to the main JavaScript file's directory.\n     */\n    factoryConfig.locateFile = (path, prefix) => {\n
if (path.endsWith('.worker.js')) {\n        const response = wasmWorkerContents;\n        const blob = new
Blob([response], {type: 'application/javascript'});\n        return URL.createObjectURL(blob);\n      }\n\n      if
(path.endsWith('.wasm')) {\n        return getPathToWasmBinary(\n            simdSupported as boolean,
threadsSupported as boolean,\n            wasmPathPrefix != null ? wasmPathPrefix : prefix);\n      }\n      return prefix
+ path;\n
   };\n\n    // Use the instantiateWasm override when system fetch is not available.\n    // Reference:\n    //
https://github.com/emscripten-
core/emscripten/blob/2bca083cbbd5a4133db61fbd74d04f7feecfa907/tests/manual_wasm_instantiate.html#L170\n
if (customFetch) {\n      factoryConfig.instantiateWasm =\n
createInstantiateWasmFunc(getPathToWasmBinary(\n            simdSupported as boolean, threadsSupported as
boolean,\n            wasmPathPrefix != null ? wasmPathPrefix : ''));\n    }\n\n    let initialized = false;\n
factoryConfig.onAbort = () => {\n      if (initialized) {\n        // Emscripten already called console.warn so no need to
double log.\n        return;\n      }\n      if (initAborted) {\n        // Emscripten calls `onAbort` twice, resulting in double
error\n        // messages.\n        return;\n      }\n      initAborted = true;\n      const rejectMsg =\n
'Make sure the server can serve the `.wasm` file relative to the ' +\n          'bundled
 js file. For more details see https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-
bundlers';\n      reject({message: rejectMsg});\n    };\n\n    let wasm: Promise<BackendWasmModule>;\n    // If
`wasmPath` has been defined we must initialize the vanilla module.\n    if (threadsSupported && simdSupported
&& wasmPath == null) {\n      factoryConfig.mainScriptUrlOrBlob = new Blob(\n          [`var
```

WasmBackendModuleThreadedSimd = ` +\n wasmFactoryThreadedSimd.toString()],\n {type: 'text/javascript'});\n wasm = wasmFactoryThreadedSimd(factoryConfig);\n } else {\n // The wasmFactory works for both vanilla and SIMD binaries.\n wasm = wasmFactory(factoryConfig);\n }\n\n // The WASM module has been successfully created by the factory.\n // Any error will be caught by the onAbort callback defined above.\n wasm.then((module) => {\n initialized = true;\n initAborted = false;\n\n const voidReturnType: string
= null;\n // Using the tfjs namespace to avoid conflict with emscripten's API.\n module.tfjs = {\n init: module.cwrap('init', null, []),\n initWithThreadsCount:\n module.cwrap('init_with_threads_count', null, ['number']),\n getThreadsCount: module.cwrap('get_threads_count', 'number', []),\n registerTensor: module.cwrap(\n 'register_tensor', null,\n [\n 'number', // id\n 'number', // size\n 'number', // memoryOffset\n]),\n disposeData: module.cwrap('dispose_data', voidReturnType, ['number']),\n dispose: module.cwrap('dispose', voidReturnType, []),\n };\n\n resolve({wasm: module});\n });\n });\n}\n\nfunction typedArrayFromBuffer(\n buffer: ArrayBuffer, dtype: DataType): backend_util.TypedArray {\n switch (dtype) {\n case 'float32':\n return new Float32Array(buffer);\n case 'int32':\n return new Int32Array(buffer);\n
case 'bool':\n return new Uint8Array(buffer);\n default:\n throw new Error(`Unknown dtype ${dtype}`);\n }\n}\n\nconst wasmBinaryNames = [\n 'tfjs-backend-wasm.wasm', 'tfjs-backend-wasm-simd.wasm',\n 'tfjs-backend-wasm-threaded-simd.wasm'\n] as const ;\ntype WasmBinaryName = typeof wasmBinaryNames[number];\n\nlet wasmPath: string = null;\nlet wasmPathPrefix: string = null;\nlet wasmFileMap: {[key in WasmBinaryName]?: string} = {};\nlet initAborted = false;\nlet customFetch = false;\n\n/**\n * @deprecated Use `setWasmPaths` instead.\n * Sets the path to the `.wasm` file which will be fetched when the wasm\n * backend is initialized. See\n * https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n * for more details.\n * @param path wasm file path or url\n * @param usePlatformFetch optional boolean to use platform fetch to download\n * the wasm file, default to false.\n *\n * @doc {heading: 'Environment', namespace: 'wasm'}\n */\nexport
function setWasmPath(path: string, usePlatformFetch = false): void {\n deprecationWarn(\n 'setWasmPath has been deprecated in favor of setWasmPaths and' +\n ' will be removed in a future release.');\n if (initAborted) {\n throw new Error(\n 'The WASM backend was already initialized. Make sure you call ' +\n '`setWasmPath()` before you call `tf.setBackend()` or `tf.ready()`');\n }\n wasmPath = path;\n customFetch = usePlatformFetch;\n}\n\n/**\n * Configures the locations of the WASM binaries.\n *\n * ```js\n * setWasmPaths({\n * 'tfjs-backend-wasm.wasm': 'renamed.wasm',\n * 'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n * 'tfjs-backend-wasm-threaded-simd.wasm': 'renamed-threaded-simd.wasm'\n * });\n * tf.setBackend('wasm');\n * ```\n *\n * @param prefixOrFileMap This can be either a string or object:\n * - (string) The path to the directory where the WASM binaries are located.\n * Note that this prefix will be used to load each binary
(vanilla,\n * SIMD-enabled, threading-enabled, etc.).\n * - (object) Mapping from names of WASM binaries to custom\n * full paths specifying the locations of those binaries. This is useful if\n * your WASM binaries are not all located in the same directory, or if your\n * WASM binaries have been renamed.\n * @param usePlatformFetch optional boolean to use platform fetch to download\n * the wasm file, default to false.\n *\n * @doc {heading: 'Environment', namespace: 'wasm'}\n */\nexport function setWasmPaths(\n prefixOrFileMap: string|{[key in WasmBinaryName]?: string},\n usePlatformFetch = false): void {\n if (initAborted) {\n throw new Error(\n 'The WASM backend was already initialized. Make sure you call ' +\n '`setWasmPaths()` before you call `tf.setBackend()` or ' +\n '`tf.ready()`');\n }\n\n if (typeof prefixOrFileMap === 'string') {\n wasmPathPrefix = prefixOrFileMap;\n } else {\n wasmFileMap = prefixOrFileMap;\n
const missingPaths =\n wasmBinaryNames.filter(name => wasmFileMap[name] == null);\n if (missingPaths.length > 0) {\n throw new Error(\n `There were no entries found for the following binaries: ` +\n `${missingPaths.join(',')}. Please either call setWasmPaths with a ` +\n `map providing a path for each binary, or with a string indicating ` +\n `the directory where all the binaries can be found.`);\n }\n }\n\n customFetch = usePlatformFetch;\n}\n\n/** Used in unit tests. */\nexport function resetWasmPath(): void {\n

wasmPath = null;\n wasmPathPrefix = null;\n wasmFileMap = {};\n customFetch = false;\n initAborted = false;\n}\n\nlet threadsCount = -1;\nlet actualThreadsCount = -1;\n\n/**\n * Sets the number of threads that will be used by XNNPACK to create\n * threadpool (default to the number of logical CPU cores).\n *\n * This must be called before calling `tf.setBackend('wasm')`.\n */\nexport function setThreadsCount(numThreads: number) {\n threadsCount = numThreads;\n}\n\n/**\n * Gets the actual threads count that is used by XNNPACK.\n *\n * It is set after the backend is intialized.\n */\nexport function getThreadsCount(): number {\n if (actualThreadsCount === -1) {\n   throw new Error(`WASM backend not initialized.`);\n }\n return actualThreadsCount;\n}\n","/** @license See the LICENSE file. */\n\n// This code is auto-generated, do not modify this file!\nconst version = '3.11.0';\nexport {version};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport './flags_wasm';\n\nimport {registerBackend} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm, init} from './backend_wasm';\n\nexport {BackendWasm, getThreadsCount, setThreadsCount, setWasmPath, setWasmPaths} from './backend_wasm';\nexport {version as version_wasm} from './version';\n\nconst WASM_PRIORITY = 2;\nregisterBackend('wasm', async () => {\n const {wasm} = await init();\n return new BackendWasm(wasm);\n}, WASM_PRIORITY);\n"],"names":["_FusedMatMul","util","Abs","backend_util","Add","AddN","Identity","setup","Transpose","All","Any","wasmFunc","ArgMax","AvgPool","Reshape","BatchMatMul","slice_util","buffer","sliceImplCPU","Slice","BatchToSpaceND","Cast","Ceil","ClipByValue","concatImplCPU","Concat","Conv2D","Conv2DBackpropInput","Cos","Cosh","CropAndResize","Cumsum","DepthToSpace","DepthwiseConv2dNative","Elu","supportsFullBroadcast","Equal","Exp","ExpandDims","Fill","FlipLeftRight","Floor","FloorDiv","FusedBatchNorm","FusedConv2D","FusedDepthwiseConv2D","GatherNd","GatherV2","Greater","GreaterEqual","setupFunc","LeakyRelu","Less","LessEqual","Log","LogicalAnd","Max","Maximum","MaxPool","Mean","Min","Minimum","MirrorPad","Multiply","Neg","NonMaxSuppressionV3","NonMaxSuppressionV4","NonMaxSuppressionV5","kernelFunc","NotEqual","OneHot","OnesLike","Pack","PadV2","Pow","Prelu","Prod","rangeImplCPU","Range","RealDiv","Relu","Relu6","ResizeBilinear","Reverse","RotateWithOffset","Round","Rsqrt","ScatterNd","Select","Sigmoid","Sin","Softmax","SpaceToBatchND","SplitV","Sqrt","Square","SquaredDifference","Step","StridedSlice","Sub","Sum","Tan","Tanh","Tile","TopK","Transform","Unpack","ZerosLike","registerKernel","env","require$$0","require$$1","require$$2","global","require$$3","require$$4","tslib_1.__extends","DataStorage","engine","KernelBackend","wasmFactoryThreadedSimd","wasmFactory","deprecationWarn","registerBackend"],"mappings":";;;;

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new Uint8Array(new Int32Array(axes).buffer);\n const outShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n wasmReverse(\n   xId, axesBytes, axes.length, outShapeBytes, x.shape.length, outId);\n\n
  const reshaped =\n   reshape({inputs: {x: out}, attrs: {shape: x.shape}, backend});\n\n backend.disposeData(out.dataId);\n return reshaped;\n}\n\nexport const reverseConfig: KernelConfig = {\n kernelName: Reverse,\n backendName: 'wasm',\n kernelFunc: reverse as {} as KernelFunc,\n setupFunc: setup\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Reverse.js.map
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* ===
*/

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* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Mean.d.ts
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/OneHot.js
*
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 * ===\n
*/\nimport {KernelConfig, Ceil} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Ceil.js.map
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{"version":3,"file":"Tile.js","sourceRoot":"","sources":["../../src/kernels/Tile.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,IAAI,EAAE,uBAAuB,EAAC,MAAM,uBAAuB,CAAC;AAIpE,OAAO,EAAC,uBAAuB,EAAC,MAAM,gBAAgB,CAAC;AAEvD,MAAM,CAAC,MAAM,UAAU,GAAG,wBAAwB,CAAC,IAAI,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n
 * ===\n
*/\nimport {KernelConfig, Tile} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const tileConfig: KernelConfig = createUnaryKernelConfig(Tile);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Tile.js.map

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 * ===\n */\nimport {Cosh, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Cosh.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"DepthToSpace.js","sourceRoot":"","sources":["../../src/kernels/DepthToSpace.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAA+E,IAAI,EAAC,MAAM,uBAAuB,CAAC;AAItI,IAAI,gBAAgB,CAAC;AAE5C,SAAS,KAAK,CAAC,OAAoB;IACjC,gBAAgB,GAAG,OAAO,CAAC,IAAI,CAAC;IAChC,YAAY,CAAC,KAAK,CAAC,CAAC;IACpB

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==========\n */\n\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthToSpace: (\n xId: number, blockSize: number, channelsLast: number, xStrides: Uint8Array,\n xStridesLength: number, outputShape: Uint8Array, outputStrides: Uint8Array,\n outSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmDepthToSpace = backend.wasm.cwrap(DepthToSpace, null /*void*/, [\n 'number', // xId\n 'number', // blockSize\n 'number', // channelsLast\n 'array', // xStrides\n 'number', // xStridesLength\n 'array', // outputShape\n 'array', // outputStrides\n 'number', // outSize\n 'number',
// outId\n]);\n}\n\nexport function depthToSpace(args: {\n backend: BackendWasm,\n inputs: DepthToSpaceInputs,\n attrs: DepthToSpaceAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x} = inputs;\n const {blockSize, dataFormat} = attrs;\n\n const batchSize = x.shape[0];\n const inputHeight = (dataFormat === 'NHWC') ? x.shape[1] : x.shape[2];\n const inputWidth = (dataFormat === 'NHWC') ? x.shape[2] : x.shape[3];\n const inputDepth = (dataFormat === 'NHWC') ? x.shape[3] : x.shape[1];\n\n const outputHeight = inputHeight * blockSize;\n const outputWidth = inputWidth * blockSize;\n const outputDepth = inputDepth / (blockSize * blockSize);\n\n const outputShape = (dataFormat === 'NHWC') ?\n [batchSize, outputHeight, outputWidth, outputDepth] :\n [batchSize, outputDepth, outputHeight, outputWidth];\n\n const out = backend.makeOutput(outputShape, 'float32');\n\n const xData = backend.dataIdMap.get(x.dataId);\n const xId = xData.id;\n const
xStridesBytes =\n new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n\n const outputShapeBytes = new Uint8Array(new Int32Array(outputShape).buffer);\n const outStridesBytes =\n new Uint8Array(new Int32Array(util.computeStrides(outputShape)).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n const channelsLast = dataFormat === 'NHWC' ? 1 : 0;\n wasmDepthToSpace(\n xId, blockSize, channelsLast, xStridesBytes, x.shape.length - 1,\n outputShapeBytes, outStridesBytes, outputShape.length, outId);\n\n return out;\n}\n\nexport const depthToSpaceConfig: KernelConfig = {\n kernelName: DepthToSpace,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: depthToSpace as {} as KernelFunc\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/DepthToSpace.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"tf-backend-wasm.es2017.min.js","sources":["../src/kernels/types.ts","../src/kernels/_FusedMatMul.ts","../src/kernels/unary_kernel.ts","../src/kernels/Abs.ts","../src/kernels/binary_kernel.ts","../src/kernels/Add.ts","../src/kernels/AddN.ts","../src/kernels/Identity.ts","../src/kernels/Transpose.ts","../src/kernels/kernel_utils.ts","../src/kernels/All.ts","../src/kernels/Any.ts","../src/kernels/ArgMax.ts","../src/kernels/AvgPool.ts","../src/kernels/Reshape.ts","../src/kernels/BatchMatMul.ts","../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Slice.js","../src/kernels/Slice.ts","../src/kernels/BatchToSpaceND.ts","../src/kernels/Cast.ts","../src/kernels/Ceil.ts","../src/kernels/ClipByValue.ts","../src/kernels/Concat.ts","../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Concat_impl.js","../src/kernels/Conv2D.ts","../src/kernels/Conv2DBackpropInput.ts","../src/kernels/Cos.ts","../src/kernels/Cosh.ts","../src/kernels/CropAndResize.ts","../src/kernels/Cumsum.ts","../src/kernels/DepthToSpace.ts","../src/kernels/DepthwiseConv2dNative.ts","../src/kernels/Elu.ts","../src/kernels/Equal.ts","../src/kernels/Exp.ts","../src/kernels/ExpandDims.ts","../src/kernels/Fill.ts","../src/kernels/FlipLeftRight.ts","../src/kernels/Floor.ts","../src/kernels/FloorDiv.ts","../src/kernels/FusedBatchNorm.ts","../src/kernels/FusedConv2D.ts","../src/kernels/Fused

DepthwiseConv2D.ts","../src/kernels/GatherNd.ts","../src/kernels/GatherV2.ts","../src/kernels/Greater.ts","../src/kernels/GreaterEqual.ts","../src/kernels/LeakyRelu.ts","../src/kernels/Less.ts","../src/kernels/LessEqual.ts","../src/kernels/Log.ts","../src/kernels/LogicalAnd.ts","../src/kernels/Max.ts","../src/kernels/Maximum.ts","../src/kernels/MaxPool.ts","../src/kernels/Mean.ts","../src/kernels/Min.ts","../src/kernels/Minimum.ts","../src/kernels/MirrorPad.ts","../src/kernels/Multiply.ts","../src/kernels/Neg.ts","../src/kernels/NonMaxSuppression_util.ts","../src/kernels/NonMaxSuppressionV3.ts","../src/kernels/NonMaxSuppressionV4.ts","../src/kernels/NonMaxSuppressionV5.ts","../src/kernels/NotEqual.ts","../src/kernels/OneHot.ts","../src/kernels/OnesLike.ts","../src/kernels/Pack.ts","../src/kernels/PadV2.ts","../src/kernels/Pow.ts","../src/kernels/Prelu.ts","../src/kernels/Prod.ts","../src/kernels/Range.ts","../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Range_impl.js","../src/kernels/RealDiv.ts","../src/kernels/Relu.ts","../src/kernels/Relu6.ts","../src/kernels/ResizeBilinear.ts","../src/kernels/Reverse.ts","../src/kernels/RotateWithOffset.ts","../src/kernels/Round.ts","../src/kernels/Rsqrt.ts","../src/kernels/ScatterNd.ts","../src/kernels/Select.ts","../src/kernels/Sigmoid.ts","../src/kernels/Sin.ts","../src/kernels/Softmax.ts","../src/kernels/SpaceToBatchND.ts","../src/kernels/SplitV.ts","../src/kernels/Sqrt.ts","../src/kernels/Square.ts","../src/kernels/SquaredDifference.ts","../src/kernels/Step.ts","../src/kernels/StridedSlice.ts","../src/kernels/Sub.ts","../src/kernels/Sum.ts","../src/kernels/Tan.ts","../src/kernels/Tanh.ts","../src/kernels/Tile.ts","../src/kernels/TopK.ts","../src/kernels/Transform.ts","../src/kernels/Unpack.ts","../src/kernels/ZerosLike.ts","../src/register_all_kernels.ts","../src/flags_wasm.ts","../wasm-out/tfjs-backend-wasm-threaded-simd.js","../wasm-out/tfjs-backend-wasm.js","../src/backend_wasm.ts","../wasm-out/tfjs-backend-wasm-threaded-simd.worker.js","../src/base.ts","../src/version.ts"],"sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT
WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\n// This enum must align with the enum defined in cc/backend.h.\nexport enum CppDType {\n float32 = 0,\n int32 = 1,\n bool = 2,\n string = 3,\n complex64 = 4\n}\n\n// Must match enum in cc/fusable_activations.h.\nexport enum FusableActivation {\n linear = 0,\n relu = 1,\n relu6 = 2,\n prelu = 3,\n leakyrelu = 4,\n sigmoid = 5,\n elu = 6\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n
* distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {_FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet wasmFusedMatMul:\n (aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n transposeB: boolean, activation: number,\n biasId: number,\n preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedMatMul = backend.wasm.cwrap(_FusedMatMul, null /* void */, [\n 'number', // a_id\n 'array', // a_shape\n 'number', // a_shape.length\n 'number', // b_id\n 'array', // b_shape\n 'number', // b_shape.length\n 'number', // transpose_a\n 'number', // transpose_b\n 'number', // activation\n 'number', // biasId\n 'number', // preluActivationWeightsId\n 'number', // leakyreluAlpha\n

'number' // out_id\n]);\n}\n\nfunction fusedBatchMatMul(args: {\n inputs: _FusedMatMulInputs,\n backend: BackendWasm,\n attrs: _FusedMatMulAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {a, b, bias, preluActivationWeights} = inputs;\n\n if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n   throw new Error(\n `_FusedMatMul for non non-float32 tensors not yet supported.`);\n }\n\n const {transposeA, transposeB, activation, leakyreluAlpha} = attrs;\n const aId = backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n\n let biasId = 0;\n if (bias != null)
 {\n   const biasData = backend.dataIdMap.get(bias.dataId);\n   if (biasData.shape.length !== 1) {\n   throw new Error(\n   `_FusedMatMul only supports rank-1 bias but got ` +\n   `rank ${biasData.shape.length}.`);\n   }\n   biasId = biasData.id;\n }\n const preluActivationWeightsId = preluActivationWeights == null ?\n   0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n const fusedActivation =\n FusableActivation[activation as {} as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n   throw new Error(\n   `${activation} activation not yet supported for FusedConv2D ` +\n   `in the wasm backend.`);\n }\n\n const leftDim = transposeA ? a.shape[2] : a.shape[1];\n const rightDim = transposeB ? b.shape[1] : b.shape[2];\n const batchDim = a.shape[0];\n\n const out = backend.makeOutput([batchDim, leftDim, rightDim], a.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new
 Uint8Array(new Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n\n wasmFusedMatMul(\n   aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n   transposeA, transposeB, fusedActivation, biasId, preluActivationWeightsId,\n leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedMatMulConfig: KernelConfig = {\n kernelName: _FusedMatMul,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchMatMul as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT
 WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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/\n\nimport {DataType, KernelConfig, TensorInfo, UnaryInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nexport function createUnaryKernelConfig(\n   kernelName: string, outType?: DataType): KernelConfig {\n let wasmFunc: (xId: number, dtype: number, outId: number) => void;\n\n function setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(kernelName, null / void */, [\n   'number', // x_id\n   'number', // dtype\n 'number', // out_id\n   ]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: UnaryInputs}):\n TensorInfo {\n   const {backend, inputs: {x}} = args;\n   const xId = backend.dataIdMap.get(x.dataId).id;\n
    const out = backend.makeOutput(x.shape, outType || x.dtype);\n   const outId =
backend.dataIdMap.get(out.dataId).id;\n\n   // Short-circuit zero-sized tensors.\n   if (util.sizeFromShape(out.shape) === 0) {\n   return out;\n   }\n\n   wasmFunc(xId, CppDType[x.dtype], outId);\n   return out;\n }\n\n return {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions
 and\n * limitations under the License.\n *
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*/\nimport {Abs, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from

'./unary_kernel';\n\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nexport function createBinaryKernelConfig(\n kernelName: string, supportsFullBroadcast: boolean,\n dtype?: DataType): KernelConfig {\n let wasmFunc:\n (aId: number, aShape: Uint8Array, aShapeLen: number, bId: number,\n bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) =>\n void;\n\n function setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n 'number', // a_id,\n 'array', // a_shape\n 'number', // a_shape.length\n 'number', // b_id\n 'array', // b_shape\n 'number', // b_shape.length\n 'number', // dtype\n 'number' // out_id\n]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: BinaryInputs}):\n TensorInfo {\n const {backend, inputs} = args;\n const {a, b} = inputs;\n const aId = backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n\n const outputType = dtype != null ? dtype : a.dtype;\n const newShape = backend_util.assertAndGetBroadcastShape(a.shape, b.shape);\n const out = backend.makeOutput(newShape, outputType);\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(newShape) === 0) {\n return out;\n }\n\n const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const kernelFunc = () => wasmFunc(\n aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n CppDType[a.dtype], outId);\n\n // Currently only some float operations support full broadcast.\n if (supportsFullBroadcast && a.dtype === 'float32') {\n kernelFunc();\n return out;\n }\n\n const aBroadcastDims = backend_util.getBroadcastDims(a.shape, newShape);\n const bBroadcastDims = backend_util.getBroadcastDims(b.shape, newShape);\n const loopsOverAllOfA = aBroadcastDims.every((v, i) => v === i);\n const loopsOverAllOfB = bBroadcastDims.every((v, i) => v === i);\n if (loopsOverAllOfA && loopsOverAllOfB) {\n kernelFunc();\n return out;\n } else {\n throw new Error(\n `Broadcasting along outer dims is not yet ` +\n `supported for ${a.dtype} ${kernelName}.`);\n }\n }\n\n return {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {Add, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const addConfig: KernelConfig = createBinaryKernelConfig(Add, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the

License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {AddN, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmFunc:\n (inputIds: Uint8Array, inputIdsLen: number, dtype: number, outId: number) =>\n void;\n\nfunction setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(AddN, null /* void */, [\n 'array', // input_ids\n 'number', // input_ids.length\n 'number', // dtype\n 'number', // out_id\n]);\n}\n\nfunction addn(args: {inputs: TensorInfo[], backend: BackendWasm}) {\n const {inputs, backend} = args;\n const out = backend.makeOutput(inputs[0].shape, inputs[0].dtype);\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n const inputIds = inputs.map(x => backend.dataIdMap.get(x.dataId).id);\n const inputIdsBytes = new Uint8Array(new Int32Array(inputIds).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(inputIdsBytes, inputIds.length, CppDType[out.dtype], outId);\n\n return out;\n}\n\nexport const addNConfig: KernelConfig = {\n kernelName: AddN,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: addn as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function identity(args: {inputs: IdentityInputs, backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const inVals = backend.typedArrayFromHeap(x);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const identityConfig: KernelConfig = {\n kernelName: Identity,\n backendName: 'wasm',\n kernelFunc: identity as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {identity} from './Identity';\nimport {CppDType} from './types';\n\nlet wasmTranspose: (\n xId: number, xShape: Uint8Array, xShapeLength: number, dtype: CppDType,\n outId: number, perm: Uint8Array, permLength: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTranspose = backend.wasm.cwrap(Transpose, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // dtype\n 'number', // outId\n 'array', // perm\n 'number', // perm.length\n]);\n}\n\nexport function transpose(\n args:\n {inputs: TransposeInputs, backend: BackendWasm, attrs: TransposeAttrs}):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n // Reduce any dimensions with size one. Lower-rank transpose kernel performs\n // better due to simpler memory access pattern.\n const [reducedShape, perm] = removeOneSizeDims(inputs.x.shape, attrs.perm);\n\n let permIsNoOp = true;\n for (let i = 0; i < perm.length; i++) {\n if (perm[i] !== i) {\n

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  permIsNoOp = false;\n    }\n  }\n  const outShape = computeOutShape(inputs.x.shape, attrs.perm);\n  const x = {\n
 dataId: inputs.x.dataId,\n    shape: reducedShape,\n    dtype: inputs.x.dtype\n  };\n\n  if (permIsNoOp) {\n    const
cloned = identity({inputs, backend});\n    cloned.shape = outShape;\n    return cloned;\n  }\n\n  const out =
backend.makeOutput(outShape, x.dtype);\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n  const permBytes = new Uint8Array(new Int32Array(perm).buffer);\n
const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n  wasmTranspose(\n      xId,
xShapeBytes, x.shape.length, CppDType[x.dtype], outId, permBytes,\n      perm.length);\n  return
out;\n}\n\nfunction computeOutShape(inShape: number[], perm: number[]): number[] {\n  const outShape = new
Array(inShape.length);\n  for (let i = 0; i < outShape.length; i++) {\n    outShape[i] = inShape[perm[i]];\n  }\n
return outShape;\n}\n\nfunction
 removeOneSizeDims(\n    shape: number[], perm: number[]): [number[], number[]] {\n  const newShape: number[]
= [];\n  const newPerm: number[] = [];\n  for (let i = 0; i < shape.length; ++i) {\n    if (shape[i] !== 1) {\n
newShape.push(shape[i]);\n    }\n    if (shape[perm[i]] !== 1) {\n      newPerm.push(perm[i]);\n    }\n  }\n  for (let i =
0; i < newPerm.length; ++i) {\n    let minValIdx = -1;\n    for (let j = 0; j < newPerm.length; ++j) {\n      if
(newPerm[j] >= i &&\n          (minValIdx === -1 || newPerm[minValIdx] > newPerm[j])) {\n        minValIdx = j;\n
  }\n    }\n    newPerm[minValIdx] = i;\n  }\n  return [newShape, newPerm];\n}\n\nexport const transposeConfig:
KernelConfig = {\n  kernelName: Transpose,\n  backendName: 'wasm',\n  kernelFunc: transpose as {} as
KernelFunc,\n  setupFunc: setup,\n};\n","/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n *
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 this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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==========================================================================\n
*/\n\nimport {backend_util, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from
'../backend_wasm';\nimport {transpose} from './Transpose';\n\n/**\n * Compute permutation axes and do a transpose
if necessary.\n *\n * Used by reduction ops.\n * @param x input TensorInfo\n * @param axis reduction axes\n *
@param backend wasm backend instance\n */\nexport function permuteAxesAndTranspose(\n    x: TensorInfo,
axis:
 number|number[], backend: BackendWasm): {\n  transposed: TensorInfo|null,\n  axes: number[],\n  originalAxes:
number[],\n  inputWasTransposed: boolean\n} {\n  const xShape = x.shape;\n  const xRank = x.shape.length;\n\n
const originalAxes = util.parseAxisParam(axis, xShape);\n  let axes = originalAxes;\n  const permutedAxes =
backend_util.getAxesPermutation(axes, xRank);\n  let xTransposed = null;\n  let inputWasTransposed = false;\n  if
(permutedAxes != null) {\n    const newShape: number[] = new Array(xRank);\n    for (let i = 0; i <
newShape.length; i++) {\n      newShape[i] = xShape[permutedAxes[i]];\n    }\n\n    axes =
backend_util.getInnerMostAxes(axes.length, xRank);\n    xTransposed =\n        transpose({inputs: {x}, attrs: {perm:
permutedAxes}, backend});\n\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const transposedId =
backend.dataIdMap.get(xTransposed.dataId).id;\n    if (transposedId !== xId) {\n      inputWasTransposed = true;\n
}\n  }\n\n  return {transposed:
 xTransposed, originalAxes, axes, inputWasTransposed};\n}\n","/**\n * @license\n * Copyright 2021 Google LLC.
All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==========================================================================\n
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*/\n\nimport {All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose}
from './kernel_utils';\n\nlet wasmAll: (xId: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmAll = backend.wasm.cwrap(All, null /*void*/, ['number, number, number']);\n}\n\nfunction all(args: {backend: BackendWasm, inputs: AllInputs, attrs: AllAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n input = transposed;\n inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('all', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape,
axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmAll(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return out;\n}\n\nexport const allConfig: KernelConfig = {\n kernelName: All,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: all as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n
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*/\n\nimport {Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmAny: (xId: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmAny = backend.wasm.cwrap(Any, null /*void*/, ['number, number, number']);\n}\n\nfunction any(args: {backend: BackendWasm, inputs: AnyInputs, attrs: AnyAttrs}):\n TensorInfo {\n const {backend,
inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n input = transposed;\n inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('any', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmAny(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return out;\n}\n\nexport const anyConfig: KernelConfig = {\n kernelName: Any,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: any as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights

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 License.\n *
==========================================================================\n
*/\n\nimport {ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmFunc: (\n    xId: number, dtype: number, outerSize: number, innerSize: number,\n    outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n    'number',  // x_id\n    'number',  // dtype\n    'number',  // outer_size\n    'number',  // inner_size\n    'number'   // out_id\n  ]);\n}\n\nfunction argmax(\n    args: {inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs}) {\n  const {backend, inputs, attrs} = args;\n const {axis} = attrs as {} as ArgMaxAttrs;\n  const {x} = inputs as {} as ArgMaxInputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n
  let inputId = xId;\n  let input = x;\n\n  const {transposed, axes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n  if (inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId !== xId) {\n      // transpose was not a no-op. We will need to dispose of this\n      // once we are done.\n      input = transposed;\n      inputId = transposedId;\n    }\n  }\n\n  const outShape = input.shape.slice(0, -1);\n  const out = backend.makeOutput(outShape, 'int32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const outerSize = util.sizeFromShape(out.shape);\n  const innerSize = input.shape[axes[0]];\n  wasmFunc(inputId, CppDType[input.dtype], outerSize, innerSize, outId);\n\n  if (inputWasTransposed) {\n    // dispose of the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  return out;\n}\n\nexport const argMaxConfig: KernelConfig = {\n  kernelName: ArgMax,\n  backendName: 'wasm',\n
  kernelFunc: argmax as {} as KernelFunc,\n  setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmAvgPool: (\n   xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n    filterHeight: number, filterWidth: number, padTop: number, padRight: number,\n    padBottom: number, padLeft: number, strideHeight: number,\n stride Width: number, channels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmAvgPool = backend.wasm.cwrap(AvgPool, null /* void */, [\n    'number',  // xId\n    'number',  // batchSize\n    'number',  // inputHeight\n    'number',  // inputWidth\n    'number',  // filterHeight\n    'number',  // filterWidth\n    'number',  // padTop\n    'number',  // padRight\n    'number',  // padBottom\n    'number',  // padLeft\n    'number',  // strideHeight\n    'number',  // strideWidth\n    'number',  // channels\n    'number',  // outId\n  ]);\n}\n\nfunction avgPool(\n    args: {inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs}) {\n  const {inputs, attrs, backend} = args;\n\n  const x = inputs.x as Tensor4D;\n  const xId
 = backend.dataIdMap.get(x.dataId).id;\n\n  const {filterSize, strides, pad, dimRoundingMode} = attrs;\n  const convInfo = backend_util.computePool2DInfo(\n      x.shape, filterSize, strides, 1 /* dilations */, pad,
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dimRoundingMode);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const channels = convInfo.inChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n   throw new Error(\n   `wasm backend does not support dataFormat:` +\n `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n   throw new Error(\n   `was backend only supports average pooling with dilation = [1, 1],
 ` +\n        `got [${convInfo.dilationHeight}, ${convInfo.dilationWidth}].`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmAvgPool(\n   xId, x.shape[0], x.shape[1], x.shape[2], filterHeight, filterWidth,\n   padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels,\n   outId);\n return out;\n}\n\nexport const avgPoolConfig: KernelConfig = {\n kernelName: AvgPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: avgPool as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is
 distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function reshape(\n   args: {inputs: ReshapeInputs, attrs: ReshapeAttrs, backend: BackendWasm}) {\n const {inputs, attrs} = args;\n const {x} = inputs;\n const {shape} = attrs;\n\n const xSize = util.sizeFromShape(x.shape);\n const $shape = util.inferFromImplicitShape(shape, xSize);\n\n util.assert(\n   xSize === util.sizeFromShape($shape),\n   () => `new shape: ${$shape}, old shape: ${x.shape}. New shape and old ` +\n   `shape must have the same number of elements.`);\n\n // Backend needs to track
 refCount for the dataId for reshape op\n args.backend.incRef(x.dataId);\n return {dataId: x.dataId, shape: $shape, dtype: x.dtype};\n}\n\nexport const reshapeConfig: KernelConfig = {\n kernelName: Reshape,\n backendName: 'wasm',\n kernelFunc: reshape as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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 /\n\nimport {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from './Reshape';\n\nlet wasmBatchMatMul: (\n   aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n   transposeB: boolean, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul, null / void */, [\n   'number', // a_id\n   'array',   // a_shape\n   'number', // a_shape.length\n   'number', // b_id\n   'array',   // b_shape\n   'number', // b_shape.length\n   'number', // transpose_a\n   'number', // transpose_b\n   'number'   // out_id\n]);\n}\n\nfunction batchMatMul(args: {\n inputs: BatchMatMulInputs,\n backend: BackendWasm,\n attrs: BatchMatMulAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {a, b} = inputs;\n

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  const {transposeA, transposeB} = attrs;\n\n  if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n    throw new Error(\n        `BatchMatMul for non non-float32 tensors not yet supported.`);\n  }\n\n  const aRank = a.shape.length;\n  const bRank = b.shape.length;\n\n  const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];\n  const innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];\n\n  const outerShapeA = transposeA ? a.shape[aRank - 1] : a.shape[aRank - 2];\n  const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank - 1];\n\n  const outerDimsA = a.shape.slice(0, -2);\n  const outerDimsB = b.shape.slice(0, -2);\n\n  const batchDimA = util.sizeFromShape(outerDimsA);\n  const batchDimB = util.sizeFromShape(outerDimsB);\n\n  const batchDimsCompatible =\n      batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;\n\n  util.assert(\n      aRank >= 2 && bRank >= 2 && batchDimsCompatible,\n      () => `Error in matMul: the input batch
 dimensions must either be the ` +\n          `same or at least one input batch dimension must be 1. Got input ` +\n
 `batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);\n\n  const outShapeOuterDims =\n      batchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);\n  const outShape = outShapeOuterDims.concat([outerShapeA, outerShapeB]);\n\n  util.assert(\n      innerShapeA === innerShapeB,\n      () => `Error in matMul: inner shapes (${innerShapeA}) and (` +\n          `${innerShapeB}) of Tensors with shapes ${a.shape} and ` +\n          `${b.shape} and transposeA=${transposeA}` +\n          ` and transposeB=${transposeB} must match.`);\n\n  const a3dShape = transposeA ? [batchDimA, innerShapeA, outerShapeA] :\n      [batchDimA, outerShapeA, innerShapeA];\n  const b3dShape = transposeB ? [batchDimB, outerShapeB, innerShapeB] :\n                                [batchDimB, innerShapeB, outerShapeB];\n\n  // The rest of the implementation
 is designed to operate on rank-3 tensors\n  const a3d = reshape({inputs: {x: a}, backend, attrs: {shape: a3dShape}});\n  const b3d = reshape({inputs: {x: b}, backend, attrs: {shape: b3dShape}});\n\n  const a3dId = backend.dataIdMap.get(a3d.dataId).id;\n  const b3dId = backend.dataIdMap.get(b3d.dataId).id;\n\n  const leftDim = transposeA ? a3d.shape[2] : a3d.shape[1];\n  const rightDim = transposeB ? b3d.shape[1] : b3d.shape[2];\n  const batchDim = Math.max(batchDimA, batchDimB);\n\n  const out = backend.makeOutput([batchDim, leftDim, rightDim], a3d.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  const aShapeBytes = new Uint8Array(new Int32Array(a3d.shape).buffer);\n  const bShapeBytes = new Uint8Array(new Int32Array(b3d.shape).buffer);\n\n  wasmBatchMatMul(\n      a3dId, aShapeBytes, a3d.shape.length, b3dId, bShapeBytes,\n      b3d.shape.length, transposeA, transposeB, outId);\n\n  backend.disposeData(a3d.dataId);\n  backend.disposeData(b3d.dataId);\n\n  out.shape
 = outShape;\n  return out;\n}\n\nexport const batchMatMulConfig: KernelConfig = {\n  kernelName: BatchMatMul,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: batchMatMul as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\nimport { backend_util, buffer, Slice, slice_util, util } from '@tensorflow/tfjs-core';\nimport
 { assertNotComplex } from '../cpu_util';\nexport function sliceImpl(vals, begin, size, shape, dtype) {\n    const isContinous = slice_util.isSliceContinous(shape, begin, size);\n    const length = util.sizeFromShape(size);\n    const xStrides = util.computeStrides(shape);\n    if (isContinous) {\n        const flatOffset = slice_util.computeFlatOffset(begin, xStrides);\n        if (dtype === 'string') {\n            return vals.slice(flatOffset, flatOffset + length);\n        }\n        return vals.subarray(flatOffset, flatOffset + length);\n    }\n    const decodedData = dtype === 'string' ?\n        backend_util.fromUint8ToStringArray(vals) :\n        vals;\n    const inBuf = buffer(shape, dtype, decodedData);\n    const outBuf = buffer(size, dtype);\n    for (let i = 0; i < outBuf.size; ++i) {\n
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const outLoc = outBuf.indexToLoc(i);\n const inLoc = outLoc.map((idx, j) => idx + begin[j]);\n outBuf.set(inBuf.get(...inLoc), ...outLoc);\n }\n if (dtype === 'string') {\n return backend_util.fromStringArrayToUint8(outBuf.values);\n }\n return outBuf.values;\n}\nexport function slice(args) {\n const { inputs, backend, attrs } = args;\n const { x } = inputs;\n const { begin, size } = attrs;\n assertNotComplex(x, 'slice');\n const [$begin, $size] = slice_util.parseSliceParams(x, begin, size);\n slice_util.assertParamsValid(x, $begin, $size);\n const vals = backend.data.get(x.dataId).values;\n const outVals = sliceImpl(vals, $begin, $size, x.shape, x.dtype);\n return backend.makeTensorInfo($size, x.dtype, outVals);\n}\nexport const sliceConfig = {\n kernelName: Slice,\n backendName: 'cpu',\n kernelFunc: slice\n};\n//# sourceMappingURL=data:application/json; base64,eyJ2ZXJzaW9uIjozLCJmaWxlIjoiU2xpY2UuanMiLCJzb3VyY2VSb290IjoiIiwic291cmNlcyI6WyIuLi8uLi8uLi8uLi8uLi8uLi90ZmpzLWJhY2tlbmQtY3B1L3NyYy9rZXJuZWxzL1NsaWNlLnRzIl0sIm5hbWVzIjpbXSwibWFwcGluZ3MiOiJBQUFBOzs7Ozs7Ozs7Ozs7R0FlRztBQU8sRUFBQyxZQUFZLENBQUM7QUM1MsS0FBSyxFQUFFLFlBQVksRUFBRSxNQUFNLHVCQUF1QixDQUFDO0FBQzVELE9BQU8sRUFBRSxnQkFBZ0IsRUFBRSxNQUFNLHVCQUF1QixDQUFDO0FBQ3p

UFBTSxDQUFDLE1BQU0sV0FBVyxHQUFpQjtJQUN2QyxVQUFVLEVBQUUsS0FBSztJQUNqQixXQUFXLE
VBQUUsS0FBSztJQUNsQixVQUFVLEVBQUUsS0FBeUI7Q0FDdEMsQ0FBQyIsInNvdXJjZXNDb250ZW50Ijp
bIi8qKlxuICogQGxpY2Vuc2VcbiAqIENvcHlyaWdodCAyMDIwIEdvb2dsZSBMTEMuIEFsbCBSaWdodHMgUm
VzZXJ2ZWQuXG4gKiBMaWNlbnNlZCB1bmRlciB0aGUgQXBhY2hlIExpY2Vuc2UsIFZlcnNpb24gMi4wICh0a
GUgXCJMaWNlbnNlXCIpO1xuICogeW91IG1heSBub3QgdXNlIHRoaXMgZmlsZSBleGNlcHQgaW4gY29tcGxp
YW5jZSB3aXRoIHRoZSBMaWNlbnNlLlxuICogWW91IG1heSBvYnRhaW4gYSBjb3B5IG9mIHRoZSBMaWNlbnNlIG
nNlIGF0XG4gKlxuICogaHR0cDovL3d3dy5hcGFjaGUub3JnL2xpY2Vuc2VzL0xJQ0VOU0UtMi4wXG4gKlxuIC
ogVW5sZXNzIHJlcXVpcmVkIGJ5IGFwcGxpY2FibGUgbGF3IG9yIGFncmVlZCB0byBpbiB3cml0aW5nLCBzb2
Z0d2FyZVxuICogZGlzdHJpYnV0ZWQgdW5kZXIgdGhlIExpY2Vuc2UgaXMgZGlzdHJpYnV0ZWQgb24gYW4g
XCJBUyBJU1wiIEJBU0lTLFxuICogV0lUSE9VVCBXQVJSQU5USUVTIE9SIENPTkRJVElPTlMgT0YgQU5ZI
EtJTkQsIGVpdGhlciBleHByZXNzIG9yIGltcGxpZWQuXG4gKiBiBleHByZXNzIG9yIGltcGxpZWQgZm9yIHRoZSBzc
GVjaWZpYyBsYW5ndWFnZSBnb3Zlcm5pbmcgcGVybWlzc2lvbnMgYW5kXG4gKiBiBsaW1pdGF0aW9ucyB1bm
RlciB0aGUgTGljZW5zZS5cbiAqXG4gKiBiBTZWUgdGhlIExpY2Vuc2UgZm9yIHRoZSBzc
ZW5kQ1BVfSBmcm9tICcuLi9iYWNrZW5kX2NwdSc7XG5pbXBvcnQge2Fzc2VydE5vdENvbXBsZXh9IGZyb2
0gJy4uL2NwdV91dGlsJztcblxuZXhwb3J0IGZ1bmN0aW9uIHNsaWNlSW1wbChcbiAgICB2YWxzPzogbnVtYm
ZW5kVmFsdWVzLCBiZWdpbjogbnVtYmVyW10sIHNpemU6IG51bWJlcltdLCBzaGFwZTogbnVtYmVyW10sXG
4gICAgZHR5cGU6IERhdGFUeXBlKTogQmFja2VuZFZhbHVlcyB7XG4gIGNvbnN0IGlzQ29udGlub3VzID0gc2
xpY2VfdXRpbC5pc1NsaWNlQ29udGlub3VzKHNoYXBlKTtcbiAgY29uc3QgeFN0cmlkZXMgPSB1dGlsLmNvbXB1dGVTd
HJpZGVzKHNoYXBlKTtcblxuICBpZiAoaXNDb250aW5vdXMpIHtcbiAgICBjb25zdCBmbGF0T2Zmc2V0ID0gc
2xpY2VfdXRpbC5jb21wdXRlRmxhdE9mZnNldChiZWdpbiwgeFN0cmlkZXMpO1xuXG4gICAgY29uc3QgZ
BlID09PSAnc3RyaW5nJykge1xuICAgICAgZmxhdE9mZnNldCArPSBiZWdpbiFbaV0gKiBzdHJpZGVzW2ldO1xuICAgIH0gZWxzZSB7XG4gICAgICBmbGF0T2Zmc2V0ID0gc
2xpY2VfdXRpbC5jb21wdXRlRmxhdE9mZnNldChiZWdpbiwgeFN0cmlkZXMpO1xuICAgIH1cbiAgfVxuXG
HJpZGVzKHNoYXBlKTtcblxuICBpZiAoaXNDb250aW5vdXMpIHtcbiAgICBjb25zdCBmbGF0T2Zmc2V0ID0gc
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BlID09PSAnc3RyaW5nJykge1xuICAgICAgZmxhdE9mZnNldCArPSBiZWdpbltpXSAqIHN0cmlkZXNbaV07XG4gICAgfSBlbHNlIHtcbiAgICAgIGZsYXRPZmZzZXQgPSBzbGljZV91dGlsLmNvbXB1dGVT
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BhcnJheSB0byB0eXBlZCBhcnJheS5cbiAgY29uc3QgaW5mZXJyZWRTaGFwZSA9IGluZmVyU2hhcGUodmFsdWVzKTtcbiAgaWYgKHNoYXBlICYmIHV0aWwuc2l6ZUZyb21TaGFwZShzaGFwZSkgIT09IHV0aWwuc2l6ZUZyb21TaGFwZShpbmZlcnJlZFNoYXBlKSkge1xuICAgIHRocm93IG5ldyBFcnJvcihgW21ha2VUeXBlZEFycmF5XSBTaGFwZSAke3NoYXBlfSBtdXN0IG1hdGNoIHRoZSBsZW5ndGggb2YgYCArXG4gICAgICAgIGBpbnB1dCB2YWx1ZXMgKCR7aW5mZXJyZWRTaGFwZX0pLmApO1xuICB9XG4gIGlmIChkdHlwZSAhPT0gJ2Zsb2F0MzInICYmIGR0eXBlICE9PSAnaW50MzInKSB7XG4gICAgdGhyb3cgbmV3IEVycm9yKGBbbWFrZVR5cGVkQXJyYXldIFVuc3VwcG9ydGVkIHR5cGUgJHtkdHlwZX1gKTtcbiAgfVxuICBjb25zdCB0eXBlZEFyciA9IGR0eXBlID09PSAnZmxvYXQzMicgPyBuZXcgRmxvYXQzMkFycmF5KHZhbHVlcykgOlxuICAgICAgZHR5cGUgPT09ICdpbnQzMicgPyBuZXcgSW50MzJBcnJheSh2YWx1ZXMpIDpcbiAgICAgIGR0eXBlID09PSAnYm9vbCcgPyBuZXcgVWludDhBcnJheSh2YWx1ZXMpIDpcbiAgICAgIG51bGw7XG4gIGlmICh0eXBlZEFyciA9PSBudWxsKSB7XG4gICAgdGhyb3cgbmV3IEVycm9yKGBbbWFrZVR5cGVkQXJyYXldIFVua25vd24gZGF0YSB0eXBlICR7ZHR5cGV9YCk7XG4gIH1cbiAgcmV0dXJuIHR5cGVkQXJyO1xufVxuXG5leHBvcnQgZnVuY3Rpb24gbWFrZVplcm9zVHlwZWRBcnJheShzaXplLCBkdHlwZSkge1xuICBpZiAoZHR5cGUgPT09ICdmbG9hdDMyJyB8fCBkdHlwZSA9PSBudWxsKSB7XG4gICAgcmV0dXJuIG5ldyBGbG9hdDMyQXJyYXkoc2l6ZSk7XG4gIH0gZWxzZSBpZiAoZHR5cGUgPT09ICdpbnQzMicpIHtcbiAgICByZXR1cm4gbmV3IEludDMyQXJyYXkoc2l6ZSk7XG4gIH0gZWxzZSBpZiAoZHR5cGUgPT09ICdib29sJykge1xuICAgIHJldHVybiBuZXcgVWludDhBcnJheShzaXplKTtcbiAgfSBlbHNlIHtcbiAgICB0aHJvdyBuZXcgRXJyb3IoYFVua25vd24gZGF0YSB0eXBlICR7ZHR5cGV9YCk7XG4gIH1cbn1cblxuZXhwb3J0IGZ1bmN0aW9uIG1ha2VPbmVzVHlwZWRBcnJheShzaXplLCBkdHlwZSkge1xuICBpZiAoZHR5cGUgPT09ICdmbG9hdDMyJyB8fCBkdHlwZSA9PSBudWxsKSB7XG4gICAgcmV0dXJuIG5ldyBGbG9hdDMyQXJyYXkoc2l6ZSkuZmlsbCgxKTtcbiAgfSBlbHNlIGlmIChkdHlwZSA9PT0gJ2ludDMyJykge1xuICAgIHJldHVybiBuZXcgSW50MzJBcnJheShzaXplKS5maWxsKDEpO1xuICB9IGVsc2UgaWYgKGR0eXBlID09PSAnYm9vbCcpIHtcbiAgICByZXR1cm4gbmV3IFVpbnQ4QXJyYXkoc2l6ZSkuZmlsbCgxKTtcbiAgfSBlbHNlIHtcbiAgICB0aHJvdyBuZXcgRXJyb3IoYFVua25vd24gZGF0YSB0eXBlICR7ZHR5cGV9YCk7XG4gIH1cbn1cblxuZXhwb3J0IGZ1bmN0aW9uIGNyZWF0ZVNjYWxhclZhbHVlKHZhbHVlLCBkdHlwZSkge1xuICBpZiAoZHR5cGUgPT09ICdzdHJpbmcnKSB7XG4gICAgcmV0dXJuIGVuY29kZVN0cmluZyh2YWx1ZSk7XG4gIH0gZWxzZSBpZiAoZHR5cGUgPT09ICdib29sJykge1xuICAgIHJldHVybiBuZXcgVWludDhBcnJheShbdmFsdWUgPyAxIDogMF0pO1xuICB9IGVsc2UgaWYgKGR0eXBlID09PSAnZmxvYXQzMicpIHtcbiAgICByZXR1cm4gbmV3IEZsb2F0MzJBcnJheShbdmFsdWVdKTtcbiAgfSBlbHNlIGlmIChkdHlwZSA9PT0gJ2ludDMyJykge1xuICAgIHJldHVybiBuZXcgSW50MzJBcnJheShbdmFsdWVdKTtcbiAgfSBlbHNlIHtcbiAgICB0aHJvdyBuZXcgRXJyb3IoYFVua25vd24gZGF0YSB0eXBlICR7ZHR5cGV9YCk7XG4gIH1cbn1cblxuZXhwb3J0IGZ1bmN0aW9uIGFzc2VydChleHByLCBtc2cpIHtcbiAgaWYgKCFleHByKSB7XG4gICAgdGhyb3cgbmV3IEVycm9yKHR5cGVvZiBtc2cgPT09ICdzdHJpbmcnID8gbXNnIDogbXNnKCkpO1xuICB9XG59XG5cbmV4cG9ydCBmdW5jdGlvbiBhc3NlcnRTaGFwZXNNYXRjaChzaGFwZUEsIHNoYXBlQiwgZXJyb3JNZXNzYWdlUHJlZml4ID0gJycpIHtcbiAgYXNzZXJ0KGFyZVNoYXBlc0VxdWFsKHNoYXBlQSwgc2hhcGVCKSwgKCkgPT4gZXJyb3JNZXNzYWdlUHJlZml4ICsgYCBTaGFwZXMgJHtzaGFwZUF9IGFuZCAke3NoYXBlQn0gbXVzdCBtYXRjaGApO1xufVxuXG5leHBvcnQgZnVuY3Rpb24gYXJlU2hhcGVzRXF1YWwoc2hhcGVBLCBzaGFwZUIpIHtcbiAgaWYgKHNoYXBlQS5sZW5ndGggIT09IHNoYXBlQi5sZW5ndGgpIHtcbiAgICByZXR1cm4gZmFsc2U7XG4gIH1cbiAgZm9yIChsZXQgaSA9IDA7IGkgPCBzaGFwZUEubGVuZ3RoOyBpKyspIHtcbiAgICBpZiAoc2hhcGVBW2ldICE9PSBzaGFwZUJbaV0pIHtcbiAgICAgIHJldHVybiBmYWxzZTtcbiAgICB9XG4gIH1cbiAgcmV0dXJuIHRydWU7XG59XG5cbmV4cG9ydCBmdW5jdGlvbiBhc3NlcnROb25OdWxsSW5wdXQoYSkge1xuICBhc3NlcnQoYSAhPSBudWxsLCAoKSA9PiBgVGhlIGlucHV0IHRvIHRoZSB0ZW5zb3IgY29uc3RydWN0b3IgbXVzdCBhIGAgK1xuICAgICAgYG5vbi1udWxsIHZhbHVlLmApO1xufVxuXG5leHBvcnQgZnVuY3Rpb24gc2l6ZURpbXMoZGltcykge1xuICBsZXQgc2l6ZSA9IDE7XG4gIGZvciAobGV0IGkgPSAwOyBpIDwgZGltcy5sZW5ndGg7IGkrKykge1xuICAgIHNpemUgKj0gZGltc1tpXTtcbiAgfVxuICByZXR1cm4gc2l6ZTtcbn1cblxuZXhwb3J0IGZ1bmN0aW9uIGFycmF5cyhuKSB7XG4gIGNvbnN0IHJlcyA9IFtdO1xuICB3aGlsZSAocmVzLmxlbmd0aCA8IG4pIHtcbiAgICByZXMucHVzaChbXSk7XG4gIH1cbiAgcmV0dXJuIHJlcztcbn1cblxuZXhwb3J0IGZ1bmN0aW9uIGFycmF5c1N0b3JlZEFzTWFwKG4pIHtcbiAgY29uc3QgcmVzID0gW107XG4gIHdoaWxlIChyZXMubGVuZ3RoIDwgbikge1xuICAgIHJlcy5wdXNoKHt9KTtcbiAgfVxuICByZXR1cm4gcmVzO1xufVxuXG5leHBvcnQgZnVuY3Rpb24gZGlzdChhLCBiKSB7XG4gIGxldCBkID0gMDtcbiAgZm9yIChsZXQgaSA9IDA7IGkgPCBhLmxlbmd0aDsgaSsrKSB7XG4gICAgZCArPSAoYVtpXSAtIGJbaV0pICogKGFbaV0gLSBiW2ldKTtcbiAgfVxuICByZXR1cm4gTWF0aC5zcXJ0KGQpO1xufVxuXG5leHBvcnQgZnVuY3Rpb24gc3VtKGFycikge1xuICBsZXQgc3VtID0gMDtcbiAgZm9yIChsZXQgaSA9I

TogJ2NwdScsXG4gIGtlcm5lbEZ1bmM6IHNsaWNlIGFzIHt9IGFzIEtlcm5lbEZ1bmNcbn07XG4iXX0=","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Slice, slice_util, SliceAttrs, SliceInputs, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {sliceImplCPU} from '../kernel_utils/shared';\n\nexport function slice(\n args: {inputs: SliceInputs, attrs: SliceAttrs, backend: BackendWasm}) {\n const {inputs: {x}, attrs: {begin, size}, backend} = args;\n\n const [begin_, size_] = slice_util.parseSliceParams(x, begin, size);\n\n const isContinous = slice_util.isSliceContinous(x.shape, begin_, size_);\n const xVals = backend.readSync(x.dataId);\n const out = backend.makeOutput(size_, x.dtype);\n const xStrides = util.computeStrides(x.shape);\n const outData = backend.dataIdMap.get(out.dataId);\n\n if (isContinous) {\n const flatOffset = slice_util.computeFlatOffset(begin_, xStrides);\n\n if (x.dtype === 'string') {\n outData.stringBytes =\n (xVals as Uint8Array[])\n .slice(flatOffset, flatOffset + util.sizeFromShape(size_));\n } else {\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(\n (xVals as TypedArray)\n .subarray(flatOffset, flatOffset + util.sizeFromShape(size_)));\n }\n\n return out;\n }\n\n if (x.dtype === 'string') {\n const res = sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype);\n outData.stringBytes = res as Uint8Array[];\n return out;\n }\n\n const outVals = backend.typedArrayFromHeap(out);\n const rank = x.shape.length;\n if (rank === 2) {\n slice2d(\n xVals as TypedArray, xStrides[0], outVals, begin_ as [number, number],\n size_ as [number, number]);\n } else if (rank === 3) {\n slice3d(\n xVals as TypedArray, xStrides[0], xStrides[1], outVals,\n begin_ as [number, number, number], size_ as [number, number, number]);\n } else if (rank === 4) {\n slice4d(\n xVals as TypedArray, xStrides[0], xStrides[1], xStrides[2], outVals,\n begin_ as [number, number, number, number],\n size_ as [number, number, number, number]);\n } else {\n const res =\n sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype) as TypedArray;\n outVals.set(res);\n }\n\n return out;\n}\n\nfunction slice2d(\n xVals: backend_util.TypedArray, xStride: number,\n outVals: backend_util.TypedArray, begin: [number, number],\n size: [number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n const endI = beginI + size[0];\n for (let i = beginI; i < endI; i++) {\n const xOffset = i * xStride + beginJ;\n outVals.set(xVals.subarray(xOffset, xOffset + size[1]), outOffset);\n outOffset += size[1];\n }\n}\n\nfunction slice3d(\n xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n outVals: backend_util.TypedArray, begin: [number, number, number],\n size: [number, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n for (let i = beginI; i < endI; i++) {\n for (let j = beginJ; j < endJ; j++) {\n const xOffset = i * xStride1 + j * xStride2 + beginK;\n outVals.set(xVals.subarray(xOffset, xOffset + size[2]), outOffset);\n outOffset += size[2];\n }\n }\n}\n\nfunction slice4d(\n xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n xStride3: number, outVals: backend_util.TypedArray,\n begin: [number, number, number, number],\n size: [number, number, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n const endK = beginK + size[2];\n const beginL = begin[3];\n\n for (let i = beginI; i < endI; i++) {\n for (let j = beginJ; j < endJ; j++) {\n for (let k = beginK; k < endK; k++) {\n const xOffset = i * xStride1 + j * xStride2 + k * xStride3 + beginL;\n outVals.set(xVals.subarray(xOffset, xOffset + size[3]), outOffset);\n outOffset += size[3];\n }\n }\n }\n}\n\nexport const sliceConfig: KernelConfig = {\n kernelName: Slice,\n backendName: 'wasm',\n kernelFunc: slice as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n *

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==========\n
*/\n\nimport {backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig,
KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport
{reshape} from './Reshape';\nimport {slice} from './Slice';\nimport {transpose} from './Transpose';\n\nfunction
batchToSpaceND(args: {\n inputs: BatchToSpaceNDInputs,\n backend: BackendWasm,\n attrs:
BatchToSpaceNDAttrs\n}) {\n const
{inputs, backend, attrs} = args;\n const {x} = inputs;\n const {blockShape, crops} = attrs;\n\n const prod =
blockShape.reduce((a, b) => a * b);\n\n const reshaped = backend_util.getReshaped(x.shape, blockShape, prod);\n
const permuted = backend_util.getPermuted(reshaped.length, blockShape.length);\n const reshapedPermuted =\n
backend_util.getReshapedPermuted(x.shape, blockShape, prod);\n const sliceBeginCoords =\n
backend_util.getSliceBeginCoords(crops, blockShape.length);\n const sliceSize =\n
backend_util.getSliceSize(reshapedPermuted, crops, blockShape.length);\n\n const xReshaped = reshape({inputs:
{x}, backend, attrs: {shape: reshaped}});\n const xTransposed =\n   transpose({inputs: {x: xReshaped}, backend,
attrs: {perm: permuted}});\n const xTransposedReshaped = reshape(\n   {inputs: {x: xTransposed}, backend,
attrs: {shape: reshapedPermuted}});\n const result = slice({\n   inputs: {x: xTransposedReshaped},\n   backend,\n
attrs: {begin: sliceBeginCoords,
size: sliceSize}\n });\n\n backend.disposeData(xReshaped.dataId);\n backend.disposeData(xTransposed.dataId);\n
backend.disposeData(xReshaped.dataId);\n\n return result;\n}\n\nexport const batchToSpaceNDConfig:
KernelConfig = {\n kernelName: BatchToSpaceND,\n backendName: 'wasm',\n kernelFunc: batchToSpaceND as
{} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed
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License.\n *
==========\n
*/\n\nimport {Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport
{TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function
cast(\n   args: {inputs: CastInputs, attrs: CastAttrs, backend: BackendWasm}):\n   TensorInfo {\n const {inputs:
{x}, attrs: {dtype}, backend} = args;\n const out = backend.makeOutput(x.shape, dtype);\n const inVals =
backend.typedArrayFromHeap(x);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n
return out;\n}\n\nexport const castConfig: KernelConfig = {\n kernelName: Cast,\n backendName: 'wasm',\n
kernelFunc: cast as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights
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License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\nimport {KernelConfig, Ceil} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from

'./unary_kernel';\n\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {ClipByValue, ClipByValueAttrs, ClipByValueInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmClip: (xId: number, min: number, max: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmClip = backend.wasm.cwrap(ClipByValue, null /* void */, [\n 'number', // x_id\n 'number', // min\n 'number', // max\n 'number' // out_id\n]);\n}\n\nfunction clip(args: {\n inputs: ClipByValueInputs,\n backend: BackendWasm,\n attrs: ClipByValueAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {clipValueMin, clipValueMax} = attrs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmClip(xId, clipValueMin, clipValueMax, outId);\n return out;\n}\n\nexport const clipByValueConfig: KernelConfig = {\n kernelName: ClipByValue,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: clip as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF
ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {concatImplCPU} from '../kernel_utils/shared';\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\n\nexport function concat(\n args: {inputs: ConcatInputs, backend: BackendWasm, attrs: ConcatAttrs}) {\n const {inputs, backend} = args;\n\n const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];\n\n let outShape = backend_util.computeOutShape(inputs.map(t => t.shape), axis);\n\n // Keep only non-empty tensors (ignore tensors with 0 in their shape).\n const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);\n if ($inputs.length === 1) {\n return identity({inputs: {x: $inputs[0]}, backend});\n }\n\n const out = backend.makeOutput(outShape, inputs[0].dtype);\n\n if (util.sizeFromShape(outShape) === 0) {\n return out;\n }\n\n const shapes = $inputs.map(t => t.shape);\n backend_util.assertParamsConsistent(shapes, axis);\n\n if ($inputs[0].dtype === 'string') {\n // Any concat of n-dimensional tensors across any axis can be reduced to\n // a concatenation of two-dimensional tensors across the axis 1 by first\n // partitioning the axes of the original tensors into those less than the\n // axis to be concatenated and the rest. Then reshape the tensors\n // into a two-dimensional tensor by collapsing these two sets of axes and\n // concatenate the resulting matrices across the axis 1, finally reshaping\n // the result to have the proper shape.\n const inputs2D = $inputs.map(t => {\n const innerSize = util.sizeFromShape(t.shape.slice(axis));\n const shape = [-1, innerSize];\n return reshape({inputs: {x: t}, backend, attrs: {shape}});\n });\n\n const inputsValShapes = inputs2D.map(t => {\n return {vals: backend.readSync(t.dataId), shape: t.shape};\n });\n\n // Concats 2d tensors along axis=1.\n outShape =\n backend_util.computeOutShape(inputs2D.map(t => t.shape), 1 /* axis */);\n const simplyConcat = inputs2D[0].shape[0] === 1;\n const outVals = concatImplCPU(\n

inputsValShapes, outShape, inputs[0].dtype,\n simplyConcat) as string[];\n\n const finalOutShape =\n backend_util.computeOutShape($inputs.map(t => t.shape), axis);\n\n out.shape = finalOutShape;\n const outData = backend.dataIdMap.get(out.dataId);\n outData.stringBytes = backend_util.fromStringArrayToUint8(outVals);\n\n inputs2D.forEach(t => backend.disposeData(t.dataId));\n\n return out;\n }\n\n const batchDim = util.sizeFromShape($inputs[0].shape.slice(0, axis));\n let sumInnerDims = 0;\n const innerDims = $inputs.map(input => {\n const innerDim = util.sizeFromShape(input.shape.slice(axis));\n sumInnerDims += innerDim;\n return innerDim;\n });\n const inVals = $inputs.map(input => backend.typedArrayFromHeap(input));\n const outVals = backend.typedArrayFromHeap(out);\n for (let b = 0; b < batchDim; b++) {\n let outOffset = b * sumInnerDims;\n for (let i = 0; i < inVals.length; i++) {\n const innerDim = innerDims[i];\n const inOffset = b * innerDim;\n const vals = inVals[i].subarray(inOffset, inOffset + innerDim);\n outVals.set(vals, outOffset);\n outOffset += innerDim;\n }\n }\n return out;\n}\n\nexport const concatConfig: KernelConfig = {\n kernelName: Concat,\n backendName: 'wasm',\n kernelFunc: concat as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport { backend_util, util } from '@tensorflow/tfjs-core';\nexport function concatImpl(inputs, outShape, dtype, simplyConcat) {\n const outVals = util.getArrayFromDType(dtype, util.sizeFromShape(outShape));\n if (simplyConcat && dtype !== 'string') {\n // Use built-in TypedArray.set() method for speed.\n let offset = 0;\n inputs.forEach(input => {\n const size = util.sizeFromShape(input.shape);\n outVals.set(input.vals, offset);\n offset += size;\n });\n }\n else {\n let colOffset = 0;\n inputs.forEach(input => {\n const decodedData = dtype === 'string' ?\n backend_util.fromUint8ToStringArray(input.vals) :\n input.vals;\n let tIdx = 0;\n for (let row = 0; row < input.shape[0]; ++row) {\n const resIdx = row * outShape[1] + colOffset;\n for (let col = 0; col < input.shape[1]; ++col) {\n outVals[resIdx + col] = decodedData[tIdx++];\n }\n }\n colOffset += input.shape[1];\n });\n }\n return outVals;\n}\n//# sourceMappingURL=data:application/json; base64,eyJ2ZXJzaW9uIjozLCJmaWxlIjoiQ29uY2F0X2ltcGwuanMiLCJzb3VyY2VSb290IjoiIiwic291cmNlcyI6WyIuLi8uLi8uLi8uLi8uLi8uLi90ZmpzLWJhY2tlbmQtY3B1L3NyYy9rZXJuZWxzL0NvbmNhdF9pbXBsLnRzIl0sIm5hbWVzIjpbXSwibWFwcGluZ3MiOiJBQUFBOzs7Ozs7Ozs7OzsyR0FlRztBQUVILE9BQU8sRUFBRSxZQUFZLEVBQUUsSUFBSSxFQUFFLE1BQU0sdUJBQXVCLENBQUM7QUFFM0QsTUFBTSxVQUFVLFVBQVUsQ0FBQyxNQUFNLEVBQUUsUUFBUSxFQUFFLEtBQUssRUFBRSxZQUFZO0lBQzlELE1BQU0sT0FBTyxHQUFHLElBQUksQ0FBQyxlQUFlLENBQUMsS0FBSyxFQUFFLElBQUksQ0FBQyxlQUFlLENBQUMsUUFBUSxDQUFDLENBQUMsQ0FBQztJQUM1RSxJQUFJLFlBQVksSUFBSSxLQUFLLEtBQUssUUFBUSxFQUFFO1FBQ3RDLDBDQUEwQztRQUMxQyxJQUFJLE1BQU0sR0FBRyxDQUFDLENBQUM7UUFDZixNQUFNLENBQUMsT0FBTyxDQUFDLEtBQUssQ0FBQyxFQUFFO1lBQ3JCLE1BQU0sSUFBSSxHQUFHLElBQUksQ0FBQyxlQUFlLENBQUMsS0FBSyxDQUFDLEtBQUssQ0FBQyxDQUFDO1lBQy9DLE9BQU8sQ0FBQyxHQUFHLENBQUMsS0FBSyxDQUFDLElBQUksRUFBRSxNQUFNLENBQUMsQ0FBQztZQUNoQyxNQUFNLElBQUksSUFBSSxDQUFDO1FBQ2pCLENBQUMsQ0FBQyxDQUFDO0tBQ0o7U0FDSTtRQUNILElBQUksU1BBSSxHQUFHLENBQUMsQ0FBQztRQUNiLE1BQU0sQ0FBQyxPQUFPLENBQUMsS0FBSyxDQUFDLEVBQUU7WUFDckIsTUFBTSxXQUFXLEdBQUcsS0FBSyxLQUFLLFFBQVEsQ0FBQyxDQUFDO2dCQUN0QyxZQUFZLENBQUMsb0JBQW9CLENBQUMsS0FBSyxDQUFDLElBQUksQ0FBQyxDQUFDO2dCQUM5QyxLQUFLLENBQUMsSUFBSSxDQUFDO1lBQ2IsSUFBSSxJQUFJLEdBQUcsQ0FBQyxDQUFDO1lBQ2IsS0FBSyxJQUFJLEdBQUcsR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEtBQUssQ0FBQyxLQUFLLENBQUMsQ0FBQyxDQUFDLEVBQUUsRUFBRSxHQUFHLEVBQUU7Z0JBQ2xELE1BQU0sTUFBTSxHQUFHLEdBQUcsR0FBRyxRQUFRLENBQUMsQ0FBQyxDQUFDLEdBQUcsU1BBSSxDQUFDO2dCQUN4QyxLQUFLLElBQUksR0FBRyxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsS0FBSyxDQUFDLEtBQUssQ0FBQyxDQUFDLENBQUMsRUFBRSxFQUFFLEdBQUcsRUFBRTtvQkFDbEQsT0FBTyxDQUFDLE1BQU0sR0FBRyxHQUFHLENBQUMsR0FBRyxXQUFXLENBQUMsSUFBSSxFQUFFLENBQUMsQ0FBQztpQkFDN0M7YUFDRjtZQUNELFNBQUksSUFBSSxLQUFLLENBQUMsS0FBSyxDQUFDLENBQUMsQ0FBQyxDQUFDO1FBQ3pCLENBQUMsQ0FBQyxDQUFDO0tBQ0o7SUFDRCxPQUFPLE9BQU8sQ0FBQztBQUNqQixDQUFDIn0=

CLElBQUksSUFBSSxHQUFHLENBQUMsQ0FBQztZQUViLEtBQUssSUFBSSxHQUFHLEdBQUcsQ0FBQyxF
QUFFLEdBQUcsR0FBRyxLQUFLLENBQUMsS0FBSyxDQUFDLENBQUMsQ0FBQyxFQUFFLEVBQUUsR0F
BRyxFQUFFO2dCQUM3QyxNQUFNLE1BQU0sR0FBRyxHQUFHLEdBQUcsUUFBUSxDQUFDLENBQUMsQ
0FBQyxHQUFHLFNBQVMsQ0FBQztnQkFDN0MsTkFDN0MsS0FBSyxJQUFJLEdBQUcsR0FBRyxDQUFDLEVBQUUsR0
FBRyxHQUFHLEtBQUssQ0FBQyxLQUFLLENBQUMsQ0FBQyxDQUFDLEVBQUUsRUFBRSxRSxHQUFHLEVB
QUU7b0JBQzdDLE8sQ0FBQyxLQUFLLENBQUMsQ0FBQyxDQUFDLEVBQUUsRUFBRSxRUFBRSxDQUFDLV0FBVyxDQUFLLElBQ
UksRUFBRSxDQUFDLENBQUM7aUJBQzdDO2FBQUBQzdDO2FBQ0Y7WUFFFRCxxTQUFTLElBQUksS0FBSyxDQUFDLENBQUMsEtB
QUssQ0FBQyxDQUFDLENBQUMsQ0FBQztRQUM5QyxDQUFDLENBQUMsQ0FBQztRQUM5QztRQUM5QztRQUM9CztRQUM9CztRQUM9C

*/\n\nimport {backend_util,
Conv2D, Conv2DAttrs, Conv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmConv2d: (\n xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number, padTop: number,\n padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n dilationHeight: number, dilationWidth: number, strideHeight: number,\n strideWidth: number, inputChannels: number, outputChannels: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmConv2d = backend.wasm.cwrap(Conv2D, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', //
padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n}\n\nfunction conv2d(\n args: {inputs: Conv2DInputs, backend: BackendWasm, attrs: Conv2DAttrs}) {\n const {inputs, attrs, backend} = args;\n\n const {x, filter} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const {strides, dilations, pad, dimRoundingMode, dataFormat} = attrs;\n const $dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode, false, $dataFormat);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n
const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend Conv2D does not support dataFormat:'` +\n `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmConv2d(\n xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n dilationHeight,
dilationWidth, strideHeight, strideWidth, inputChannels,\n outputChannels, outId);\n return out;\n}\n\nexport const conv2DConfig: KernelConfig = {\n kernelName: Conv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: conv2d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport
{backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmConv2DBackpropInput: (\n dyId: number, filterId: number, batchSize: number, filterHeight: number,\n filterWidth: number, inHeight: number, inWidth: number, inChannels: number,\n outHeight: number, outWidth: number, outChannels: number,\n strideHeight: number, strideWidth: number, topPad: number, leftPad: number,\n fltS0: number, fltS1: number, fltS2: number, xBatchStride: number,\n

xRowStride: number, xColStride: number, xChannelStride: number,\n yBatchStride: number, yRowStride: number, yColStride: number,\n yChannelStride: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmConv2DBackpropInput = backend.wasm.cwrap(Conv2DBackpropInput, null, [\n 'number', // dyId\n 'number', // filterId\n
'number', // batchSize\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // inHeight\n 'number', // inWidth\n 'number', // inChannels\n 'number', // outHeight\n 'number', // outWidth\n 'number', // outChannels\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // topPad\n 'number', // leftPad\n 'number', // fltS0\n 'number', // fltS1\n 'number', // fltS2\n 'number', // xBatchStride\n 'number', // xRowStride\n 'number', // xColStride\n 'number', // xChannelStride\n 'number', // yBatchStride\n 'number', // yRowStride\n 'number', // yColStride\n 'number', // yChannelStride\n 'number', // outId\n]);\n}\n\nfunction conv2DBackpropInput(args: {\n backend: BackendWasm,\n inputs: Conv2DBackpropInputInputs,\n attrs: Conv2DBackpropInputAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {dy, filter} = inputs;\n const {strides, pad, dataFormat,
dimRoundingMode, inputShape} = attrs;\n\n const dilations = 1;\n\n const $dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n inputShape, filter.shape as [number, number, number, number], strides,\n dilations, pad, dimRoundingMode, false /* depthwise */, $dataFormat);\n const {\n batchSize,\n filterHeight,\n filterWidth,\n inChannels,\n inHeight,\n inWidth,\n outChannels,\n outHeight,\n outWidth,\n strideHeight,\n strideWidth\n } = convInfo;\n\n const topPad = filterHeight - 1 - convInfo.padInfo.top;\n const leftPad = filterWidth - 1 - convInfo.padInfo.left;\n\n const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n const dxStrides = util.computeStrides(convInfo.inShape);\n const dyStrides = util.computeStrides(dy.shape);\n const [fltS0, fltS1, fltS2] = util.computeStrides(filter.shape);\n const xBatchStride = dxStrides[0];\n const xRowStride = isChannelsLast
? dxStrides[1] : dxStrides[2];\n const xColStride = isChannelsLast ? dxStrides[2] : 1;\n const xChannelStride = isChannelsLast ? 1 : dxStrides[1];\n const yBatchStride = dyStrides[0];\n const yRowStride = isChannelsLast ? dyStrides[1] : dyStrides[2];\n const yColStride = isChannelsLast ? dyStrides[2] : 1;\n const yChannelStride = isChannelsLast ? 1 : dyStrides[1];\n\n const out = backend.makeOutput(convInfo.inShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const dyId = backend.dataIdMap.get(dy.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n wasmConv2DBackpropInput(\n dyId, filterId, batchSize,
filterHeight, filterWidth, inHeight, inWidth,\n inChannels, outHeight, outWidth, outChannels, strideHeight,
stride Width,\n topPad, leftPad, fltS0, fltS1, fltS2, xBatchStride, xRowStride,\n xColStride, xChannelStride,
yBatchStride, yRowStride, yColStride,\n yChannelStride, outId);\n return out;\n}\n\nexport
const conv2DBackpropInputConfig: KernelConfig = {\n kernelName: Conv2DBackpropInput,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: conv2DBackpropInput as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {Cos, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig}
from './unary_kernel';\n\nexport const cosConfig: KernelConfig = createUnaryKernelConfig(Cos);\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for

the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\nimport {Cosh, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from './Cast';\n\n// Must match enum in CropAndResize.cc\nenum InterpolationMethod {\n bilinear = 0,\n nearest = 1\n}\n\nlet wasmCropAndResize: (\n   imagesId: number, boxesId: number, boxIndId: number, numBoxes: number,\n   imagesShape: Uint8Array, cropHeight: number, cropWidth: number,\n   method: number, extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n   'number', // imagesId\n   'number', // boxesId\n   'number', // boxIndId\n   'number', // numBoxes\n   'array',   // images shape\n   'number', // cropHeight\n   'number', // cropWidth\n   'number', // method\n   'number', // extrapolation value\n   'number'   // out id\n]);\n}\n\nfunction cropAndResize(args: {\n backend: BackendWasm,\n inputs: CropAndResizeInputs,\n attrs: CropAndResizeAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {method, extrapolationValue, cropSize} = attrs;\n const {image, boxes, boxInd} = inputs;\n\n const numBoxes = boxes.shape[0];\n\n const [cropHeight, cropWidth] = cropSize as [number, number];\n const outShape = [numBoxes, cropHeight, cropWidth, image.shape[3]];\n\n let imagesData = backend.dataIdMap.get(image.dataId);\n let castedData;\n if (image.dtype !== 'float32') {\n   castedData = cast({backend, inputs: {x: image}, attrs: {dtype: 'float32'}});\n   imagesData = backend.dataIdMap.get(castedData.dataId);\n }\n\n const imagesId = imagesData.id;\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const boxIndId = backend.dataIdMap.get(boxInd.dataId).id;\n\n const out = backend.makeOutput(outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n\n wasmCropAndResize(\n   imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n   cropWidth,\n   InterpolationMethod[method as {} as keyof typeof InterpolationMethod],\n   extrapolationValue, outId);\n\n if (castedData != null) {\n   backend.disposeData(castedData.dataId);\n }\n\n return out;\n}\n\nexport const cropAndResizeConfig: KernelConfig = {\n kernelName: CropAndResize,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: cropAndResize as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Cumsum, CumsumAttrs, CumsumInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nimport {transpose} from './Transpose';\n\nlet wasmCumsum: (xId: number, exclusive: number, reverse: number,\n   finalDim: number, outId: number, dtype: CppDType) => void;\n\nfunction setup(backend:

BackendWasm) {\n wasmCumsum = backend.wasm.cwrap(Cumsum, null /* void */, [\n   'number', // x_id\n 'number', // exclusive\n   'number', // reverse\n   'number', // final_dim\n   'number', // out_id\n   'number' // dtype\n]);\n}\n\nexport function cumsum(\n args: {inputs: CumsumInputs, backend: BackendWasm, attrs: CumsumAttrs}):\nTensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {axis, exclusive, reverse} = attrs;\n const xRank = x.shape.length;\n\n util.assert(x.dtype
 === 'float32' || x.dtype === 'int32',\n   () => `cumsum does not support ${x.dtype} tensors in the WASM backend`);\n // permute required axis to inner most axis\n const permutation =
backend_util.getAxesPermutation([axis], xRank);\n let permutedX = x;\n if (permutation !== null) {\n permutedX = transpose({inputs: {x}, attrs: {perm: permutation}, backend});\n }\n const permutedAxis =
backend_util.getInnerMostAxes(1, xRank)[0];\n backend_util.assertAxesAreInnerMostDims('cumsum', [permutedAxis], xRank);\n\n const permutedOut = backend.makeOutput(permutedX.shape, permutedX.dtype);\n const finalDim = permutedX.shape[permutedAxis];\n const permutedXId =
backend.dataIdMap.get(permutedX.dataId).id;\n const permutedOutId =
backend.dataIdMap.get(permutedOut.dataId).id;\n wasmCumsum(permutedXId, exclusive ? 1 : 0, reverse ? 1 : 0, finalDim,\n   permutedOutId, CppDType[x.dtype]);\n\n // transpose data back if permuted\n let out = permutedOut;\n if (permutation
 !== null) {\n   const undoPermutation = backend_util.getUndoAxesPermutation(permutation);\n   out = transpose(\n   {inputs: {x: permutedOut}, attrs: {perm: undoPermutation}, backend});\n backend.disposeData(permutedX.dataId);\n   backend.disposeData(permutedOut.dataId);\n }\n return out;\n}\n\nexport const cumsumConfig: KernelConfig = {\n kernelName: Cumsum,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: cumsum as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n
 * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthToSpace: (\n   xId: number, blockSize: number, channelsLast: number, xStrides: Uint8Array,\n   xStridesLength: number, outputShape: Uint8Array, outputStrides: Uint8Array,\n   outSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmDepthToSpace = backend.wasm.cwrap(DepthToSpace, null /*void*/, [\n   'number', // xId\n   'number', // blockSize\n   'number', // channelsLast\n   'array',   // xStrides\n   'number', // xStridesLength\n   'array',   // outputShape\n   'array',   // outputStrides\n   'number', // outSize\n   'number', // outId\n
  ]);\n}\n\nexport function depthToSpace(args: {\n backend: BackendWasm,\n inputs: DepthToSpaceInputs,\n attrs: DepthToSpaceAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x} = inputs;\n const {blockSize, dataFormat} = attrs;\n\n const batchSize = x.shape[0];\n const inputHeight = (dataFormat === 'NHWC') ? x.shape[1] : x.shape[2];\n const inputWidth = (dataFormat === 'NHWC') ? x.shape[2] : x.shape[3];\n const inputDepth = (dataFormat === 'NHWC') ? x.shape[3] : x.shape[1];\n\n const outputHeight = inputHeight * blockSize;\n const outputWidth = inputWidth * blockSize;\n const outputDepth = inputDepth / (blockSize * blockSize);\n\n const outputShape = (dataFormat === 'NHWC') ?\n   [batchSize, outputHeight, outputWidth, outputDepth] :\n   [batchSize, outputDepth, outputHeight, outputWidth];\n\n const out = backend.makeOutput(outputShape, 'float32');\n\n const xData = backend.dataIdMap.get(x.dataId);\n const xId = xData.id;\n const xStridesBytes
 =\n   new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n\n const outputShapeBytes = new Uint8Array(new Int32Array(outputShape).buffer);\n const outStridesBytes =\n   new Uint8Array(new

Int32Array(util.computeStrides(outputShape)).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n const channelsLast = dataFormat === 'NHWC' ? 1 : 0;\n wasmDepthToSpace(\n   xId, blockSize, channelsLast, xStridesBytes, x.shape.length - 1,\n   outputShapeBytes, outStridesBytes, outputShape.length, outId);\n\n return out;\n}\n\nexport const depthToSpaceConfig: KernelConfig = {\n kernelName: DepthToSpace,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: depthToSpace as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License
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*/\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs, DepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthwiseConv2d: (\n   xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n   filterId: number, filterHeight: number, filterWidth: number, padTop: number,\n   padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n   dilationHeight: number, dilationWidth:
 number, strideHeight: number,\n   strideWidth: number, inputChannels: number, outputChannels: number,\n   outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmDepthwiseConv2d =\n   backend.wasm.cwrap(DepthwiseConv2dNative, null /* void */, [\n   'number', // xId\n   'number', // batchSize\n   'number', // inputHeight\n   'number', // inputWidth\n   'number', // filterId\n   'number', // filterHeight\n   'number', // filterWidth\n   'number', // padTop\n   'number', // padRight\n   'number', // padBottom\n   'number', // padLeft\n   'number', // isSamePad\n   'number', // dilationHeight\n   'number', // dilationWidth\n   'number', // strideHeight\n   'number', // strideWidth\n   'number', // inputChannels\n   'number', // outputChannels\n   'number', // outId\n   ]);\n}\n\nfunction depthwiseConv2d(args: {\n inputs: DepthwiseConv2dNativeInputs,\n
  backend: BackendWasm,\n attrs: DepthwiseConv2dNativeAttrs\n}) {\n const {inputs, attrs, backend} = args;\n\n const {x, filter} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const {strides, dilations, pad, dimRoundingMode} = attrs;\n\n const $dilations = dilations == null ? [1, 1] : dilations;\n\n const convInfo = backend_util.computeConv2DInfo(\n   (x as Tensor4D).shape, (filter as Tensor4D).shape, strides,\n   ($dilations as number | [number, number]), pad, dimRoundingMode,\n   true /* depthwise */);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n
  const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n   throw new Error(\n   `wasm backend DepthwiseConv2dNative does not support dataFormat:'` +\n   `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmDepthwiseConv2d(\n   xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n   filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n   dilationHeight, dilationWidth, strideHeight, strideWidth, inputChannels,\n   outputChannels, outId);\n return out;\n}\n\nexport const depthwiseConv2dNativeConfig: KernelConfig = {\n kernelName: DepthwiseConv2dNative,\n backendName: 'wasm',\n setupFunc: setup,\n

kernelFunc: depthwiseConv2d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport {Elu, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const eluConfig: KernelConfig = createUnaryKernelConfig(Elu);\n","/**\n * @license\n *
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*/\nimport {Equal, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const equalConfig: KernelConfig =\n createBinaryKernelConfig(Equal, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright
2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const expConfig: KernelConfig = createUnaryKernelConfig(Exp, 'float32');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from './Reshape';\n\nexport function expandDims(args: {\n inputs: ExpandDimsInputs,\n attrs: ExpandDimsAttrs,\n backend: BackendWasm\n}) {\n const {inputs, attrs, backend} = args;\n const
{input} = inputs;\n const {dim} = attrs;\n\n const inputRank = input.shape.length;\n const newShape = input.shape.slice();\n let $dim = dim;\n if (dim < 0) {\n // Negative value is counted from the tail of rank.\n util.assert(\n -(inputRank + 1) <= dim,\n () => `Axis must be in the interval [${- (inputRank + 1)}, ${\n inputRank}]`);\n $dim = inputRank + dim + 1;\n }\n newShape.splice($dim, 0, 1);\n\n return reshape({inputs: {x: input}, backend, attrs: {shape: newShape}});\n}\n\nexport const expandDimsConfig: KernelConfig = {\n kernelName: ExpandDims,\n backendName: 'wasm',\n kernelFunc: expandDims as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version

2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {Fill, FillAttrs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function fill(args: {attrs: FillAttrs, backend: BackendWasm}) {\n const {attrs: {shape, value, dtype}, backend} = args;\n const out = backend.makeOutput(shape, dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(value as number);\n return out;\n}\n\nexport const fillConfig: KernelConfig = {\n kernelName: Fill,\n backendName: 'wasm',\n kernelFunc: fill as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {FlipLeftRight, FlipLeftRightInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFlipLeftRight: (\n   xId: number, batch: number, imageHeight: number, imageWidth: number,\n   numChannels:
 number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmFlipLeftRight = backend.wasm.cwrap(FlipLeftRight, null /* void */, [\n   'number', // xId\n   'number', // batch\n   'number', // imageHeight\n   'number', // imageWidth\n   'number', // numChannels\n   'number', // outId\n]);\n}\n\nexport function flipLeftRight(\n   args: {inputs: FlipLeftRightInputs, backend: BackendWasm}): TensorInfo {\n const {inputs, backend} = args;\n const {image} = inputs;\n\n const out = backend.makeOutput(image.shape, image.dtype);\n const imageId = backend.dataIdMap.get(image.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n\n wasmFlipLeftRight(\n   imageId, batch, imageHeight, imageWidth, numChannels, outId);\n return out;\n}\n\nexport const flipLeftRightConfig: KernelConfig = {\n kernelName: FlipLeftRight,\n backendName: 'wasm',\n kernelFunc: flipLeftRight
 as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n","/**\n * @license\n * Copyright
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*/\n\nimport {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const floorDivConfig: KernelConfig =\n
createBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n","/**\n * @license\n * Copyright
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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*/\n\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc,
TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet
wasmBatchNorm: (\n   xId: number, meanId: number, varianceId: number, offsetId: number,\n   scaleId: number,
varianceEpsilon: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmBatchNorm = backend.wasm.cwrap(\n   FusedBatchNorm, null /* void */,\n   ['number', 'number',
'number', 'number', 'number', 'number', 'number']);\n}\n\nfunction fusedBatchNorm(args: {\n backend:
BackendWasm,\n inputs: FusedBatchNormInputs,\n attrs: FusedBatchNormAttrs\n}): TensorInfo {\n const
{backend, inputs, attrs} = args;\n const {varianceEpsilon} = attrs;\n const {x, mean, variance, offset, scale} =
inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const meanId =
backend.dataIdMap.get(mean.dataId).id;\n const varianceId = backend.dataIdMap.get(variance.dataId).id;\n const
offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n const scaleId = scale != null ?
backend.dataIdMap.get(scale.dataId).id : 0;\n\n const out = backend.makeOutput(x.shape, x.dtype);\n // Short-
circuit zero-sized tensors.\n if (util.sizeFromShape(x.shape) ===
0) {\n   return out;\n }\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmBatchNorm(\n   xId,
meanId, varianceId, offsetId, scaleId, varianceEpsilon, outId);\n return out;\n}\n\nexport const
fusedBatchNormConfig: KernelConfig = {\n kernelName: FusedBatchNorm,\n backendName: 'wasm',\n
setupFunc: setup,\n kernelFunc: fusedBatchNorm as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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under the License.\n *
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*/\n\nimport {backend_util, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc,
Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport
{FusableActivation} from './types';\n\nlet wasmFusedConv2d:\n   (xId: number, batchSize: number, inputHeight:
number, inputWidth: number,\n   filterId: number, filterHeight: number, filterWidth: number,\n   biasId: number,
padTop: number, padRight: number, padBottom: number,\n   padLeft: number, isSamePad: number,
dilationHeight: number,\n   dilationWidth: number, strideHeight: number, strideWidth: number,\n
inputChannels: number, outputChannels: number, activation: number,\n   preluActivationWeightsId: number,
leakyreluAlpha: number, outId: number) =>\n   void;\n\nfunction setup(backend: BackendWasm) {\n
wasmFusedConv2d = backend.wasm.cwrap(FusedConv2D, null /*
void */, [\n   'number', // xId\n   'number', // batchSize\n   'number', // inputHeight\n   'number', // inputWidth\n
'number', // filterId\n   'number', // filterHeight\n   'number', // filterWidth\n   'number', // biasId\n   'number', //

padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // activation\n 'number', // preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number', // outId\n]);\n}\n\nfunction fusedConv2d(args: {\n inputs: FusedConv2DInputs,\n backend: BackendWasm,\n attrs: FusedConv2DAttrs\n}) {\n const {inputs, attrs, backend} = args;\n const {x, filter, bias, preluActivationWeights} = inputs;\n const {\n strides,\n   pad,\n   dilations,\n
  dataFormat,\n   dimRoundingMode,\n   activation,\n   leakyreluAlpha\n } = attrs;\n\n const convInfo = backend_util.computeConv2DInfo(\n   (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode);\n\n const fusedActivation =\n   FusableActivation[activation as {} as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n   throw new Error(\n   `${activation} activation not yet supported for FusedConv2D ` +\n   `in the wasm backend.`);\n }\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n if (bias != null) {\n   const biasData = backend.dataIdMap.get(bias.dataId);\n   if (biasData.shape.length !== 1) {\n   throw new Error(\n `FusedConv2D only supports rank-1 bias but got ` +\n   `rank ${biasData.shape.length}.`);\n   }\n   if (biasData.shape[0] !== outputChannels)
  {\n   throw new Error(\n   `FusedConv2D bias shape (${biasData.shape}) does not ` +\n   `match the number of output channels (${outputChannels})`);\n   }\n   biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize = convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if (dataFormat !== 'NHWC') {\n   throw new Error(\n   `wasm backend FusedConv2D does not
   support dataFormat:'` +\n        `${dataFormat}'. Please use 'NHWC'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const preluActivationWeightsId = preluActivationWeights == null ?\n   0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedConv2d(\n   xId, batchSize, inHeight, inWidth, filterId, filterHeight, filterWidth,\n   biasId, padTop, padRight, padBottom, padLeft, isSamePad, dilationHeight,\n   dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n   fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedConv2DConfig: KernelConfig = {\n kernelName: FusedConv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedConv2d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
   2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {backend_util, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs,
FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet wasmFusedDepthwiseConv2d:\n   (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number,

```
 filterHeight: number, filterWidth: number,\n     biasId: number, padTop: number, padRight: number, padBottom:
number,\n     padLeft: number, isSamePad: number, dilationHeight: number,\n     dilationWidth: number,
strideHeight: number, strideWidth: number,\n     inputChannels: number, outputChannels: number, activation:
number,\n     preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n
void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedDepthwiseConv2d =\n
backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n        'number',  // xId\n        'number',  //
batchSize\n        'number',  // inputHeight\n        'number',  // inputWidth\n        'number',  // filterId\n        'number',  //
filterHeight\n        'number',  // filterWidth\n        'number',  // biasId\n        'number',  // padTop\n        'number',  //
padRight\n        'number',  // padBottom\n        'number',  // padLeft\n        'number',  // isSamePad\n
 'number',  // dilationHeight\n        'number',  // dilationWidth\n        'number',  // strideHeight\n        'number',  //
strideWidth\n        'number',  // inputChannels\n        'number',  // outputChannels\n        'number',  // activation\n
'number',  // preluActivationWeightsId\n        'number',  // leakyreluAlpha\n        'number',  // outId\n
]);\n}\n\nfunction fusedDepthwiseConv2d(args: {\n  inputs: FusedDepthwiseConv2DInputs,\n  backend:
BackendWasm,\n  attrs: FusedDepthwiseConv2DAttrs\n}) {\n  const {inputs, attrs, backend} = args;\n  const {x,
filter, bias, preluActivationWeights} = inputs;\n  const {\n    strides,\n    pad,\n    dilations,\n    dataFormat,\n
dimRoundingMode,\n    activation,\n    leakyreluAlpha\n  } = attrs;\n\n  const convInfo =
backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n
pad, dimRoundingMode, true /* depthwise */);\n\n  const fusedActivation =\n      FusableActivation[activation
 as {} as keyof typeof FusableActivation];\n  if (fusedActivation == null) {\n    throw new Error(\n
`${activation} activation not yet supported for FusedDepthwiseConv2D ` +\n        `in the wasm backend.`);\n  }\n\n
const xId = backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n
const outputChannels = convInfo.outChannels;\n\n  let biasId = 0;\n  if (bias != null) {\n    const biasData =
backend.dataIdMap.get(bias.dataId);\n    if (biasData.shape.length !== 1) {\n      throw new Error(\n
`FusedDepthwiseConv2D only supports rank-1 bias but got ` +\n          `rank ${biasData.shape.length}.`);\n    }\n
if (biasData.shape[0] !== outputChannels) {\n      throw new Error(\n          `FusedDepthwiseConv2D bias shape
(${biasData.shape}) does not ` +\n          `match the number of output channels (${outputChannels})`);\n    }\n
biasId = biasData.id;\n  }\n\n  const filterHeight = convInfo.filterHeight;\n
  const filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const padRight =
convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft = convInfo.padInfo.left;\n
const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth = convInfo.dilationWidth;\n  const
strideHeight = convInfo.strideHeight;\n  const strideWidth = convInfo.strideWidth;\n  const inputChannels =
convInfo.inChannels;\n  const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n  const batchSize =
convInfo.batchSize;\n  const inHeight = convInfo.inHeight;\n  const inWidth = convInfo.inWidth;\n\n  if
(dataFormat !== 'NHWC') {\n    throw new Error(\n        `wasm backend FusedDepthwiseConv2D does not support
dataFormat:'` +\n        `${dataFormat}'. Please use 'NHWC'.`);\n  }\n\n  const out =
backend.makeOutput(convInfo.outShape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const
preluActivationWeightsId = preluActivationWeights
 == null ?\n      0 :\n      backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n
wasmFusedDepthwiseConv2d(\n      xId, batchSize, inHeight, inWidth, filterId, filterHeight, filterWidth,\n
biasId, padTop, padRight, padBottom, padLeft, isSamePad, dilationHeight,\n      dilationWidth, strideHeight,
strideWidth, inputChannels, outputChannels,\n      fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0,
outId);\n\n  return out;\n}\n\nexport const fusedDepthwiseConv2DConfig: KernelConfig = {\n  kernelName:
FusedDepthwiseConv2D,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: fusedDepthwiseConv2d as
{} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed
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License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
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law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmGatherNd: (\n xId: number, dtype: CppDType, indicesId: number, numSlices: number,\n sliceRank: number, sliceSize: number, strides: Uint8Array, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n 'number', // xId\n 'number', // dtype\n 'number', // indicesId\n 'number', // numSlices\n 'number', // sliceRank\n 'number', // sliceSize\n 'array', // strides\n 'number' // outId\n]);\n}\n\nfunction gatherNd(args: {backend: BackendWasm, inputs: GatherNdInputs}):\n TensorInfo {\n const {backend, inputs} = args;\n const {params, indices} = inputs;\n\n const [resultShape, numSlices, sliceSize, strides] =\n gather_util.prepareAndValidate(params, indices);\n\n const out = backend.makeOutput(resultShape, params.dtype);\n if (numSlices === 0) {\n return out;\n }\n\n const indicesShape = indices.shape;\n const sliceRank = indicesShape[indicesShape.length - 1];\n\n const xData = backend.dataIdMap.get(params.dataId);\n const xId = xData.id;\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const stridesBytes = new Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmGatherNd(\n xId, CppDType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n stridesBytes, outId);\n\n return out;\n}\n\nexport const gatherNdConfig: KernelConfig = {\n kernelName: GatherNd,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherNd\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc, Tensor, TensorInfo, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from './Reshape';\nimport {CppDType} from './types';\n\nlet wasmGather: (\n xId: number, dtype: CppDType, xStrides: Uint8Array, stridesSize: number,\n indicesId: number, batchSize: number, outStrides: Uint8Array,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmGather = backend.wasm.cwrap('Gather', null /*void*/, [\n 'number', // xId\n 'number', // dtype\n 'array', // xStrides\n 'number', // stridesSize\n 'number', // indicesId\n 'number', // batchSize\n 'array', // outStrides\n 'number' // outId\n]);\n}\n\nfunction gatherV2(\n args: {backend: BackendWasm, inputs: GatherV2Inputs, attrs: GatherV2Attrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x, indices} = inputs;\n const {axis, batchDims} = attrs;\n\n // Throw error when any index is out of bound.\n const parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n const indicesVals = backend.readSync(indices.dataId) as TypedArray;\n const axisDim = x.shape[parsedAxis];\n for (let i = 0; i < indicesVals.length; ++i) {\n const index = indicesVals[i];\n util.assert(\n index <= axisDim - 1 && index >= 0,\n () =>\n `GatherV2: the index value ${index} is not in [0, ${axisDim - 1}]`);\n }\n\n const shapeInfo = backend_util.segment_util.collectGatherOpShapeInfo(\n x as Tensor, indices as Tensor, parsedAxis, batchDims);\n\n const flattenX = reshape({\n inputs: {x},\n attrs: {\n shape: [\n shapeInfo.batchSize, shapeInfo.outerSize, shapeInfo.dimSize,\n shapeInfo.sliceSize\n]\n },\n backend\n });\n const indicesSize = util.sizeFromShape(indices.shape);\n const flattenIndex = reshape({\n inputs: {x: indices},\n attrs: {shape: [shapeInfo.batchSize, indicesSize / shapeInfo.batchSize]},\n

backend\n });\n const flattenOutputShape = [\n shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n shapeInfo.sliceSize\n];\n\n const out = backend.makeOutput(flattenOutputShape, x.dtype);\n if (util.sizeFromShape(x.shape) === 0) {\n return out;\n }\n const stridesSize = flattenX.shape.length - 1;\n\n const xData = backend.dataIdMap.get(flattenX.dataId);\n const xId = xData.id;\n\n const indicesData = backend.dataIdMap.get(flattenIndex.dataId);\n const indicesId = indicesData.id;\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const xStridesBytes = new Uint8Array(\n new Int32Array(util.computeStrides(flattenX.shape)).buffer);\n const outStridesBytes = new Uint8Array(\n new Int32Array(util.computeStrides(flattenOutputShape)).buffer);\n\n wasmGather(\n xId, CppDType[x.dtype], xStridesBytes, stridesSize, indicesId,\n shapeInfo.batchSize, outStridesBytes, outId);\n\n backend.disposeData(flattenX.dataId);\n backend.disposeData(flattenIndex.dataId);\n\n // reshape\n out.shape = shapeInfo.outputShape;\n return out;\n}\n\nexport const gatherV2Config: KernelConfig = {\n kernelName: GatherV2,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherV2 as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\nimport {Greater, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterConfig: KernelConfig =\n createBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\nimport {GreaterEqual, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterEqualConfig: KernelConfig =\n createBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmFunc: (\n xId: number, dtype: number, leakyreluAlpha: number, outId: number) => void;\n\nfunction setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(LeakyRelu, null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // leakyrelu_alpha\n 'number', // out_id\n]);\n}\n\nexport function leakyRelu(\n args:\n {inputs: LeakyReluInputs, attrs: LeakyReluAttrs, backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, attrs: {alpha}, backend} = args;\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n // According to TF API, LeakyRelu returns float32 when input is either

float32\n // or int32.\n const out = backend.makeOutput(x.shape, 'float32');\n\n if (util.sizeFromShape(x.shape)
 !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n   wasmFunc(xId, CppDType[x.dtype], alpha,
outId);\n }\n\n return out;\n}\n\nexport const leakyReluConfig: KernelConfig = {\n kernelName: LeakyRelu,\n
backendName: 'wasm',\n setupFunc,\n kernelFunc: leakyRelu as {} as KernelFunc,\n};\n","/**\n * @license\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
==\n
 */\nimport {KernelConfig, Less} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessConfig: KernelConfig =\n
createBinaryKernelConfig(Less, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==\n
 */\n\nimport {KernelConfig, LessEqual} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessEqualConfig: KernelConfig =\n
createBinaryKernelConfig(LessEqual, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==\n
 */\nimport {KernelConfig, Log} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const logConfig: KernelConfig = createUnaryKernelConfig(Log);\n","/**\n * @license\n *
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\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\nimport {KernelConfig, LogicalAnd}
 from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst
supportsFullBroadcast = false;\nexport const logicalAndConfig: KernelConfig =\n
createBinaryKernelConfig(LogicalAnd, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES

OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {backend_util,
KernelConfig, KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmMax: (xId: number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMax = backend.wasm.cwrap(Max, null /*void*/, [\n   'number', // x_id\n   'number', // dtype\n   'number', // reduce_size\n   'number', // out_id\n]);\n}\n\nfunction max(args: {backend: BackendWasm, inputs: MaxInputs, attrs: MaxAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {reductionIndices: axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed)
  {\n   const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   input = transposed;\n   inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('max', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n   wasmMax(inputId, CppDType[x.dtype], reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n return out;\n}\n\nexport const maxConfig: KernelConfig = {\n kernelName: Max,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: max as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const maximumConfig:
  KernelConfig =\n   createBinaryKernelConfig(Maximum, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet
  wasmMaxPool: (\n   xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n   filterHeight: number, filterWidth: number, padTop: number, padRight: number,\n   padBottom: number, padLeft: number, dilationHeight: number,\n   dilationWidth: number, strideHeight: number, strideWidth: number,\n   inputChannels: number, outputChannels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n

wasmMaxPool = backend.wasm.cwrap(MaxPool, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n}\n\nfunction maxPool(\n args: {inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n const {inputs, attrs, backend} = args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n // TF API supports int32 input. CPU and WebGL backend also support int32\n // input. WASM backend doesn't support it because it uses xnnpack which only\n // supports float32.\n //\n // Add the following assert only for the WASM backend instead of at core op\n // level.\n //\n // TODO: add support for int32 input.\n util.assert(\n x.dtype === 'float32',\n () =>\n `Error in MaxPool: only float32 input is supported. Got ${x.dtype}.`);\n\n const {filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend does not support dataFormat:` +\n `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmMaxPool(\n xId, x.shape[0], x.shape[1], x.shape[2], filterHeight, filterWidth,\n padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n strideHeight, strideWidth, inputChannels, outputChannels, outId);\n return out;\n}\n\nexport const maxPoolConfig: KernelConfig = {\n kernelName: MaxPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: maxPool as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {cast} from './Cast';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmMean: (xId: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMean =\n backend.wasm.cwrap(Mean, null /*void*/, ['number, number, number']);\n}\n\nexport function mean(\n args: {backend: BackendWasm, inputs: MeanInputs, attrs: MeanAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was not a no-op. We will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n reductionAxes.length, input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'mean', reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n

backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize = util.sizeFromShape(reduceShape);\n let castedInput = input;\n if (input.dtype !== 'float32') {\n   castedInput =\n cast({backend, inputs: {x: input}, attrs: {dtype: 'float32'}});\n   inputId = backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(outShape, 'float32');\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n wasmMean(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n if (input.dtype !== 'float32') {\n   backend.disposeData(castedInput.dataId);\n }\n\n return out;\n}\n\nexport const meanConfig: KernelConfig = {\n kernelName: Mean,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: mean as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF
 ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmMin: (xId: number, dtype: number, reduceSize: number, outId: number) =>\n   void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMin = backend.wasm.cwrap(Min, null /*void*/, [\n   'number', // x_id\n   'number', // dtype\n   'number', // reduce_size\n   'number', // out_id\n]);\n}\n\nfunction min(args: {backend: BackendWasm, inputs: MinInputs, attrs: MinAttrs}):\n   TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x}
 = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n   const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   if (transposedId !== xId) {\n   // transpose was not a no-op. We will need to dispose of this\n   // once we are done.\n   input = transposed;\n   inputId = transposedId;\n   }\n }\n\n const inputRank = input.shape.length;\n\n backend_util.assertAxesAreInnerMostDims('min', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n wasmMin(inputId, CppDType[x.dtype], reduceSize,
 outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n return out;\n}\n\nexport const minConfig: KernelConfig = {\n kernelName: Min,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: min as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n

```
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==========================================================================\n
*/\nimport {KernelConfig, Minimum} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\nconst supportsFullBroadcast = false;\nexport const minimumConfig: KernelConfig =\n
createBinaryKernelConfig(Minimum, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2021 Google
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See
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==========================================================================\n
*/\n\nimport {KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\n// Must match
enum in MirrorPad.cc\nenum MirrorPaddingMode {\n  reflect = 0,\n  symmetric = 1\n}\n\nlet wasmMirrorPad: (\n
xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n    prePaddingsBytes:
Uint8Array, postPaddingsBytes: Uint8Array, mode: number,\n    outId: number) => void;\n\nfunction
setup(backend: BackendWasm) {\n  wasmMirrorPad = backend.wasm.cwrap(MirrorPad, null /* void */, [\n
'number',  // xId\n    'array',   // x.shape\n    'number',  // x.shape.length\n    'number',  // x.dtype\n    'array',   // pre-
paddings\n    'array',   // post-paddings\n    'number',
 // mode\n    'number',  // outId\n  ]);\n}\n\nfunction mirrorPad(args: {\n  inputs: MirrorPadInputs,\n  backend:
BackendWasm,\n  attrs: MirrorPadAttrs\n}) {\n  const {inputs: {x}, backend, attrs: {paddings, mode}} = args;\n\n
const outShape = paddings.map(\n      (p, i) => p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n  const xId =
backend.dataIdMap.get(x.dataId).id;\n  const out = backend.makeOutput(outShape, x.dtype);\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n  const xShapeBytes = new Uint8Array(new
Int32Array(x.shape).buffer);\n\n  const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);\n  const
postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n  const prePaddingsBytes =\n      new
Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n  const postPaddingsBytes =\n      new Uint8Array(new
Int32Array(postPaddingsFlat).buffer);\n\n  wasmMirrorPad(\n      xId, xShapeBytes, x.shape.length,
CppDType[x.dtype], prePaddingsBytes,\n      postPaddingsBytes,
 MirrorPaddingMode[mode], outId);\n  return out;\n}\n\nexport const mirrorPadConfig: KernelConfig = {\n
kernelName: MirrorPad,\n  backendName: 'wasm',\n  kernelFunc: mirrorPad as {} as KernelFunc,\n  setupFunc:
setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
==========================================================================\n
*/\n\nimport {KernelConfig, Multiply} from '@tensorflow/tfjs-core';\n\nimport
 {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = true;\nexport const
multiplyConfig: KernelConfig =\n    createBinaryKernelConfig(Multiply, supportsFullBroadcast);\n","/**\n *
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2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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==========\n
*/\nimport {KernelConfig, Neg} from '@tensorflow/tfjs-core';\n\nimport
{createUnaryKernelConfig} from './unary_kernel';\nexport const negConfig: KernelConfig =
createUnaryKernelConfig(Neg);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n *
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {BackendWasm} from '../backend_wasm';\n\n// Analogous to `struct Result` in
`non_max_suppression_impl.h`.\ninterface Result
{\n pSelectedIndices: number;\n selectedSize: number;\n pSelectedScores: number;\n pValidOutputs:
number;\n}\n/**\n * Parse the result of the c++ method, which has the shape equivalent to\n * `Result`.\n */\nexport
function parseResultStruct(\n backend: BackendWasm, resOffset: number): Result {\n const result = new
Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);\n const pSelectedIndices = result[0];\n const
selectedSize = result[1];\n const pSelectedScores = result[2];\n const pValidOutputs = result[3];\n // Since the
result was allocated on the heap, we have to delete it.\n backend.wasm._free(resOffset);\n return
{pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs};\n}\n","/**\n * @license\n * Copyright 2019
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distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either
express or implied.\n * See the License for the specific language governing permissions and\n * limitations under
the License.\n *
==========\n
*/\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs,
NonMaxSuppressionV3Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'../backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n
boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number)
=> number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n
NonMaxSuppressionV3,\n 'number', // Result*\n [\n
'number', // boxesId\n 'number', // scoresId\n 'number', // maxOutputSize\n 'number', //
iouThreshold\n 'number', // scoreThreshold\n]);\n}\n\nfunction kernelFunc(args: {\n backend:
BackendWasm,\n inputs: NonMaxSuppressionV3Inputs,\n attrs: NonMaxSuppressionV3Attrs\n}): TensorInfo {\n
const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold} = attrs;\n const
{boxes, scores} = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const scoresId =
backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset =\n wasmFunc(boxesId, scoresId, maxOutputSize,
iouThreshold, scoreThreshold);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n
parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V3, we have to delete it from the
heap.\n backend.wasm._free(pSelectedScores);\n backend.wasm._free(pValidOutputs);\n\n const
selectedIndicesTensor
=\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n return
selectedIndicesTensor;\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n kernelName:
NonMaxSuppressionV3,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as {} as

KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs, NonMaxSuppressionV4Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number,\n padToMaxOutputSize: boolean) => number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n NonMaxSuppressionV4,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', // scoreThreshold\n 'bool', // padToMaxOutputSize\n]);\n}\n\nfunction nonMaxSuppressionV4(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV4Inputs,\n attrs: NonMaxSuppressionV4Attrs\n}): TensorInfo[] {\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold, padToMaxOutputSize} =\n attrs;\n const {boxes, scores} = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset = wasmFunc(\n boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n padToMaxOutputSize);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V4, we have to delete it from the heap.\n backend.wasm._free(pSelectedScores);\n\n const selectedIndicesTensor =\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n const validOutputsTensor = backend.makeOutput([], 'int32', pValidOutputs);\n\n return [selectedIndicesTensor, validOutputsTensor];\n}\n\nexport const nonMaxSuppressionV4Config: KernelConfig = {\n kernelName: NonMaxSuppressionV4,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: nonMaxSuppressionV4 as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs, NonMaxSuppressionV5Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc:\n (boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number, softNmsSigma: number) =>\n number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n NonMaxSuppressionV5,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', // scoreThreshold\n 'number', // softNmsSigma\n]);\n}\n\nfunction kernelFunc(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV5Inputs,\n attrs: NonMaxSuppressionV5Attrs\n}): TensorInfo[] {\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold, softNmsSigma} = attrs;\n const {boxes, scores} = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n

const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset = wasmFunc(\n   boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n   softNmsSigma);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n   parseResultStruct(backend, resOffset);\n\n // Since we are not using validOutputs for V5, we have to delete it from the\n // heap.\n backend.wasm._free(pValidOutputs);\n\n const selectedIndicesTensor =\n   backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n const selectedScoresTensor =\n   backend.makeOutput([selectedSize], 'float32', pSelectedScores);\n\n return [selectedIndicesTensor, selectedScoresTensor];\n}\n\nexport const nonMaxSuppressionV5Config: KernelConfig = {\n kernelName: NonMaxSuppressionV5,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ==\n */\nimport {KernelConfig, NotEqual} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const notEqualConfig: KernelConfig =\n createBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ==\n */\n\nimport {KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmOneHot: (\n   indicesId: number, depth: number, onValue: number, offValue: number,\n   outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmOneHot = backend.wasm.cwrap(OneHot, null /* void */, [\n   'number', // indices_id\n   'number', // depth,\n   'number', // onValue\n   'number', // offValue\n   'number'   // out_id\n]);\n}\n\nfunction oneHot(\n   args: {inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm}) {\n const {inputs, backend, attrs} = args;\n const {indices} = inputs;\n const {depth, onValue, offValue} = attrs;\n\n const out = backend.makeOutput([...indices.shape, depth], 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n wasmOneHot(indicesId, depth, onValue, offValue, outId);\n\n return out;\n}\n\nexport const oneHotConfig: KernelConfig = {\n kernelName: OneHot,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: oneHot as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ==\n */\n\nimport {KernelConfig, KernelFunc, OnesLike, OnesLikeInputs} from '@tensorflow/tfjs-core';\n\nimport

{BackendWasm} from '../backend_wasm';\n\nfunction onesLike(args: {inputs: OnesLikeInputs, backend: BackendWasm}) {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(1);\n return
 out;\n}\n\nexport const onesLikeConfig: KernelConfig = {\n kernelName: OnesLike,\n backendName: 'wasm',\n kernelFunc: onesLike as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport
 {BackendWasm} from '../backend_wasm';\n\nimport {concat} from './Concat';\nimport {expandDims} from './ExpandDims';\n\nexport function pack(\n   args: {inputs: PackInputs, backend: BackendWasm, attrs: PackAttrs}):\n   TensorInfo {\n const {inputs, backend, attrs} = args;\n const {axis} = attrs;\n\n if (inputs.length === 1) {\n   return expandDims(\n   {inputs: {input: inputs[0]}, backend, attrs: {dim: axis}});\n }\n\n const shape = inputs[0].shape;\n const dtype = inputs[0].dtype;\n\n inputs.forEach(t => {\n   util.assertShapesMatch(\n   shape, t.shape,\n   'All tensors passed to stack must have matching shapes');\n   util.assert(\n   dtype === t.dtype,\n   () => 'All tensors passed to stack must have matching dtypes');\n });\n\n const intermediateTensorInfos: TensorInfo[] = [];\n const expandedTensors = inputs.map(t => {\n   const expandedT =\n   expandDims({inputs: {input: t}, backend, attrs: {dim: axis}});\n   intermediateTensorInfos.push(expandedT);\n   return expandedT;\n });\n\n const result = concat({inputs: expandedTensors, backend, attrs: {axis}});\n\n intermediateTensorInfos.forEach(t => backend.disposeData(t.dataId));\n\n return result;\n}\n\nexport const packConfig: KernelConfig = {\n kernelName: Pack,\n backendName: 'wasm',\n kernelFunc: pack as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n
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/\n\nimport {KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {fill} from './Fill';\n\nimport {CppDType} from './types';\n\nlet wasmPadV2: (\n   xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n   prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array,\n   constantValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmPadV2 = backend.wasm.cwrap(PadV2, null / void */, [\n   'number', // xId\n   'array',   // x.shape\n   'number', // x.shape.length\n   'number', // x.dtype\n   'array',   // pre-paddings\n   'array',   // post-paddings\n   'number', // constantValue\n   'number', // outId\n]);\n}\n\nfunction pad(\n   args: {inputs: PadV2Inputs, backend: BackendWasm, attrs: PadV2Attrs}) {\n const {inputs: {x}, backend,
 attrs: {paddings, constantValue}} = args;\n\n const outShape = paddings.map(\n   (p, i) => p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n\n if (util.sizeFromShape(x.shape) === 0) {\n   // Short-circuit the computation, since x doesn't have value, only\n   // the shape is used to compute output shape to pad.\n   return fill({\n   backend,\n   attrs: {shape: outShape, value: constantValue, dtype: x.dtype}\n   });\n }\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(outShape, x.dtype);\n const

outTensorData = backend.dataIdMap.get(out.dataId);\n const outId = outTensorData.id;\n\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n const prePaddingsBytes =\n   new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const postPaddingsBytes =\n   new Uint8Array(new
Int32Array(postPaddingsFlat).buffer);\n\n wasmPadV2(\n   xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n   postPaddingsBytes, constantValue, outId);\n return out;\n}\n\nexport const padV2Config: KernelConfig = {\n kernelName: PadV2,\n backendName: 'wasm',\n kernelFunc: pad as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n
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*/\nimport {KernelConfig, Pow} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const powConfig: KernelConfig =\n createBinaryKernelConfig(Pow, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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/\n\nimport {KernelConfig, KernelFunc, Prelu, PreluInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from './Cast';\n\nlet wasmPrelu: (xId: number, weightsId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmPrelu = backend.wasm.cwrap(Prelu, null / void */, [\n   'number', // x_id\n   'number', // weights_id\n   'number'   // out_id\n]);\n}\n\nfunction prelu(args: {inputs: PreluInputs, backend: BackendWasm}) {\n const {inputs, backend} = args;\n const {x, alpha} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const weightsId = backend.dataIdMap.get(alpha.dataId).id;\n\n let inputId = xId;\n const input = x;\n let castedInput = input;\n if (input.dtype !== 'float32') {\n   castedInput = cast({backend, inputs: {x}, attrs: {dtype: 'float32'}});\n   inputId = backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n
  const out = backend.makeOutput(x.shape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmPrelu(inputId, weightsId, outId);\n\n if (input.dtype !== 'float32') {\n backend.disposeData(castedInput.dataId);\n }\n return out;\n}\n\nexport const preluConfig: KernelConfig = {\n kernelName: Prelu,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prelu as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing
permissions and\n * limitations under the License.\n *
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*/\n\nimport {backend_util, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, util} from

'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\n\nimport {CppDType} from './types';\n\nlet wasmProd: (\n xId: number, reduceSize: number,\n dtype: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmProd = backend.wasm.cwrap(Prod, null /*void*/, [\n 'number',\n 'number',\n 'number',\n 'number'\n]);\n}\n\nfunction prod(args: {\n backend: BackendWasm,\n inputs: ProdInputs,\n attrs: ProdAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was not a no-op. We will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n reductionAxes.length, input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'prod', reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmProd(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return out;\n}\n\nexport const prodConfig: KernelConfig = {\n kernelName: Prod,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prod as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==*/\n\nimport {KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {rangeImplCPU} from '../kernel_utils/shared';\n\nexport const range =\n (args: {backend: BackendWasm, attrs: RangeAttrs}): TensorInfo => {\n const {backend, attrs} = args;\n const {start, stop, step, dtype} = attrs;\n const values = rangeImplCPU(start, stop, step, dtype);\n\n const out = backend.makeOutput([values.length], dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(values);\n return out;\n};\n\nexport const rangeConfig: KernelConfig = {\n kernelName: Range,\n backendName: 'wasm',\n kernelFunc: range as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==*/\n\nimport { util } from '@tensorflow/tfjs-core';\n\nexport function rangeImpl(start, stop, step, dtype) {\n const sameStartStop = start === stop;\n const increasingRangeNegativeStep = start < stop && step < 0;\n const decreasingRangePositiveStep = stop < start && step > 1;\n if (sameStartStop

|| increasingRangeNegativeStep ||\n decreasingRangePositiveStep) {\n return util.makeZerosTypedArray(0, dtype);\n }\n const numElements = Math.abs(Math.ceil((stop - start) / step));\n const values = util.makeZerosTypedArray(numElements, dtype);\n if (stop < start && step === 1) {\n // Auto adjust the step's sign if it hasn't been set\n // (or was set to 1)\n step = -1;\n }\n values[0] = start;\n for (let i = 1; i < values.length; i++) {\n values[i] = values[i - 1] + step;\n }\n return values;\n}\n//#
sourceMappingURL=data:application/json; base64,eyJ2ZXJzaW9uIjozLCJmaWxlIjoiUmFuZ2VfaW1wbC5qcyIsInNvdXJjZVJvb3QiOiIiLCJzb3VyY2VzIjpbIi4uLy4uLy4uLy4uLy4uLy4uL3RmanMtYmFja2VuZC1jcHUvc3JjL3tlcm5lbHMvUmFuZ2VfaW1wbC50cyJdLCJuYW1lcyI6W10sIm1hcHBpbmdzIjoiQUFBQTs7Ozs7Ozs7Ozs7O0dBZUc7QUFFSCxPQUFPLEVBQUUsUUFBUSxFQUFFLFVBQVUsRUFBRSxNQUFNLHVCQUF1QixDQUFDO0FBQzdELE9BQU8sRUFBRSxJQUFJLEVBQUUsTUFBTSxzQkFBc0IsQ0FBQztBQUM1QyxPQUFPLEVBQUUsZ0JBQWdCLEVBQUUsTUFBTSxnQ0FBZ0MsQ0FBQztBQUNsRS

0XG4gICAgLy8gKG9yIHdhcyBzZXQgdG8gMSlcbiAgICBzdGVwID0gLTE7XG4gIH1cblxuICB2YWx1ZXNbMF0gPSBzdGFydDtcbiAgZm9yIChsZXQgaSA9IDE7IGkgPCB2YWx1ZXMubGVuZ3RoOyBpKyspIHtcbiAgICB2YWx1ZXNbaV0gPSB2YWx1ZXNbaSAtIDFdICsgc3RlcDtcbiAgfVxuXG4gIHJldHVybiB2YWx1ZXM7XG59XG4gICAgICAgICAg

'number', // halfPixelCenters\n   'number'   // outId\n]);\n}\n\nfunction resizeBilinear(args: {\n backend: BackendWasm,\n inputs: ResizeBilinearInputs,\n attrs: ResizeBilinearAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n\n const {images} = inputs;\n const {alignCorners, halfPixelCenters, size} = attrs;\n const [newHeight, newWidth] = size;\n\n const [batch, oldHeight, oldWidth, numChannels] = images.shape;\n const outShape = [batch, newHeight, newWidth, numChannels];\n\n let xData = backend.dataIdMap.get(images.dataId);\n let castedData;\n if (xData.dtype !== 'float32') {\n   castedData =\n cast({backend, inputs: {x: images}, attrs: {dtype: 'float32'}});\n   xData = backend.dataIdMap.get(castedData.dataId);\n }\n const xId = xData.id;\n\n const out = backend.makeOutput(outShape, 'float32');\n if (util.sizeFromShape(images.shape) === 0) {\n   return out;\n }\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmResizeBilinear(\n   xId, batch, oldHeight, oldWidth, numChannels, newHeight, newWidth,\n   alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId);\n\n if (castedData != null) {\n   backend.disposeData(castedData.dataId);\n }\n\n return out;\n}\n\nexport const resizeBilinearConfig: KernelConfig = {\n kernelName: ResizeBilinear,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: resizeBilinear as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\n\nlet wasmReverse: (\n   xId: number, axes: Uint8Array, axesLength: number, outShape: Uint8Array,\n   outShapeLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmReverse = backend.wasm.cwrap(Reverse, null, [\n   'number', // x_id\n   'array',   // axes\n   'number', // axes_length\n   'array',   // out_shape\n   'number', // out_shape_length\n   'number'   // out_id\n]);\n}\n\nexport function reverse(\n   args: {inputs: ReverseInputs, backend: BackendWasm, attrs: ReverseAttrs}):\n   TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {dims} = attrs;\n\n const axes = util.parseAxisParam(dims, x.shape);\n\n if (x.shape.length === 0) {\n   return identity({inputs: {x}, backend});\n }\n\n const out = backend.makeOutput(x.shape, x.dtype);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const axesBytes = new Uint8Array(new Int32Array(axes).buffer);\n const outShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n wasmReverse(\n   xId, axesBytes, axes.length, outShapeBytes, x.shape.length, outId);\n\n const reshaped =\n   reshape({inputs: {x: out}, attrs: {shape: x.shape}, backend});\n\n backend.disposeData(out.dataId);\n return reshaped;\n}\n\nexport const reverseConfig: KernelConfig = {\n kernelName: Reverse,\n backendName: 'wasm',\n kernelFunc: reverse as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {KernelConfig, KernelFunc, RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmRotate: (\n   xId: number, batch: number, imageHeight:

number, imageWidth: number,\n numChannels: number, radians: number, centerX: number, centerY: number,\n fillBytes: Uint8Array, fillLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmRotate = backend.wasm.cwrap(RotateWithOffset, null /* void */, [\n 'number', // xId\n 'number', // batch\n 'number', // imageHeight\n 'number', //
 imageWidth\n 'number', // numChannels\n 'number', // radians\n 'number', // centerX\n 'number', // centerY\n 'array', // fillBytes\n 'number', // fillLength\n 'number', // outId\n]);\n}\n\nexport function rotateWithOffset(args: {\n inputs: RotateWithOffsetInputs,\n backend: BackendWasm,\n attrs: RotateWithOffsetAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {image} = inputs;\n const {radians, fillValue, center} = attrs;\n\n const out = backend.makeOutput(image.shape, image.dtype);\n const imageId = backend.dataIdMap.get(image.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n\n const [centerX, centerY] =\n backend_util.getImageCenter(center, imageHeight, imageWidth);\n\n const fillIsBlack = fillValue === 0;\n const fullOpacityValue = 255;\n\n const fillValues = typeof fillValue === 'number' ?\n [fillValue, fillValue,
 fillValue, fillIsBlack ? 0 : fullOpacityValue] :\n [...fillValue, fullOpacityValue];\n const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);\n\n wasmRotate(\n imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX,\n centerY, fillBytes, fillValues.length, outId);\n return out;\n}\n\nexport const rotateWithOffsetConfig: KernelConfig = {\n kernelName: RotateWithOffset,\n backendName: 'wasm',\n kernelFunc: rotateWithOffset as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR
 CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\nimport {KernelConfig, Round} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the
 specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n
 * ==\n
*/\n\nimport {KernelConfig, KernelFunc, scatter_util, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmScatterNd: (\n indicesId: number, updatesId: number, dtype: CppDType, sliceRank:

number,\n numUpdates: number, sliceSize: number, strides: Uint8Array,\n outputSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmScatterNd = backend.wasm.cwrap(ScatterNd, null /*void*/, [\n 'number', // indicesId\n 'number', // updatesId\n 'number', // dtype\n 'number', // sliceRank\n 'number', // numUpdates\n 'number', // sliceSize\n 'array', // strides\n 'number', // outputSize\n 'number' // outId\n]);\n}\n\nfunction scatterNd(\n args:\n {backend: BackendWasm, inputs: ScatterNdInputs,
 attrs: ScatterNdAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {indices, updates} = inputs;\n const {shape} = attrs;\n\n const out = backend.makeOutput(shape, updates.dtype);\n if (util.sizeFromShape(shape) === 0) {\n return out;\n }\n\n const {sliceRank, numUpdates, sliceSize, strides, outputSize} =\n scatter_util.calculateShapes(updates, indices, shape);\n\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const updatesData = backend.dataIdMap.get(updates.dataId);\n const updatesId = updatesData.id;\n\n const stridesBytes = new Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmScatterNd(\n indicesId, updatesId, CppDType[updates.dtype], sliceRank, numUpdates,\n sliceSize, stridesBytes, outputSize, outId);\n\n return out;\n}\n\nexport const scatterNdConfig: KernelConfig = {\n kernelName: ScatterNd,\n backendName: 'wasm',\n
 setupFunc: setup,\n kernelFunc: scatterNd as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {KernelConfig, KernelFunc, Select, SelectInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmSelect: (\n conditionId: number, tId: number,
 eId: number, offset: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmSelect = backend.wasm.cwrap('SelectV2', null, [\n 'number', // conditionId\n 'number', // tId\n 'number', // eId\n 'number', // offset\n 'number', // outId\n]);\n}\n\nfunction select(args: {inputs: SelectInputs, backend: BackendWasm}) {\n const {inputs, backend} = args;\n const {condition, t, e} = inputs;\n\n const conditionId = backend.dataIdMap.get(condition.dataId).id;\n const tId = backend.dataIdMap.get(t.dataId).id;\n const eId = backend.dataIdMap.get(e.dataId).id;\n const out = backend.makeOutput(t.shape, t.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const cRank = condition.shape.length;\n const tRank = t.shape.length;\n\n const offset = cRank === 0 || cRank > 1 || tRank === 1 ?\n 1 :\n util.sizeFromShape(t.shape.slice(1));\n\n wasmSelect(conditionId, tId, eId, offset, outId);\n return out;\n}\n\nexport const
 selectConfig: KernelConfig = {\n kernelName: Select,\n backendName: 'wasm',\n kernelFunc: select as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm}

from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Sigmoid, null /* void */, ['number', 'number']);\n}\n\nfunction sigmoid(args: {backend: BackendWasm, inputs: SigmoidInputs}):\n   TensorInfo {\n const {backend, inputs: {x}} = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n   return out;\n }\n\n wasmFunc(xId, outId);\n return out;\n}\n\nexport const sigmoidConfig: KernelConfig = {\n kernelName: 'Sigmoid',\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sigmoid as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport {KernelConfig, Sin} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n
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/\n\nimport {KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number, channels: number, batch: number) =>\n   void;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Softmax, null / void */, [\n   'number', // xId\n   'number', // outId\n 'number', // channels\n   'number'   // batch\n]);\n}\n\nfunction softmax(\n   args: {backend: BackendWasm,
 inputs: SoftmaxInputs, attrs: SoftmaxAttrs}):\n   TensorInfo {\n const {backend, inputs: {logits}, attrs: {dim}} = args;\n const xId = backend.dataIdMap.get(logits.dataId).id;\n const out = backend.makeOutput(logits.shape, logits.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const channels = logits.shape[dim];\n const batch = util.sizeFromShape(logits.shape) / channels;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n   return out;\n }\n\n wasmFunc(xId, outId, channels, batch);\n return out;\n}\n\nexport const softmaxConfig: KernelConfig = {\n kernelName: Softmax,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: softmax as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n
 *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, ReshapeAttrs, ReshapeInputs, SpaceToBatchND, SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, TransposeAttrs, TransposeInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {padV2Config} from

'./PadV2';\nimport {reshape} from './Reshape';\nimport {transpose} from './Transpose';\n\nfunction spaceToBatchND(args: {\n inputs: SpaceToBatchNDInputs,\n backend: BackendWasm,\n attrs: SpaceToBatchNDAttrs\n}) {\n const {inputs,
 backend, attrs} = args;\n const {x} = inputs;\n const {blockShape, paddings} = attrs;\n\n const prod = util.sizeFromShape(blockShape);\n\n const completePaddings: Array<[number, number]> = [[0, 0]];\n completePaddings.push(...(paddings as Array<[number, number]>));\n\n for (let i = 1 + blockShape.length; i < x.shape.length; ++i) {\n   completePaddings.push([0, 0]);\n }\n\n const paddedX = padV2Config.kernelFunc({\n inputs: {x},\n   backend,\n   attrs: {paddings: completePaddings, constantValue: 0}\n }) as TensorInfo;\n\n const reshapedPaddedShape =\n   backend_util.getReshaped(paddedX.shape, blockShape, prod, false);\n\n const permutedReshapedPaddedPermutation = backend_util.getPermuted(\n   reshapedPaddedShape.length, blockShape.length, false);\n\n const flattenShape =\n   backend_util.getReshapedPermuted(paddedX.shape, blockShape, prod, false);\n\n const reshapeInputs: ReshapeInputs = {x: paddedX};\n const reshapeAttrs: ReshapeAttrs = {shape: reshapedPaddedShape};\n
  const paddedXReshaped =\n   reshape({inputs: reshapeInputs, backend, attrs: reshapeAttrs});\n\n const transposeInputs: TransposeInputs = {x: paddedXReshaped};\n const transposeAttrs:\n   TransposeAttrs = {perm: permutedReshapedPaddedPermutation};\n const paddedXT =\n   transpose({inputs: transposeInputs, backend, attrs: transposeAttrs});\n\n const resultReshapeInputs: ReshapeInputs = {x: paddedXT};\n const resultReshapeAttrs: ReshapeAttrs = {shape: flattenShape};\n const result = reshape(\n   {inputs: resultReshapeInputs, backend, attrs: resultReshapeAttrs});\n\n backend.disposeData(paddedX.dataId);\n backend.disposeData(paddedXReshaped.dataId);\n backend.disposeData(paddedXT.dataId);\n\n return result;\n}\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n kernelName: SpaceToBatchND,\n backendName: 'wasm',\n kernelFunc: spaceToBatchND as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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==\n
*/\n\nimport {KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, util} from '@tensorflow/tfjs-core';\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {slice} from './Slice';\n\nexport function splitV(\n   args: {inputs: SplitVInputs, attrs: SplitVAttrs, backend: BackendWasm}) {\n const
 {inputs, attrs, backend} = args;\n const {x} = inputs;\n const {numOrSizeSplits, axis} = attrs;\n\n const $axis = util.parseAxisParam(axis, x.shape)[0];\n\n const splitSizes = backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n const begin = new Array(x.shape.length).fill(0);\n const size = x.shape.slice();\n return splitSizes.map(s => {\n   const xSliceSize = [...size];\n   xSliceSize[$axis] = s;\n   const xSlice =\n   slice({inputs: {x}, attrs: {begin, size: xSliceSize}, backend});\n   begin[$axis] += s;\n   return xSlice;\n });\n}\n\nexport const splitVConfig: KernelConfig = {\n kernelName: SplitV,\n backendName: 'wasm',\n kernelFunc: splitV as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {KernelConfig, Sqrt} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const sqrtConfig: KernelConfig = createUnaryKernelConfig(Sqrt);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n
 * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n*/\nimport {KernelConfig, Square} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const squareConfig: KernelConfig = createUnaryKernelConfig(Square);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n*/\nimport {KernelConfig, SquaredDifference} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const squaredDifferenceConfig: KernelConfig =\n   createBinaryKernelConfig(SquaredDifference, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on
 an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n*/\n\nimport {KernelConfig, KernelFunc, Step, StepAttrs, StepInputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmStep: (xId: number, alpha: number, dtype: number, outId: number) =>\n   void;\n\nfunction setup(backend: BackendWasm): void {\n wasmStep = backend.wasm.cwrap(Step, null /*void*/, [\n   'number', // x_id\n   'number', // alpha\n   'number', // dtype\n   'number', // out_id\n]);\n}\n\nfunction step(\n   args: {backend: BackendWasm, inputs: StepInputs, attrs: StepAttrs}):\n   TensorInfo {\n const {backend, inputs, attrs} = args;\n const {alpha} = attrs;\n const {x} = inputs;\n const
 xId = backend.dataIdMap.get(x.dataId).id;\n\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmStep(xId, alpha, CppDType[x.dtype], outId);\n return out;\n}\n\nexport const stepConfig: KernelConfig = {\n kernelName: Step,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: step as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under

the License.\n *
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*/\n\nimport {KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from './Reshape';\nimport {slice} from './Slice';\n\nlet wasmStridedSlice: (\n xId: number, xStridesBytes: Uint8Array, xRank: number,\n beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n outShapeBytes: Uint8Array, outStridesBytes: Uint8Array,\n outShapeLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n 'number', // xId\n 'array', // xStrides\n 'number', // xRank\n 'array', // beginBytes\n 'array', // endBytes\n 'array', // stridesBytes\n 'array', // outShapeBytes\n 'array', // outStridesBytes\n
'number', // outShapeLength\n 'number', // outId\n]);\n}\n\nexport function stridedSlice(args: {\n backend: BackendWasm,\n inputs: StridedSliceInputs,\n attrs: StridedSliceAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x} = inputs;\n\n const {\n begin,\n end,\n strides,\n beginMask,\n endMask,\n ellipsisMask,\n newAxisMask,\n shrinkAxisMask\n } = attrs;\n\n const {\n finalShapeSparse,\n finalShape,\n isIdentity,\n sliceDim0,\n isSimpleSlice,\n begin: $begin,\n end: $end,\n strides: $strides\n } =\n slice_util.sliceInfo(\n x.shape, begin, end, strides, beginMask, endMask, ellipsisMask,\n newAxisMask, shrinkAxisMask);\n\n let result;\n\n if (isIdentity) {\n // Optimization #1, slice is a no-op plus reshape\n result = reshape({inputs: {x}, backend, attrs: {shape: finalShape}});\n } else if (sliceDim0 || isSimpleSlice) {\n // Optimization #2, slice is memory contiguous
(only occurs in dim 0)\n util.assert(\n x.shape.length >= 1,\n () => `Input must have rank at least 1, got: ${x.shape.length}`);\n\n const size = slice_util.computeOutShape($begin, $end, $strides);\n // To tolerate begin[0] > end[0] (a 0-output slice), we min(begin, end).\n const sliced = slice({inputs: {x}, backend, attrs: {begin: $begin, size}});\n result =\n reshape({inputs: {x: sliced}, backend, attrs: {shape: finalShape}});\n backend.disposeData(sliced.dataId);\n } else {\n const out = backend.makeOutput(finalShapeSparse, 'float32');\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const xStridesBytes =\n new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n const beginBytes = new Uint8Array(new Int32Array($begin).buffer);\n const endBytes = new Uint8Array(new Int32Array($end).buffer);\n const stridesBytes = new Uint8Array(new Int32Array($strides).buffer);\n\n const outputShapeBytes
=\n new Uint8Array(new Int32Array(finalShapeSparse).buffer);\n const outStridesBytes = new Uint8Array(\n new Int32Array(util.computeStrides(finalShapeSparse)).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmStridedSlice(\n xId, xStridesBytes, x.shape.length, beginBytes, endBytes, stridesBytes,\n outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);\n\n result = reshape({inputs: {x: out}, backend, attrs: {shape: finalShape}});\n\n backend.disposeData(out.dataId);\n }\n\n return result;\n}\n\nexport const stridedSliceConfig: KernelConfig = {\n kernelName: StridedSlice,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: stridedSlice as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License
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*/\nimport {KernelConfig, Sub} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const subConfig: KernelConfig =\n createBinaryKernelConfig(Sub, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *

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*/\n\nimport {backend_util, KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmSum: (xId: number, reduceSize: number, dtype: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmSum = backend.wasm.cwrap(Sum, null /*void*/, [\n   'number', // input_id\n   'number', // reduce_size\n   'number', //
dtype\n   'number', // out_id\n]);\n}\n\nfunction sum(args: {backend: BackendWasm, inputs: SumInputs, attrs: SumAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n   const transposedId =
backend.dataIdMap.get(transposed.dataId).id;\n   if (transposedId !== xId) {\n   // transpose was not a no-op. We will need to dispose of this\n   // once we are done.\n   input = transposed;\n   inputId = transposedId;\n   reductionAxes = backend_util.getInnerMostAxes(\n   reductionAxes.length, input.shape.length);\n   }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n   'sum', reductionAxes, input.shape.length);\n const [outShape,
reduceShape] =\n   backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n   wasmSum(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n return out;\n}\n\nexport const sumConfig: KernelConfig = {\n kernelName: Sum,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sum as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport {KernelConfig, Tan} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const tanConfig: KernelConfig = createUnaryKernelConfig(Tan);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n
*\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from

'./unary_kernel';\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n*/\n\nimport {KernelConfig, KernelFunc, Tile, TileAttrs, TileInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmTile: (\n xId: number, xShape: Uint8Array, xShapeSize: number, newShape: Uint8Array,\n newShapeSize: number, dtype: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTile = backend.wasm.cwrap(Tile, null /* void */, [\n 'number', // x_id\n 'array', // x_shape\n 'number', // x_shape.length\n 'array', // new_shape\n 'number', // new_shape.length\n 'number' // out_id\n]);\n}\n\nfunction tile(\n args: {inputs: TileInputs, backend: BackendWasm, attrs: TileAttrs}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const {reps} = attrs;\n\n const newShape: number[] = new Array(x.shape.length);\n for (let i = 0; i < newShape.length; i++) {\n newShape[i] = x.shape[i] * reps[i];\n }\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n const newShapeBytes = new Uint8Array(new Int32Array(newShape).buffer);\n\n const out = backend.makeOutput(newShape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmTile(\n xId, xShapeBytes, x.shape.length, newShapeBytes, newShape.length,\n CppDType[out.dtype], outId);\n return out;\n}\n\nexport const tileConfig: KernelConfig = {\n kernelName: Tile,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: tile as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n*/\n\nimport {KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {CppDType} from './types';\n\nlet wasmTopK: (\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number,\n xDtype: CppDType, k: number, sorted: boolean,\n outValuesId: number,\n outIndicesId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n 'number', // k\n 'bool', // sorted\n 'number', // outValuesId\n 'number', // outIndicesId\n]);\n}\n\nexport const topk:\n (args: {inputs: TopKInputs, backend: BackendWasm, attrs: TopKAttrs}) =>\n TensorInfo[] | TensorInfo = ({inputs, backend, attrs}) => {\n const {x} = inputs;\n const {k, sorted} = attrs;\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n const outputShape = x.shape.slice();\n outputShape[outputShape.length - 1] = k;\n const outValues = backend.makeOutput(outputShape, x.dtype);\n const outValuesId = backend.dataIdMap.get(outValues.dataId).id;\n\n const outIndices = backend.makeOutput(outputShape, 'int32');\n const outIndicesId = backend.dataIdMap.get(outIndices.dataId).id;\n\n wasmTopK(\n xId, xShapeBytes, x.shape.length,\n CppDType[x.dtype], k, sorted,\n outValuesId, outIndicesId);\n\n return [outValues, outIndices];\n};\n\nexport const topKConfig: KernelConfig = {\n kernelName: TopK,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: topk as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All

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i++) {\n if (i !== axis) {\n outShape[outIndex++] = value.shape[i];\n }\n }\n const outs: TensorInfo[] = new Array(numOutputs);\n const begin = new Array(rank).fill(0);\n const size = value.shape.slice();\n size[axis] = 1;\n for (let i = 0; i < outs.length; i++) {\n begin[axis] = i;\n outs[i] = slice({inputs: {x: value}, attrs: {begin, size}, backend});\n }\n return outs.map(({dataId, dtype}) => ({dataId, dtype, shape: outShape}));\n}\n\nexport const unpackConfig: KernelConfig = {\n kernelName: Unpack,\n backendName: 'wasm',\n kernelFunc: unpack as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, KernelFunc, ZerosLike, ZerosLikeInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nfunction zerosLike(args: {inputs: ZerosLikeInputs, backend: BackendWasm}) {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(0);\n return out;\n}\n\nexport const zerosLikeConfig: KernelConfig = {\n kernelName: ZerosLike,\n backendName: 'wasm',\n kernelFunc: zerosLike as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\n// We explicitly import the modular kernels so they get registered in the\n// global registry when we compile the library. A modular build would replace\n// the contents of this file and import only the kernels that are needed.\nimport {KernelConfig, registerKernel} from '@tensorflow/tfjs-core';\n\nimport {fusedMatMulConfig} from './kernels/_FusedMatMul';\nimport {absConfig} from './kernels/Abs';\nimport {addConfig} from './kernels/Add';\nimport {addNConfig} from './kernels/AddN';\nimport {allConfig} from './kernels/All';\nimport {anyConfig} from './kernels/Any';\nimport {argMaxConfig} from './kernels/ArgMax';\nimport {avgPoolConfig} from './kernels/AvgPool';\nimport {batchMatMulConfig} from './kernels/BatchMatMul';\nimport {batchToSpaceNDConfig} from './kernels/BatchToSpaceND';\nimport {castConfig} from './kernels/Cast';\nimport {ceilConfig} from './kernels/Ceil';\nimport {clipByValueConfig} from './kernels/ClipByValue';\nimport {concatConfig} from './kernels/Concat';\nimport {conv2DConfig} from './kernels/Conv2D';\nimport {conv2DBackpropInputConfig} from './kernels/Conv2DBackpropInput';\nimport {cosConfig} from './kernels/Cos';\nimport {coshConfig} from './kernels/Cosh';\nimport {cropAndResizeConfig} from './kernels/CropAndResize';\nimport {cumsumConfig} from './kernels/Cumsum';\nimport {depthToSpaceConfig} from './kernels/DepthToSpace';\nimport {depthwiseConv2dNativeConfig} from './kernels/DepthwiseConv2dNative';\nimport {eluConfig} from './kernels/Elu';\nimport {equalConfig} from './kernels/Equal';\nimport {expConfig} from './kernels/Exp';\nimport {expandDimsConfig} from './kernels/ExpandDims';\nimport {fillConfig} from './kernels/Fill';\nimport {flipLeftRightConfig} from './kernels/FlipLeftRight';\nimport {floorConfig} from './kernels/Floor';\nimport {floorDivConfig} from './kernels/FloorDiv';\nimport {fusedBatchNormConfig} from './kernels/FusedBatchNorm';\nimport {fusedConv2DConfig} from './kernels/FusedConv2D';\nimport {fusedDepthwiseConv2DConfig} from './kernels/FusedDepthwiseConv2D';\nimport {gatherNdConfig} from './kernels/GatherNd';\nimport

{gatherV2Config} from './kernels/GatherV2';\nimport {greaterConfig} from './kernels/Greater';\nimport {greaterEqualConfig} from './kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport {leakyReluConfig} from './kernels/LeakyRelu';\nimport {lessConfig} from './kernels/Less';\nimport {lessEqualConfig} from './kernels/LessEqual';\nimport {logConfig} from './kernels/Log';\nimport {logicalAndConfig} from './kernels/LogicalAnd';\nimport {maxConfig} from './kernels/Max';\nimport {maximumConfig} from './kernels/Maximum';\nimport {maxPoolConfig} from './kernels/MaxPool';\nimport {meanConfig} from './kernels/Mean';\nimport {minConfig} from './kernels/Min';\nimport {minimumConfig} from './kernels/Minimum';\nimport
{mirrorPadConfig} from './kernels/MirrorPad';\nimport {multiplyConfig} from './kernels/Multiply';\nimport {negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from './kernels/NonMaxSuppressionV3';\nimport {nonMaxSuppressionV4Config} from './kernels/NonMaxSuppressionV4';\nimport {nonMaxSuppressionV5Config} from './kernels/NonMaxSuppressionV5';\nimport {notEqualConfig} from './kernels/NotEqual';\nimport {oneHotConfig} from './kernels/OneHot';\nimport {onesLikeConfig} from './kernels/OnesLike';\nimport {packConfig} from './kernels/Pack';\nimport {padV2Config} from './kernels/PadV2';\nimport {powConfig} from './kernels/Pow';\nimport {preluConfig} from './kernels/Prelu';\nimport {prodConfig} from './kernels/Prod';\nimport {rangeConfig} from './kernels/Range';\nimport {realDivConfig} from './kernels/RealDiv';\nimport {reluConfig} from './kernels/Relu';\nimport {relu6Config} from './kernels/Relu6';\nimport {reshapeConfig} from './kernels/Reshape';\nimport {resizeBilinearConfig}
from './kernels/ResizeBilinear';\nimport {reverseConfig} from './kernels/Reverse';\nimport {rotateWithOffsetConfig} from './kernels/RotateWithOffset';\nimport {roundConfig} from './kernels/Round';\nimport {rsqrtConfig} from './kernels/Rsqrt';\nimport {scatterNdConfig} from './kernels/ScatterNd';\nimport {selectConfig} from './kernels/Select';\nimport {sigmoidConfig} from './kernels/Sigmoid';\nimport {sinConfig} from './kernels/Sin';\nimport {sliceConfig} from './kernels/Slice';\nimport {softmaxConfig} from './kernels/Softmax';\nimport {spaceToBatchNDConfig} from './kernels/SpaceToBatchND';\nimport {splitVConfig} from './kernels/SplitV';\nimport {sqrtConfig} from './kernels/Sqrt';\nimport {squareConfig} from './kernels/Square';\nimport {squaredDifferenceConfig} from './kernels/SquaredDifference';\nimport {stepConfig} from './kernels/Step';\nimport {stridedSliceConfig} from './kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig} from './kernels/Sum';\nimport
{tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport {tileConfig} from './kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transformConfig} from './kernels/Transform';\nimport {transposeConfig} from './kernels/Transpose';\nimport {unpackConfig} from './kernels/Unpack';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst kernelConfigs: KernelConfig[] = [\n absConfig,\n addConfig,\n addNConfig,\n allConfig,\n anyConfig,\n argMaxConfig,\n avgPoolConfig,\n batchMatMulConfig,\n batchToSpaceNDConfig,\n castConfig,\n ceilConfig,\n clipByValueConfig,\n concatConfig,\n conv2DConfig,\n conv2DBackpropInputConfig,\n cosConfig,\n coshConfig,\n cropAndResizeConfig,\n cumsumConfig,\n depthToSpaceConfig,\n depthwiseConv2dNativeConfig,\n eluConfig,\n equalConfig,\n expConfig,\n expandDimsConfig,\n fillConfig,\n flipLeftRightConfig,\n floorConfig,\n floorDivConfig,\n
fusedMatMulConfig,\n fusedBatchNormConfig,\n fusedConv2DConfig,\n fusedDepthwiseConv2DConfig,\n gatherNdConfig,\n gatherV2Config,\n greaterConfig,\n greaterEqualConfig,\n identityConfig,\n leakyReluConfig,\n lessConfig,\n lessEqualConfig,\n logConfig,\n logicalAndConfig,\n maxConfig,\n maximumConfig,\n maxPoolConfig,\n meanConfig,\n minConfig,\n minimumConfig,\n mirrorPadConfig,\n multiplyConfig,\n negConfig,\n nonMaxSuppressionV3Config,\n nonMaxSuppressionV4Config,\n nonMaxSuppressionV5Config,\n notEqualConfig,\n oneHotConfig,\n onesLikeConfig,\n packConfig,\n padV2Config,\n powConfig,\n preluConfig,\n prodConfig,\n rangeConfig,\n realDivConfig,\n reluConfig,\n relu6Config,\n reshapeConfig,\n resizeBilinearConfig,\n reverseConfig,\n rotateWithOffsetConfig,\n

rsqrtConfig,\n roundConfig,\n scatterNdConfig,\n selectConfig,\n sigmoidConfig,\n sinConfig,\n sliceConfig,\n softmaxConfig,\n spaceToBatchNDConfig,\n splitVConfig,\n sqrtConfig,\n squareConfig,\n squaredDifferenceConfig,\n stepConfig,\n stridedSliceConfig,\n subConfig,\n sumConfig,\n tanConfig,\n tanhConfig,\n tileConfig,\n topKConfig,\n transformConfig,\n transposeConfig,\n unpackConfig,\n zerosLikeConfig\n];\n\nfor (const kernelConfig of kernelConfigs) {\n registerKernel(kernelConfig);\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {env} from '@tensorflow/tfjs-core';\n\nconst ENV = env();\n\n/**\n * True if SIMD is supported.\n */\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag(\n // This typed array passed in to WebAssembly.validate is WebAssembly binary\n // code. In this case it is a small program that contains SIMD\n // instructions.\n 'WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new Uint8Array([\n 0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3,\n 2, 1, 0, 10, 9, 1, 7, 0, 65, 0, 253, 15, 26, 11\n])));\n\n/**\n * True if threads are supported.\n */\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag('WASM_HAS_MULTITHREAD_SUPPORT', async () => {\n // TODO(annxingyuan): Enable node support once this is resolved:\n // https://github.com/tensorflow/tfjs/issues/3830\n if (ENV.get('IS_NODE')) {\n return false;\n }\n\n try {\n // Test for transferability of SABs (needed for Firefox)\n // https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkBZlHETpA/dwsMNchWEQAJ\n new MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n // This typed array is a WebAssembly program containing threaded\n // instructions.\n return WebAssembly.validate(new Uint8Array([\n 0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3, 2, 1, 0, 5,\n 4, 1, 3, 1, 1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26, 11\n]));\n } catch (e) {\n return false;\n }\n});\n","\nvar WasmBackendModuleThreadedSimd = (function() {\n var _scriptDir = typeof document !== 'undefined' && document.currentScript ? document.currentScript.src : undefined;\n if (typeof __filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return (\nfunction(WasmBackendModuleThreadedSimd) {\n WasmBackendModuleThreadedSimd = WasmBackendModuleThreadedSimd || {};\n\nfunction GROWABLE_HEAP_I8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAP8}function GROWABLE_HEAP_U8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAPU8}function GROWABLE_HEAP_I32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAP32}function GROWABLE_HEAP_U32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAPU32}function GROWABLE_HEAP_F64(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAPF64}var Module=typeof WasmBackendModuleThreadedSimd!==\"undefined\"?WasmBackendModuleThreadedSimd:{};var readyPromiseResolve,readyPromiseReject;Module[\"ready\"]=new Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var moduleOverrides={};var key;for(key in Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var thisProgram=\"./this.program\";var quit_=function(status,toThrow){throw

toThrow};var ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof window===\"object\";ENVIRONMENT_IS_WORKER=typeof importScripts===\"function\";ENVIRONMENT_IS_NODE=typeof process===\"object\"&&typeof process.versions===\"object\"&&typeof process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONMENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var ENVIRONMENT_IS_PTHREAD=Module[\"ENVIRONMENT_IS_PTHREAD\"]||false;if(ENVIRONMENT_IS_PTHREAD){buffer=Module[\"buffer\"]}var scriptDirectory=\"\";function locateFile(path){if(Module[\"locateFile\"]){return Module[\"locateFile\"](path,scriptDirectory)}return scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\"path\").dirname(scriptDirectory)+\"/\"}else{scriptDirectory=__dirname+\"/\"}read_=function shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=nodePath[\"normalize\"](filename);return nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\")};readBinary=function readBinary(filename){var ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return ret};if(process[\"argv\"].length>1){thisProgram=process[\"argv\"][1].replace(/\\\\/g,\"/\")}arguments_=process[\"argv\"].slice(2);process[\"on\"](\"uncaughtException\",function(ex){if(!(ex instanceof ExitStatus)){throw ex}});process[\"on\"](\"unhandledRejection\",abort);quit_=function(status){process[\"exit\"](status)};Module[\"inspect\"]=function(){return\"[Emscripten Module object]\"};var nodeWorkerThreads;try{nodeWorkerThreads=require(\"worker_threads\")}catch(e){console.error('The \"worker_threads\" module is not supported in this node.js build - perhaps a newer version is needed?');throw e}global.Worker=nodeWorkerThreads.Worker}else if(ENVIRONMENT_IS_SHELL){if(typeof read!=\"undefined\"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var data;if(typeof readbuffer===\"function\"){return new Uint8Array(readbuffer(f))}data=read(f,\"binary\");assert(typeof data===\"object\");return data};if(typeof scriptArgs!=\"undefined\"){arguments_=scriptArgs}else if(typeof arguments!=\"undefined\"){arguments_=arguments}if(typeof quit===\"function\"){quit_=function(status){quit(status)}}if(typeof print!==\"undefined\"){if(typeof console===\"undefined\")console={};console.log=print;console.warn=console.error=typeof printErr!==\"undefined\"?printErr:print}}else if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDirectory=self.location.href}else if(typeof document!==\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(typeof _scriptDir !== \"undefined\" && _scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf(\"blob:\")!==0){scriptDirectory=scriptDirectory.substr(0,scriptDirectory.lastIndexOf(\"/\")+1)}else{scriptDirectory=\"\"}if(ENVIRONMENT_IS_NODE){read_=function shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=nodePath[\"normalize\"](filename);return nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\")};readBinary=function readBinary(filename){var ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return ret}}else{read_=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.send(null);return xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.responseType=\"arraybuffer\";xhr.send(null);return new Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,true);xhr.responseType=\"arraybuffer\";xhr.onload=function(){if(xhr.status

==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror()};xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title}}else{}if(ENVIRONMENT_IS_NODE){if(typeof
performance===\"undefined\"){global.performance=require(\"perf_hooks\").performance}}var
out=Module[\"print\"]||console.log.bind(console);var err=Module[\"printErr\"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module[\"arguments\"])arguments_=Module[\"arguments\"];if(Module[\"thisProgram\"])thisProgram=
Module[\"thisProgram\"];if(Module[\"quit\"])quit_=Module[\"quit\"];function
warnOnce(text){if(!warnOnce.shown)warnOnce.shown={};if(!warnOnce.shown[text]){warnOnce.shown[text]=1;er
r(text)}}var Atomics_load=Atomics.load;var Atomics_store=Atomics.store;var
Atomics_compareExchange=Atomics.compareExchange;var
wasmBinary;if(Module[\"wasmBinary\"])wasmBinary=Module[\"wasmBinary\"];var
noExitRuntime=Module[\"noExitRuntime\"]||true;if(typeof WebAssembly!==\"object\"){abort(\"no
native wasm support detected\")}var wasmMemory;var wasmModule;var ABORT=false;var
EXITSTATUS;function assert(condition,text){if(!condition){abort(\"Assertion failed: \"+text)}}function
getCFunc(ident){var func=Module[\"_\"+ident];assert(func,\"Cannot call unknown function \"+ident+\", make sure
it is exported\");return func}function ccall(ident,returnType,argTypes,args,opts){var
toC={\"string\":function(str){var ret=0;if(str!==null&&str!==undefined&&str!==0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\"array\":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType===\"string\")return UTF8ToString(ret);if(returnType===\"boolean\")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}}var
ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return ret}function
cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type===\"number\"});var
numericRet=returnType!==\"string\";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}}function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
str=\"\";while(!(idx>=endIdx)){var u0=heap[idx++];if(!u0)return
str;if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(GROWABLE_HEAP_U8(),ptr,maxBytesToRead):\"\"}function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10)|u1&1023}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){return

stringToUTF8Array(str,GROWABLE_HEAP_U8(),outPtr,maxBytesToWrite)}function lengthBytesUTF8(str){var len=0;for(var i=0;i<str.length;++i){var u=str.charCodeAt(i);if(u>=55296&&u<=57343)u=65536+((u&1023)<<10)|str.charCodeAt(++i)&1023;if(u<=127)++len;else if(u<=2047)len+=2;else if(u<=65535)len+=3;else len+=4}return len}function writeArrayToMemory(array,buffer){GROWABLE_HEAP_I8().set(array,buffer)}function alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function updateGlobalBufferAndViews(buf){buffer=buf;Module[\"HEAP8\"]=HEAP8=new Int8Array(buf);Module[\"HEAP16\"]=HEAP16=new Int16Array(buf);Module[\"HEAP32\"]=HEAP32=new Int32Array(buf);Module[\"HEAPU8\"]=HEAPU8=new Uint8Array(buf);Module[\"HEAPU16\"]=HEAPU16=new Uint16Array(buf);Module[\"HEAPU32\"]=HEAPU32=new Uint32Array(buf);Module[\"HEAPF32\"]=HEAPF32=new Float32Array(buf);Module[\"HEAPF64\"]=HEAPF64=new Float64Array(buf)}var INITIAL_MEMORY=Module[\"INITIAL_MEMORY\"]||16777216;if(ENVIRONMENT_IS_PTHREAD){wasmMemory=Module[\"wasmMemory\"];buffer=Module[\"buffer\"]}else{if(Module[\"wasmMemory\"]){wasmMemory=Module[\"wasmMemory\"]}else{wasmMemory=new WebAssembly.Memory({\"initial\":INITIAL_MEMORY/65536,\"maximum\":2147483648/65536,\"shared\":true});if(!(wasmMemory.buffer instanceof SharedArrayBuffer)){err(\"requested a shared WebAssembly.Memory but the returned buffer is not a SharedArrayBuffer, indicating that while the browser has SharedArrayBuffer it does not have WebAssembly threads support - you may need to set a flag\");if(ENVIRONMENT_IS_NODE){console.log(\"(on node you may need: --experimental-wasm-threads --experimental-wasm-bulk-memory and also use a recent version)\")}throw Error(\"bad memory\")}}}if(wasmMemory){buffer=wasmMemory.buffer}INITIAL_MEMORY=buffer.byteLength;updateGlobalBufferAndViews(buffer);var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var __ATEXIT__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;var runtimeExited=false;if(!ENVIRONMENT_IS_PTHREAD)__ATINIT__.push({func:function(){___wasm_call_ctors()}});function preRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module[\"preRun\"]){if(typeof Module[\"preRun\"]==\"function\")Module[\"preRun\"]=[Module[\"preRun\"]];while(Module[\"preRun\"].length){addOnPreRun(Module[\"preRun\"].shift())}}callRuntimeCallbacks(__ATPRERUN__)}function initRuntime(){runtimeInitialized=true;if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATINIT__)}function preMain(){if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATMAIN__)}function exitRuntime(){if(ENVIRONMENT_IS_PTHREAD)return;runtimeExited=true}function postRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module[\"postRun\"]){if(typeof Module[\"postRun\"]==\"function\")Module[\"postRun\"]=[Module[\"postRun\"]];while(Module[\"postRun\"].length){addOnPostRun(Module[\"postRun\"].shift())}}callRuntimeCallbacks(__ATPOSTRUN__)}function addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function addRunDependency(id){assert(!ENVIRONMENT_IS_PTHREAD,\"addRunDependency cannot be used in a pthread worker\");runDependencies++;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}}function removeRunDependency(id){runDependencies--;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}if(runDependencies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}if(dependenciesFulfilled){var callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}}Module[\"preloadedImages\"]={};Module[\"preloadedAudios\"]={};function

abort(what){if(Module[\"onAbort\"]){Module[\"onAbort\"](what)}if(ENVIRONMENT_IS_PTHREAD)console.error(\"Pthread aborting at \"+(new Error).stack);what+=\"\";err(what);ABORT=true;EXITSTATUS=1;what=\"abort(\"+what+\"). Build with -s ASSERTIONS=1 for more info.\";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var dataURIPrefix=\"data:application/octet-stream; base64,\";function isDataURI(filename){return hasPrefix(filename,dataURIPrefix)}var fileURIPrefix=\"file://\";function isFileURI(filename){return hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile=\"tfjs-backend-wasm-threaded-simd.wasm\";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function getBinary(file){try{if(file==wasmBinaryFile&&wasmBinary){return new Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw\"both async and sync fetching of the wasm failed\"}}catch(err){abort(err)}}function getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof fetch===\"function\"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){if(!response[\"ok\"]){throw\"failed to load wasm binary file at '\"+wasmBinaryFile+\"'\"}return response[\"arrayBuffer\"]()}).catch(function(){return getBinary(wasmBinaryFile)})}else{if(readAsync){return new Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new Uint8Array(response))},reject)})}}}return Promise.resolve().then(function(){return getBinary(wasmBinaryFile)})}function createWasm(){var info={\"a\":asmLibraryArg};function receiveInstance(instance,module){var exports=instance.exports;Module[\"asm\"]=exports;wasmTable=Module[\"asm\"][\"I\"];wasmModule=module;if(!ENVIRONMENT_IS_PTHREAD){var numWorkersToLoad=PThread.unusedWorkers.length;PThread.unusedWorkers.forEach(function(w){PThread.loadWasmModuleToWorker(w,function(){if(!--numWorkersToLoad)removeRunDependency(\"wasm-instantiate\")})})}if(!ENVIRONMENT_IS_PTHREAD){addRunDependency(\"wasm-instantiate\")}function receiveInstantiatedSource(output){receiveInstance(output[\"instance\"],output[\"module\"])}function instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err(\"failed to asynchronously prepare wasm: \"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof WebAssembly.instantiateStreaming===\"function\"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFile)&&typeof fetch===\"function\"){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return result.then(receiveInstantiatedSource,function(reason){err(\"wasm streaming compile failed: \"+reason);err(\"falling back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)})})}else{return instantiateArrayBuffer(receiveInstantiatedSource)}}if(Module[\"instantiateWasm\"]){try{var exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports}catch(e){err(\"Module.instantiateWasm callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}var ASM_CONSTS={10520:function(){throw\"Canceled!\"},10538:function($0,$1){setTimeout(function(){__emscripten_do_dispatch_to_thread($0,$1)},0)}};function initPthreadsJS(){PThread.initRuntime()}function callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof callback==\"function\"){callback(Module);continue}var func=callback.func;if(typeof func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)()}else{wasmTable.get(func)(callback.arg)}}else{func(callback.arg===undefined?null:callback.arg)}}}var ERRNO_CODES={EPERM:63,ENOENT:44,ESRCH:71,EINTR:27,EIO:29,ENXIO:60,E2BIG:1,ENOEXEC:45,EBADF:8,ECHILD:12,EAGAIN:6,EWOULDBLOCK:6,ENOMEM:48,EACCES:2,EFAULT:21,ENOTBLK:105,EBUSY:10,EEXIST:20,EXDEV:75,ENODEV:43,ENOTDIR:54,EISDIR:31,EINVAL:28,ENFILE:41,EMFILE:33,EN

OTTY:59,ETXTBSY:74,EFBIG:22,ENOSPC:51,ESPIPE:70,EROFS:69,EMLINK:34,EPIPE:64,EDOM:18,ERANGE:68,ENOMSG:49,EIDRM:24,ECHRNG:106,EL2NSYNC:156,EL3HLT:107,EL3RST:108,ELNRNG:109,EUNATCH:110,ENOCSI:111,EL2HLT:112,EDEADLK:16,ENOLCK:46,EBADE:113,EBADR:114,EXFULL:115,ENOANO:104,EBADRQC:103,EBADSLT:102,EDEADLOCK:16,EBFONT:101,ENOSTR:100,ENODATA:116,ETIME:117,ENOSR:118,ENONET:119,ENOPKG:120,EREMOTE:121,ENOLINK:47,EADV:122,ESRMNT:123,ECOMM:124,EPROTO:65,EMULTIHOP:36,EDOTDOT:125,EBADMSG:9,ENOTUNIQ:126,EBADFD:127,EREMCHG:128,ELIBACC:129,ELIBBAD:130,ELIBSCN:131,ELIBMAX:132,ELIBEXEC:133,ENOSYS:52,ENOTEMPTY:55,ENAMETOOLONG:37,ELOOP:32,EOPNOTSUPP:138,EPFNOSUPPORT:139,ECONNRESET:15,ENOBUFS:42,EAFNOSUPPORT:5,EPROTOTYPE:67,ENOTSOCK:57,ENOPROTOOPT:50,ESHUTDOWN:140,ECONNREFUSED:14,EADDRINUSE:3,ECONNABORTED:13,ENETUNREACH:40,ENETDOWN:38,ETIMEDOUT:73,EHOSTDOWN:142,EHOSTUNREACH:23,EINPROGRESS:26,EALREADY:7,EDESTADDRREQ:17,EMSGSIZE:35,EPROTONOSUPPORT:66,ESOCKTNOSUPPORT:137,EADDRNOTAVAIL:4,ENETRESET:39,EISCONN:30,ENOTCONN:53,ETOOMANYREFS:141,EUSERS:136,EDQUOT:19,ESTALE:72,ENOTSUP:138,ENOMEDIUM:148,EILSEQ:25,EOVERFLOW:61,ECANCELED:11,ENOTRECOVERABLE:56,EOWNERDEAD:62,ESTRPIPE:135};function
_emscripten_futex_wake(addr,count){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0||count<0)return-28;if(count==0)return 0;if(count>=2147483647)count=Infinity;var
mainThreadWaitAddress=Atomics.load(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2);var
mainThreadWoken=0;if(mainThreadWaitAddress==addr){var
loadedAddr=Atomics.compareExchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,mainThreadWaitAddress,0);if(loadedAddr==mainThreadWaitAddress){--count;mainThreadWoken=1;if(count<=0)return 1}}var ret=Atomics.notify(GROWABLE_HEAP_I32(),addr>>2,count);if(ret>=0)return
ret+mainThreadWoken;throw\"Atomics.notify returned an unexpected value
\"+ret}Module[\"_emscripten_futex_wake\"]=_emscripten_futex_wake;function
killThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! killThread() can only ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in killThread!\";GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
pthread=PThread.pthreads[pthread_ptr];pthread.worker.terminate();PThread.freeThreadData(pthread);PThread.runningWorkers.splice(PThread.runningWorkers.indexOf(pthread.worker),1);pthread.worker.pthread=undefined}function cancelThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cancelThread() can only ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in cancelThread!\";var
pthread=PThread.pthreads[pthread_ptr];pthread.worker.postMessage({\"cmd\":\"cancel\"})}function
cleanupThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cleanupThread() can only ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in cleanupThread!\";var
pthread=PThread.pthreads[pthread_ptr];if(pthread){GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
worker=pthread.worker;PThread.returnWorkerToPool(worker)}}var
PThread={unusedWorkers:[],runningWorkers:[],initMainThreadBlock:function(){var
pthreadPoolSize=8;for(var
i=0;i<pthreadPoolSize;++i){PThread.allocateUnusedWorker()}},initRuntime:function(){var
tb=_malloc(228);for(var
i=0;i<228/4;++i)GROWABLE_HEAP_U32()[tb/4+i]=0;GROWABLE_HEAP_I32()[tb+12>>2]=tb;var
headPtr=tb+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var tlsMemory=_malloc(512);for(var
i=0;i<128;++i)GROWABLE_HEAP_U32()[tlsMemory/4+i]=0;Atomics.store(GROWABLE_HEAP_U32(),tb+100>>2,tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tb+40>>2,tb);__emscripten_thread_init(tb,!ENVIRONMENT_IS_WORKER,1);_emscripten_register_main_browser_thread_id(tb)},initWorker:function(){},pthreads:{},threadExitHandlers:[],setThreadStatus:function(){},runExitHandlers:function(){while(PThread.threadExitHandlers.l

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ength>0){PThread.threadExitHandlers.pop()()}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self())___pthread
_tsd_run_dtors()},runExitHandlersAndDeinitThread:function(tb,exitCode){Atomics.store(GROWABLE_HEAP_U
32(),tb+56>>2,1);Atomics.store(GROWABLE_HEAP_U32(),tb+60>>2,0);PThread.runExitHandlers();Atomics.stor
e(GROWABLE_HEAP_U32(),tb+4>>2,exitCode);Atomics.store(GROWABLE_HEAP_U32(),tb+0>>2,1);_emscri
pten_futex_wake(tb+0,2147483647);__emscripten_thread_init(0,0,0)},threadExit:function(exitCode){var
tb=_pthread_self();if(tb){PThread.runExitHandlersAndDeinitThread(tb,exitCode);if(ENVIRONMENT_IS_PTHRE
AD){postMessage({\"cmd\":\"exit\"})}}},threadCancel:function(){PThread.runExitHandlersAndDeinitThread(_pthr
ead_self(),-1);postMessage({\"cmd\":\"cancelDone\"})},terminateAllThreads:function(){for(var t in
PThread.pthreads){var
pthread=PThread.pthreads[t];if(pthread&&pthread.worker){PThread.returnWorkerToPool(pthread.worker)}}PThre
ad.pthreads={};for(var i=0;i<PThread.unusedWorkers.length;++i){var
worker=PThread.unusedWorkers[i];worker.terminate()}PThread.unusedWorkers=[];for(var
i=0;i<PThread.runningWorkers.length;++i){var worker=PThread.runningWorkers[i];var
pthread=worker.pthread;PThread.freeThreadData(pthread);worker.terminate()}PThread.runningWorkers=[]},freeTh
readData:function(pthread){if(!pthread)return;if(pthread.threadInfoStruct){var
tlsMemory=GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2];GROWABLE_HEAP_I32()[pthread.thr
eadInfoStruct+100>>2]=0;_free(tlsMemory);_free(pthread.threadInfoStruct)}pthread.threadInfoStruct=0;if(pthread.
allocatedOwnStack&&pthread.stackBase)_free(pthread.stackBase);pthread.stackBase=0;if(pthread.worker)pthread.
worker.pthread=null},returnWorkerToPool:function(worker){PThread.runWithoutMainThreadQueuedCalls(functio
n(){delete
PThread.pthreads[worker.pthread.threadInfoStruct];PThread.unusedWorkers.push(worker);PThread.runningWorker
s.splice(PThread.runningWorkers.indexOf(worker),1);PThread.freeThreadData(worker.pthread);worker.pthread=un
defined})},runWithoutMainThreadQueuedCalls:function(func){GROWABLE_HEAP_I32()[__emscripten_allow_m
ain_runtime_queued_calls>>2]=0;try{func()}finally{GROWABLE_HEAP_I32()[__emscripten_allow_main_runti
me_queued_calls>>2]=1}},receiveObjectTransfer:function(data){},loadWasmModuleToWorker:function(worker,o
nFinishedLoading){worker.onmessage=function(e){var
 d=e[\"data\"];var
cmd=d[\"cmd\"];if(worker.pthread)PThread.currentProxiedOperationCallerThread=worker.pthread.threadInfoStruct;
if(d[\"targetThread\"]&&d[\"targetThread\"]!=_pthread_self()){var
thread=PThread.pthreads[d.targetThread];if(thread){thread.worker.postMessage(e.data,d[\"transferList\"])}else{con
sole.error('Internal error! Worker sent a message \"'+cmd+'\" to target pthread '+d[\"targetThread\"]+\", but that
thread no longer
exists!\")}PThread.currentProxiedOperationCallerThread=undefined;return}if(cmd===\"processQueuedMainThread
Work\"){_emscripten_main_thread_process_queued_calls()}else
if(cmd===\"spawnThread\"){spawnThread(e.data)}else
if(cmd===\"cleanupThread\"){cleanupThread(d[\"thread\"])}else
if(cmd===\"killThread\"){killThread(d[\"thread\"])}else
if(cmd===\"cancelThread\"){cancelThread(d[\"thread\"])}else
if(cmd===\"loaded\"){worker.loaded=true;if(onFinishedLoading)onFinishedLoading(worker);if(worker.runPthread)
{worker.runPthread();delete
 worker.runPthread}}else if(cmd===\"print\"){out(\"Thread \"+d[\"threadId\"]+\": \"+d[\"text\"])}else
if(cmd===\"printErr\"){err(\"Thread \"+d[\"threadId\"]+\": \"+d[\"text\"])}else if(cmd===\"alert\"){alert(\"Thread
\"+d[\"threadId\"]+\": \"+d[\"text\"])}else if(cmd===\"exit\"){var
detached=worker.pthread&&Atomics.load(GROWABLE_HEAP_U32(),worker.pthread.threadInfoStruct+64>>2);if
(detached){PThread.returnWorkerToPool(worker)}}else
if(cmd===\"exitProcess\"){try{exit(d[\"returnCode\"])}catch(e){if(e instanceof ExitStatus)return;throw e}}else
if(cmd===\"cancelDone\"){PThread.returnWorkerToPool(worker)}else
if(cmd===\"objectTransfer\"){PThread.receiveObjectTransfer(e.data)}else
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if(e.data.target===\"setimmediate\"){worker.postMessage(e.data)}else{err(\"worker sent an unknown command \"+cmd)}PThread.currentProxiedOperationCallerThread=undefined};worker.onerror=function(e){err(\"pthread sent an error! \"+e.filename+\":\"+e.lineno+\": \"+e.message)};if(ENVIRONMENT_IS_NODE){worker.on(\"message\",function(data){worker.onmessage({data:data})});worker.on(\"error\",function(data){worker.onerror(data)});worker.on(\"exit\",function(data){})}worker.postMessage({\"cmd\":\"load\",\"urlOrBlob\":Module[\"mainScriptUrlOrBlob\"]||_scriptDir,\"wasmMemory\":wasmMemory,\"wasmModule\":wasmModule})},allocateUnusedWorker:function(){var pthreadMainJs=locateFile(\"tfjs-backend-wasm-threaded-simd.worker.js\");PThread.unusedWorkers.push(new Worker(pthreadMainJs))},getNewWorker:function(){if(PThread.unusedWorkers.length==0){PThread.allocateUnusedWorker();PThread.loadWasmModuleToWorker(PThread.unusedWorkers[0])}if(PThread.unusedWorkers.length>0)return PThread.unusedWorkers.pop();else return null},busySpinWait:function(msecs){var t=performance.now()+msecs;while(performance.now()<t){}}};function establishStackSpace(stackTop,stackMax){_emscripten_stack_set_limits(stackTop,stackMax);stackRestore(stackTop)}Module[\"establishStackSpace\"]=establishStackSpace;function getNoExitRuntime(){return noExitRuntime}Module[\"getNoExitRuntime\"]=getNoExitRuntime;function invokeEntryPoint(ptr,arg){return wasmTable.get(ptr)(arg)}Module[\"invokeEntryPoint\"]=invokeEntryPoint;function ___assert_fail(condition,filename,line,func){abort(\"Assertion failed: \"+UTF8ToString(condition)+\", at: \"+[filename?UTF8ToString(filename):\"unknown filename\",line,func?UTF8ToString(func):\"unknown function\"])}function ___call_main(argc,argv){var returnCode=_main(argc,argv)}var _emscripten_get_now;if(ENVIRONMENT_IS_NODE){_emscripten_get_now=function(){var t=process[\"hrtime\"]();return t[0]*1e3+t[1]/1e6}}else if(ENVIRONMENT_IS_PTHREAD){_emscripten_get_now=function(){return performance.now()-Module[\"__performance_now_clock_drift\"]}}else if(typeof dateNow!==\"undefined\"){_emscripten_get_now=dateNow}else _emscripten_get_now=function(){return performance.now()};function setErrNo(value){GROWABLE_HEAP_I32()[___errno_location()>>2]=value;return value}function _atexit(func,arg){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(1,1,func,arg)}function __emscripten_notify_thread_queue(targetThreadId,mainThreadId){if(targetThreadId==mainThreadId){postMessage({\"cmd\":\"processQueuedMainThreadWork\"})}else if(ENVIRONMENT_IS_PTHREAD){postMessage({\"targetThread\":targetThreadId,\"cmd\":\"processThreadQueue\"})}else{var pthread=PThread.pthreads[targetThreadId];var worker=pthread&&pthread.worker;if(!worker){return}worker.postMessage({\"cmd\":\"processThreadQueue\"})}return 1}function _abort(){abort()}function _emscripten_asm_const_int(code,sigPtr,argbuf){var args=readAsmConstArgs(sigPtr,argbuf);return ASM_CONSTS[code].apply(null,args)}function _emscripten_conditional_set_current_thread_status(expectedStatus,newStatus){}function _emscripten_futex_wait(addr,val,timeout){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0)return-28;if(!ENVIRONMENT_IS_WEB){var ret=Atomics.wait(GROWABLE_HEAP_I32(),addr>>2,val,timeout);if(ret===\"timed-out\")return-73;if(ret===\"not-equal\")return-6;if(ret===\"ok\")return 0;throw\"Atomics.wait returned an unexpected value \"+ret}else{if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}var tNow=performance.now();var tEnd=tNow+timeout;var lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr);while(1){tNow=performance.now();if(tNow>tEnd){lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,0);return-73}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,0);if(lastAddr==0){break}_emscripten_main_thread_process_queued_calls();if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!

=val){return-
6}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr)}return
0}}function
_emscripten_memcpy_big(dest,src,num){GROWABLE_HEAP_U8().copyWithin(dest,src,src+num)}function
_emscripten_num_logical_cores(){if(ENVIRONMENT_IS_NODE)return require(\"os\").cpus().length;return
navigator[\"hardwareConcurrency\"]}function
_emscripten_proxy_to_main_thread_js(index,sync){var numCallArgs=arguments.length-2;var
stack=stackSave();var serializedNumCallArgs=numCallArgs;var args=stackAlloc(serializedNumCallArgs*8);var
b=args>>3;for(var i=0;i<numCallArgs;i++){var arg=arguments[2+i];GROWABLE_HEAP_F64()[b+i]=arg}var
ret=_emscripten_run_in_main_runtime_thread_js(index,serializedNumCallArgs,args,sync);stackRestore(stack);retur
n ret}var _emscripten_receive_on_main_thread_js_callArgs=[];var readAsmConstArgsArray=[];function
readAsmConstArgs(sigPtr,buf){readAsmConstArgsArray.length=0;var
ch;buf>>=2;while(ch=GROWABLE_HEAP_U8()[sigPtr++]){var
double=ch<105;if(double&&buf&1)buf++;readAsmConstArgsArray.push(double?GROWABLE_HEAP_F64()[buf
++>>1]:GROWABLE_HEAP_I32()[buf]);++buf}return readAsmConstArgsArray}function
_emscripten_receive_on_main_thread_js(index,numCallArgs,args){_emscripten_receive_on_main_thread_js_callA
rgs.length=numCallArgs;var b=args>>3;for(var
i=0;i<numCallArgs;i++){_emscripten_receive_on_main_thread_js_callArgs[i]=GROWABLE_HEAP_F64()[b+i]}v
ar
isEmAsmConst=index<0;var func=!isEmAsmConst?proxiedFunctionTable[index]:ASM_CONSTS[-index-
1];return func.apply(null,_emscripten_receive_on_main_thread_js_callArgs)}function
_emscripten_get_heap_size(){return GROWABLE_HEAP_U8().length}function
emscripten_realloc_buffer(size){try{wasmMemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return
1}catch(e){}}function _emscripten_resize_heap(requestedSize){var
oldSize=_emscripten_get_heap_size();if(requestedSize<=oldSize){return false}var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
JSEvents={inEventHandler:0,removeAllEventListeners:function(){for(var
i=JSEvents.eventHandlers.length-1;i>=0;--
i){JSEvents._removeHandler(i)}JSEvents.eventHandlers=[];JSEvents.deferredCalls=[]},registerRemoveEventListen
ers:function(){if(!JSEvents.removeEventListenersRegistered){__ATEXIT__.push(JSEvents.removeAllEventListene
rs);JSEvents.removeEventListenersRegistered=true}},deferredCalls:[],deferCall:function(targetFunction,precedence
,argsList){function arraysHaveEqualContent(arrA,arrB){if(arrA.length!=arrB.length)return false;for(var i in
arrA){if(arrA[i]!=arrB[i])return false}return true}for(var i in JSEvents.deferredCalls){var
call=JSEvents.deferredCalls[i];if(call.targetFunction==targetFunction&&arraysHaveEqualContent(call.argsList,args
List)){return}}JSEvents.deferredCalls.push({targetFunction:targetFunction,precedence:precedence,argsList:argsList
});JSEvents.deferredCalls.sort(function(x,y){return
x.precedence<y.precedence})},removeDeferredCalls:function(targetFunction){for(var
i=0;i<JSEvents.deferredCalls.length;++i){if(JSEvents.deferredCalls[i].targetFunction==targetFunction){JSEvents.d
eferredCalls.splice(i,1);--i}}},canPerformEventHandlerRequests:function(){return
JSEvents.inEventHandler&&JSEvents.currentEventHandler.allowsDeferredCalls},runDeferredCalls:function(){if(!J
SEvents.canPerformEventHandlerRequests()){return}for(var i=0;i<JSEvents.deferredCalls.length;++i){var
call=JSEvents.deferredCalls[i];JSEvents.deferredCalls.splice(i,1);--

i;call.targetFunction.apply(null,call.argsList)}},eventHandlers:[],removeAllHandlersOnTarget:function(target,event
TypeString){for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==target&&(!eventTypeString||event
TypeString==JSEvents.eventHandlers[i].eventTypeString)){JSEvents._removeHandler(i--
)}}},_removeHandler:function(i){var
h=JSEvents.eventHandlers[i];h.target.removeEventListener(h.eventTypeString,h.eventListenerFunc,h.useCapture);J
SEvents.eventHandlers.splice(i,1)},registerOrRemoveHandler:function(eventHandler){var
jsEventHandler=function
jsEventHandler(event){++JSEvents.inEventHandler;JSEvents.currentEventHandler=eventHandler;JSEvents.runDef
erredCalls();eventHandler.handlerFunc(event);JSEvents.runDeferredCalls();--
JSEvents.inEventHandler};if(eventHandler.callbackfunc){eventHandler.eventListenerFunc=jsEventHandler;eventH
andler.target.addEventListener(eventHandler.eventTypeString,jsEventHandler,eventHandler.useCapture);JSEvents.e
ventHandlers.push(eventHandler);JSEvents.registerRemoveEventListeners()}else{for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==eventHandler.target&&JSEvents.e
ventHandlers[i].eventTypeString==eventHandler.eventTypeString){JSEvents._removeHandler(i--
)}}}},queueEventHandlerOnThread_iiii:function(targetThread,eventHandlerFunc,eventTypeId,eventData,userData)
{var stackTop=stackSave();var
varargs=stackAlloc(12);GROWABLE_HEAP_I32()[varargs>>2]=eventTypeId;GROWABLE_HEAP_I32()[varargs
+4>>2]=eventData;GROWABLE_HEAP_I32()[varargs+8>>2]=userData;__emscripten_call_on_thread(0,targetThr
ead,637534208,eventHandlerFunc,eventData,varargs);stackRestore(stackTop)},getTargetThreadForEventCallback:f
unction(targetThread){switch(targetThread){case
1:return 0;case 2:return PThread.currentProxiedOperationCallerThread;default:return
targetThread}},getNodeNameForTarget:function(target){if(!target)return\"\";if(target==window)return\"#window\";
if(target==screen)return\"#screen\";return
target&&target.nodeName?target.nodeName:\"\"},fullscreenEnabled:function(){return
document.fullscreenEnabled||document.webkitFullscreenEnabled}};function stringToNewUTF8(jsString){var
length=lengthBytesUTF8(jsString)+1;var cString=_malloc(length);stringToUTF8(jsString,cString,length);return
cString}function
_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height){var
stackTop=stackSave();var varargs=stackAlloc(12);var
targetCanvasPtr=0;if(targetCanvas){targetCanvasPtr=stringToNewUTF8(targetCanvas)}GROWABLE_HEAP_I32(
)[varargs>>2]=targetCanvasPtr;GROWABLE_HEAP_I32()[varargs+4>>2]=width;GROWABLE_HEAP_I32()[var
args+8>>2]=height;__emscripten_call_on_thread(0,targetThread,657457152,0,targetCanvasPtr,varargs);stackRestor
e(stackTop)}function
_emscripten_set_offscreencanvas_size_on_target_thread(targetThread,targetCanvas,width,height){targetCanvas=tar
getCanvas?UTF8ToString(targetCanvas):\"\";_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThr
ead,targetCanvas,width,height)}function maybeCStringToJsString(cString){return
cString>2?UTF8ToString(cString):cString}var specialHTMLTargets=[0,typeof
document!==\"undefined\"?document:0,typeof window!==\"undefined\"?window:0];function
findEventTarget(target){target=maybeCStringToJsString(target);var
domElement=specialHTMLTargets[target]||(typeof
document!==\"undefined\"?document.querySelector(target):undefined);return domElement}function
findCanvasEventTarget(target){return findEventTarget(target)}function
_emscripten_set_canvas_element_size_calling_thread(target,width,height){var
canvas=findCanvasEventTarget(target);if(!canvas)return-
4;if(canvas.canvasSharedPtr){GROWABLE_HEAP_I32()[canvas.canvasSharedPtr>>2]=width;GROWABLE_HEA
P_I32()[canvas.canvasSharedPtr+4>>2]=height}if(canvas.offscreenCanvas||!canvas.controlTransferredOffscreen){if
(canvas.offscreenCanvas)canvas=canvas.offscreenCanvas;var

autoResizeViewport=false;if(canvas.GLctxObject&&canvas.GLctxObject.GLctx){var
prevViewport=canvas.GLctxObject.GLctx.getParameter(2978);autoResizeViewport=prevViewport[0]===0&&prev
Viewport[1]===0&&prevViewport[2]===canvas.width&&prevViewport[3]===canvas.height}canvas.width=width;
canvas.height=height;if(autoResizeViewport){canvas.GLctxObject.GLctx.viewport(0,0,width,height)}}else
if(canvas.canvasSharedPtr){var
targetThread=GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+8>>2];_emscripten_set_offscreencanvas_size_o
n_target_thread(targetThread,target,width,height);return 1}else{return-4}return 0}function
_emscripten_set_canvas_element_size_main_thread(target,width,height){if(ENVIRONMENT_IS_PTHREAD)retur
n
_emscripten_proxy_to_main_thread_js(2,1,target,width,height);return
_emscripten_set_canvas_element_size_calling_thread(target,width,height)}function
_emscripten_set_canvas_element_size(target,width,height){var
canvas=findCanvasEventTarget(target);if(canvas){return
_emscripten_set_canvas_element_size_calling_thread(target,width,height)}else{return
_emscripten_set_canvas_element_size_main_thread(target,width,height)}}function
_emscripten_set_current_thread_status(newStatus){}function
_emscripten_set_thread_name(threadId,name){}function __webgl_enable_ANGLE_instanced_arrays(ctx){var
ext=ctx.getExtension(\"ANGLE_instanced_arrays\");if(ext){ctx[\"vertexAttribDivisor\"]=function(index,divisor){ex
t[\"vertexAttribDivisorANGLE\"](index,divisor)};ctx[\"drawArraysInstanced\"]=function(mode,first,count,primcou
nt){ext[\"drawArraysInstancedANGLE\"](mode,first,count,primcount)};ctx[\"drawElementsInstanced\"]=function(
mode,count,type,indices,primcount){ext[\"drawElementsInstancedANGLE\"](mode,count,type,indices,primcount)};
return
1}}function __webgl_enable_OES_vertex_array_object(ctx){var
ext=ctx.getExtension(\"OES_vertex_array_object\");if(ext){ctx[\"createVertexArray\"]=function(){return
ext[\"createVertexArrayOES\"]()};ctx[\"deleteVertexArray\"]=function(vao){ext[\"deleteVertexArrayOES\"](vao)};
ctx[\"bindVertexArray\"]=function(vao){ext[\"bindVertexArrayOES\"](vao)};ctx[\"isVertexArray\"]=function(vao)
{return ext[\"isVertexArrayOES\"](vao)};return 1}}function __webgl_enable_WEBGL_draw_buffers(ctx){var
ext=ctx.getExtension(\"WEBGL_draw_buffers\");if(ext){ctx[\"drawBuffers\"]=function(n,bufs){ext[\"drawBuffers
WEBGL\"](n,bufs)};return 1}}function
__webgl_enable_WEBGL_multi_draw(ctx){return!!(ctx.multiDrawWebgl=ctx.getExtension(\"WEBGL_multi_dra
w\"))}var
GL={counter:1,buffers:[],programs:[],framebuffers:[],renderbuffers:[],textures:[],uniforms:[],shaders:[],vaos:[],cont
exts:{},offscreenCanvases:{},timerQueriesEXT:[],programInfos:{},stringCache:{},unpackAlignment:4,recordError:
function
recordError(errorCode){if(!GL.lastError){GL.lastError=errorCode}},getNewId:function(table){var
ret=GL.counter++;for(var i=table.length;i<ret;i++){table[i]=null}return
ret},getSource:function(shader,count,string,length){var source=\"\";for(var i=0;i<count;++i){var
len=length?GROWABLE_HEAP_I32()[length+i*4>>2]:-
1;source+=UTF8ToString(GROWABLE_HEAP_I32()[string+i*4>>2],len<0?undefined:len)}return
source},createContext:function(canvas,webGLContextAttributes){var
ctx=canvas.getContext(\"webgl\",webGLContextAttributes);if(!ctx)return 0;var
handle=GL.registerContext(ctx,webGLContextAttributes);return
handle},registerContext:function(ctx,webGLContextAttributes){var
handle=_malloc(8);GROWABLE_HEAP_I32()[handle+4>>2]=_pthread_self();var
context={handle:handle,attributes:webGLContextAttributes,version:webGLContextAttributes.majorVersion,GLctx:
ctx};if(ctx.canvas)ctx.canvas.GLctxObject=context;GL.contexts[handle]=context;if(typeof
webGLContextAttributes.enableExtensionsByDefault===\"undefined\"||webGLContextAttributes.enableExtensions
ByDefault){GL.initExtensions(context)}return

handle},makeContextCurrent:function(contextHandle){GL.currentContext=GL.contexts[contextHandle];Module.ctx
=GLctx=GL.currentContext&&GL.currentContext.GLctx;return!(contextHandle&&!GLctx)},getContext:function(c
ontextHandle){return
GL.contexts[contextHandle]},deleteContext:function(contextHandle){if(GL.currentContext===GL.contexts[context
Handle])GL.currentContext=null;if(typeof
JSEvents===\"object\")JSEvents.removeAllHandlersOnTarget(GL.contexts[contextHandle].GLctx.canvas);if(GL.co
ntexts[contextHandle]&&GL.contexts[contextHandle].GLctx.canvas)GL.contexts[contextHandle].GLctx.canvas.GL
ctxObject=undefined;_free(GL.contexts[contextHandle].handle);GL.contexts[contextHandle]=null},initExtensions:f
unction(context){if(!context)context=GL.currentContext;if(context.initExtensionsDone)return;context.initExtension
sDone=true;var
GLctx=context.GLctx;__webgl_enable_ANGLE_instanced_arrays(GLctx);__webgl_enable_OES_vertex_array_obj
ect(GLctx);__webgl_enable_WEBGL_draw_buffers(GLctx);GLctx.disjointTimerQueryExt=GLctx.getExtension(\"
EXT_disjoint_timer_query\");__webgl_enable_WEBGL_multi_draw(GLctx);var
exts=GLctx.getSupportedExtensions()||[];exts.forEach(function(ext){if(ext.indexOf(\"lose_context\")<0&&ext.inde
xOf(\"debug\")<0){GLctx.getExtension(ext)}})},populateUniformTable:function(program){var
p=GL.programs[program];var
ptable=GL.programInfos[program]={uniforms:{},maxUniformLength:0,maxAttributeLength:-
1,maxUniformBlockNameLength:-1};var utable=ptable.uniforms;var
numUniforms=GLctx.getProgramParameter(p,35718);for(var i=0;i<numUniforms;++i){var
u=GLctx.getActiveUniform(p,i);var
name=u.name;ptable.maxUniformLength=Math.max(ptable.maxUniformLength,name.length+1);if(name.slice(-
1)==\"]\"){name=name.slice(0,name.lastIndexOf(\"[\"))}var loc=GLctx.getUniformLocation(p,name);if(loc){var
id=GL.getNewId(GL.uniforms);utable[name]=[u.size,id];GL.uniforms[id]=loc;for(var
j=1;j<u.size;++j){var
n=name+\"[\"+j+\"]\";loc=GLctx.getUniformLocation(p,n);id=GL.getNewId(GL.uniforms);GL.uniforms[id]=loc}}
}};var __emscripten_webgl_power_preferences=[\"default\",\"low-power\",\"high-performance\"];function
_emscripten_webgl_do_create_context(target,attributes){var a=attributes>>2;var
powerPreference=GROWABLE_HEAP_I32()[a+(24>>2)];var
contextAttributes={\"alpha\":!!GROWABLE_HEAP_I32()[a+(0>>2)],\"depth\":!!GROWABLE_HEAP_I32()[a+(4
>>2)],\"stencil\":!!GROWABLE_HEAP_I32()[a+(8>>2)],\"antialias\":!!GROWABLE_HEAP_I32()[a+(12>>2)],\"p
remultipliedAlpha\":!!GROWABLE_HEAP_I32()[a+(16>>2)],\"preserveDrawingBuffer\":!!GROWABLE_HEAP_
I32()[a+(20>>2)],\"powerPreference\":__emscripten_webgl_power_preferences[powerPreference],\"failIfMajorPerf
ormanceCaveat\":!!GROWABLE_HEAP_I32()[a+(28>>2)],majorVersion:GROWABLE_HEAP_I32()[a+(32>>2)],
minorVersion:GROWABLE_HEAP_I32()[a+(36>>2)],enableExtensionsByDefault:GROWABLE_HEAP_I32()[a+(
40>>2)],explicitSwapControl:GROWABLE_HEAP_I32()[a+(44>>2)],proxyContextToMainThread:GROWABLE_
HEAP_I32()[a+(48>>2)],renderViaOffscreenBackBuffer:GROWABLE_HEAP_I32()[a+(52>>2)]};var
canvas=findCanvasEventTarget(target);if(!canvas){return 0}if(contextAttributes.explicitSwapControl){return
0}var contextHandle=GL.createContext(canvas,contextAttributes);return contextHandle}function
_emscripten_webgl_create_context(a0,a1){return _emscripten_webgl_do_create_context(a0,a1)}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=GROWABLE_HEAP_I32()[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var
ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function
_fd_close(fd){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(3,1,fd);return
0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(4,1,fd,offset_low,offset_high,whence,newOffset)}function
_fd_write(fd,iov,iovcnt,pnum){if(ENVIRONMENT_IS_PTHREAD)return

_emscripten_proxy_to_main_thread_js(5,1,fd,iov,iovcnt,pnum);var num=0;for(var i=0;i<iovcnt;i++){var ptr=GROWABLE_HEAP_I32()[iov+i*8>>2];var len=GROWABLE_HEAP_I32()[iov+(i*8+4)>>2];for(var j=0;j<len;j++){SYSCALLS.printChar(fd,GROWABLE_HEAP_U8()[ptr+j])}num+=len}GROWABLE_HEAP_I32()[pnum>>2]=num;return 0}function _pthread_cleanup_pop(execute){var routine=PThread.threadExitHandlers.pop();if(execute)routine()}function _pthread_cleanup_push(routine,arg){PThread.threadExitHandlers.push(function(){wasmTable.get(routine)(arg)})}function spawnThread(threadParams){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! spawnThread() can only ever be called from main application thread!\";var worker=PThread.getNewWorker();if(worker.pthread!==undefined)throw\"Internal error!\";if(!threadParams.pthread_ptr)throw\"Internal error, no pthread ptr!\";PThread.runningWorkers.push(worker);var tlsMemory=_malloc(128*4);for(var i=0;i<128;++i){GROWABLE_HEAP_I32()[tlsMemory+i*4>>2]=0}var stackHigh=threadParams.stackBase+threadParams.stackSize;var pthread=PThread.pthreads[threadParams.pthread_ptr]={worker:worker,stackBase:threadParams.stackBase,stackSize:threadParams.stackSize,allocatedOwnStack:threadParams.allocatedOwnStack,threadInfoStruct:threadParams.pthread_ptr};var tis=pthread.threadInfoStruct>>2;Atomics.store(GROWABLE_HEAP_U32(),tis+(64>>2),threadParams.detached);Atomics.store(GROWABLE_HEAP_U32(),tis+(100>>2),tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tis+(40>>2),pthread.threadInfoStruct);Atomics.store(GROWABLE_HEAP_U32(),tis+(80>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(76>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),tis+(104>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+8>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+12>>2),threadParams.detached);var global_libc=_emscripten_get_global_libc();var global_locale=global_libc+40;Atomics.store(GROWABLE_HEAP_U32(),tis+(172>>2),global_locale);worker.pthread=pthread;var msg={\"cmd\":\"run\",\"start_routine\":threadParams.startRoutine,\"arg\":threadParams.arg,\"threadInfoStruct\":threadParams.pthread_ptr,\"stackBase\":threadParams.stackBase,\"stackSize\":threadParams.stackSize};worker.runPthread=function(){msg.time=performance.now();worker.postMessage(msg,threadParams.transferList)};if(worker.loaded){worker.runPthread();delete worker.runPthread}}function _pthread_create(pthread_ptr,attr,start_routine,arg){if(typeof SharedArrayBuffer===\"undefined\"){err(\"Current environment does not support SharedArrayBuffer, pthreads are not available!\");return 6}if(!pthread_ptr){err(\"pthread_create called with a null thread pointer!\");return 28}var transferList=[];var error=0;if(ENVIRONMENT_IS_PTHREAD&&(transferList.length===0||error)){return _emscripten_sync_run_in_main_thread_4(687865856,pthread_ptr,attr,start_routine,arg)}if(error)return error;var stackSize=0;var stackBase=0;var detached=0;if(attr&&attr!=-1){stackSize=GROWABLE_HEAP_I32()[attr>>2];stackSize+=81920;stackBase=GROWABLE_HEAP_I32()[attr+8>>2];detached=GROWABLE_HEAP_I32()[attr+12>>2]!==0}else{stackSize=2097152}var allocatedOwnStack=stackBase==0;if(allocatedOwnStack){stackBase=_memalign(16,stackSize)}else{stackBase-=stackSize;assert(stackBase>0)}var threadInfoStruct=_malloc(228);for(var i=0;i<228>>2;++i)GROWABLE_HEAP_U32()[(threadInfoStruct>>2)+i]=0;GROWABLE_HEAP_I32()[pthread_ptr>>2]=threadInfoStruct;GROWABLE_HEAP_I32()[threadInfoStruct+12>>2]=threadInfoStruct;var headPtr=threadInfoStruct+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var threadParams={stackBase:stackBase,stackSize:stackSize,allocatedOwnStack:allocatedOwnStack,detached:detached,startRoutine:start_routine,pthread_ptr:threadInfoStruct,arg:arg,transferList:transferList};if(ENVIRONMENT_IS_PTHREAD){threadParams.cmd=\"spawnThread\";postMessage(threadParams,transferList)}else{spawnThread(threadParams)}return 0}function __pthread_testcancel_js(){if(!ENVIRONMENT_IS_PTHREAD)return;var tb=_pthread_self();if(!tb)return;var

cancelDisabled=Atomics.load(GROWABLE_HEAP_U32(),tb+56>>2);if(cancelDisabled)return;var canceled=Atomics.load(GROWABLE_HEAP_U32(),tb+0>>2);if(canceled==2)throw\"Canceled!\"}function _emscripten_check_blocking_allowed(){if(ENVIRONMENT_IS_NODE)return;if(ENVIRONMENT_IS_WORKER)return;warnOnce(\"Blocking on the main thread is very dangerous, see https://emscripten.org/docs/porting/pthreads.html#blocking-on-the-main-browser-thread\")}function __emscripten_do_pthread_join(thread,status,block){if(!thread){err(\"pthread_join attempted on a null thread pointer!\");return ERRNO_CODES.ESRCH}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self()==thread){err(\"PThread \"+thread+\" is attempting to join to itself!\");return ERRNO_CODES.EDEADLK}else if(!ENVIRONMENT_IS_PTHREAD&&_emscripten_main_browser_thread_id()==thread){err(\"Main thread \"+thread+\" is attempting to join to itself!\");return ERRNO_CODES.EDEADLK}var self=GROWABLE_HEAP_I32()[thread+12>>2];if(self!==thread){err(\"pthread_join attempted on thread \"+thread+\", which does not point to a valid thread, or does not exist anymore!\");return ERRNO_CODES.ESRCH}var detached=Atomics.load(GROWABLE_HEAP_U32(),thread+64>>2);if(detached){err(\"Attempted to join thread \"+thread+\", which was already detached!\");return ERRNO_CODES.EINVAL}if(block){_emscripten_check_blocking_allowed()}for(;;){var threadStatus=Atomics.load(GROWABLE_HEAP_U32(),thread+0>>2);if(threadStatus==1){var threadExitCode=Atomics.load(GROWABLE_HEAP_U32(),thread+4>>2);if(status)GROWABLE_HEAP_I32()[status>>2]=threadExitCode;Atomics.store(GROWABLE_HEAP_U32(),thread+64>>2,1);if(!ENVIRONMENT_IS_PTHREAD)cleanupThread(thread);else postMessage({\"cmd\":\"cleanupThread\",\"thread\":thread});return 0}if(!block){return ERRNO_CODES.EBUSY}__pthread_testcancel_js();if(!ENVIRONMENT_IS_PTHREAD)_emscripten_main_thread_process_queued_calls();_emscripten_futex_wait(thread+0,threadStatus,ENVIRONMENT_IS_PTHREAD?100:1)}}function _pthread_join(thread,status){return __emscripten_do_pthread_join(thread,status,true)}function _sysconf(name){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(6,1,name);switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-1}if(!ENVIRONMENT_IS_PTHREAD)PThread.initMainThreadBlock();var GLctx;var proxiedFunctionTable=[null,_atexit,_emscripten_set_canvas_element_size_main_thread,_fd_close,_fd_seek,_fd_write,_sysconf];var asmLibraryArg={\"e\":___assert_fail,\"r\":___call_main,\"x\":__emscripten_notify_thread_queue,\"b\":_abort,\"y\":_emscripten_asm_const_int,\"j\":_emscripten_conditional_set_current_thread_status,\"d\":_emscripten_futex_wait,\"c\":_emscripten_futex_wake,\"f\":_emscripten_get_now,\"p\":_emscripten_memcpy_big,\"A\":_emscripten_num_l

ogical_cores,\"u\":_emscripten_receive_on_main_thread_js,\"q\":_emscripten_resize_heap,\"v\":_emscripten_set_canvas_element_size,\"i\":_emscripten_set_current_thread_status,\"s\":_emscripten_set_thread_name,\"w\":_emscripten_webgl_create_context,\"l\":_fd_close,\"n\":_fd_seek,\"g\":_fd_write,\"o\":initPthreadsJS,\"a\":wasmMemory||Module[\"wasmMemory\"],\"z\":_pthread_cleanup_pop,\"k\":_pthread_cleanup_push,\"h\":_pthread_create,\"m\":_pthread_join,\"t\":_sysconf};var asm=createWasm();var
___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=function(){return(___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=Module[\"asm\"][\"B\"]).apply(null,arguments)};var
_init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"C\"]).apply(null,arguments)};var
_init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Module[\"_init_with_threads_count\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads_count\"]=Module[\"asm\"][\"E\"]).apply(null,arguments)};var
_register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=Module[\"asm\"][\"F\"]).apply(null,arguments)};var
_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"asm\"][\"G\"]).apply(null,arguments)};var
_dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"H\"]).apply(null,arguments)};var
_Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"J\"]).apply(null,arguments)};var
_Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"K\"]).apply(null,arguments)};var
_AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"L\"]).apply(null,arguments)};var
_All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"M\"]).apply(null,arguments)};var
_Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"N\"]).apply(null,arguments)};var
_ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"O\"]).apply(null,arguments)};var
_AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"P\"]).apply(null,arguments)};var
_BatchMatMul=Module[\"_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\"_BatchMatMul\"]=Module[\"asm\"][\"Q\"]).apply(null,arguments)};var
_Ceil=Module[\"_Ceil\"]=function(){return(_Ceil=Module[\"_Ceil\"]=Module[\"asm\"][\"R\"]).apply(null,arguments)};var
_ClipByValue=Module[\"_ClipByValue\"]=function(){return(_ClipByValue=Module[\"_ClipByValue\"]=Module[\"asm\"][\"S\"]).apply(null,arguments)};var
_Conv2D=Module[\"_Conv2D\"]=function(){return(_Conv2D=Module[\"_Conv2D\"]=Module[\"asm\"][\"T\"]).apply(null,arguments)};var
_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=function(){return(_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=Module[\"asm\"][\"U\"]).apply(null,arguments)};var
_Cos=Module[\"_Cos\"]=function(){return(_Cos=Module[\"_Cos\"]=Module[\"asm\"][\"V\"]).apply(null,arguments)};var
_Cosh=Module[\"_Cosh\"]=function(){return(_Cosh=Module[\"_Cosh\"]=Module[\"asm\"][\"W\"]).apply(null,arguments)};var
_CropAndResize=Module[\"_CropAndResize\"]=function(){return(_CropAndResize=Module[\"_CropAndResize\"]

=Module[\"asm\"][\"X\"]).apply(null,arguments)};var
_Cumsum=Module[\"_Cumsum\"]=function(){return(_Cumsum=Module[\"_Cumsum\"]=Module[\"asm\"][\"Y\"]).apply(null,arguments)};var
_DepthToSpace=Module[\"_DepthToSpace\"]=function(){return(_DepthToSpace=Module[\"_DepthToSpace\"]=Module[\"asm\"][\"Z\"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=function(){return(_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=Module[\"asm\"][\"_\"]).apply(null,arguments)};var
_Elu=Module[\"_Elu\"]=function(){return(_Elu=Module[\"_Elu\"]=Module[\"asm\"][\"$\"]).apply(null,arguments)};var
_Equal=Module[\"_Equal\"]=function(){return(_Equal=Module[\"_Equal\"]=Module[\"asm\"][\"aa\"]).apply(null,arguments)};var
_Exp=Module[\"_Exp\"]=function(){return(_Exp=Module[\"_Exp\"]=Module[\"asm\"][\"ba\"]).apply(null,arguments)};var
_FlipLeftRight=Module[\"_FlipLeftRight\"]=function(){return(_FlipLeftRight=Module[\"_FlipLeftRight\"]=Module[\"asm\"][\"ca\"]).apply(null,arguments)};var
_Floor=Module[\"_Floor\"]=function(){return(_Floor=Module[\"_Floor\"]=Module[\"asm\"][\"da\"]).apply(null,arguments)};var
_FloorDiv=Module[\"_FloorDiv\"]=function(){return(_FloorDiv=Module[\"_FloorDiv\"]=Module[\"asm\"][\"ea\"]).apply(null,arguments)};var
_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=function(){return(_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=Module[\"asm\"][\"fa\"]).apply(null,arguments)};var
_FusedConv2D=Module[\"_FusedConv2D\"]=function(){return(_FusedConv2D=Module[\"_FusedConv2D\"]=Module[\"asm\"][\"ga\"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=function(){return(_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=Module[\"asm\"][\"ha\"]).apply(null,arguments)};var
_Gather=Module[\"_Gather\"]=function(){return(_Gather=Module[\"_Gather\"]=Module[\"asm\"][\"ia\"]).apply(null,arguments)};var
_GatherNd=Module[\"_GatherNd\"]=function(){return(_GatherNd=Module[\"_GatherNd\"]=Module[\"asm\"][\"ja\"]).apply(null,arguments)};var
_Greater=Module[\"_Greater\"]=function(){return(_Greater=Module[\"_Greater\"]=Module[\"asm\"][\"ka\"]).apply(null,arguments)};var
_GreaterEqual=Module[\"_GreaterEqual\"]=function(){return(_GreaterEqual=Module[\"_GreaterEqual\"]=Module[\"asm\"][\"la\"]).apply(null,arguments)};var
_LeakyRelu=Module[\"_LeakyRelu\"]=function(){return(_LeakyRelu=Module[\"_LeakyRelu\"]=Module[\"asm\"][\"ma\"]).apply(null,arguments)};var
_Less=Module[\"_Less\"]=function(){return(_Less=Module[\"_Less\"]=Module[\"asm\"][\"na\"]).apply(null,arguments)};var
_LessEqual=Module[\"_LessEqual\"]=function(){return(_LessEqual=Module[\"_LessEqual\"]=Module[\"asm\"][\"oa\"]).apply(null,arguments)};var
_Log=Module[\"_Log\"]=function(){return(_Log=Module[\"_Log\"]=Module[\"asm\"][\"pa\"]).apply(null,arguments)};var
_LogicalAnd=Module[\"_LogicalAnd\"]=function(){return(_LogicalAnd=Module[\"_LogicalAnd\"]=Module[\"asm\"][\"qa\"]).apply(null,arguments)};var
_Max=Module[\"_Max\"]=function(){return(_Max=Module[\"_Max\"]=Module[\"asm\"][\"ra\"]).apply(null,arguments)};var
_MaxPool=Module[\"_MaxPool\"]=function(){return(_MaxPool=Module[\"_MaxPool\"]=Module[\"asm\"][\"sa\"]).apply(null,arguments)};var
_Maximum=Module[\"_Maximum\"]=function(){return(_Maximum=Module[\"_Maximum\"]=Module[\"asm\"][\"t

a\"]).apply(null,arguments)};var
_Mean=Module[\"_Mean\"]=function(){return(_Mean=Module[\"_Mean\"]=Module[\"asm\"][\"ua\"]).apply(null,arguments)};var
_Min=Module[\"_Min\"]=function(){return(_Min=Module[\"_Min\"]=Module[\"asm\"][\"va\"]).apply(null,arguments)};var
_Minimum=Module[\"_Minimum\"]=function(){return(_Minimum=Module[\"_Minimum\"]=Module[\"asm\"][\"wa\"]).apply(null,arguments)};var
_MirrorPad=Module[\"_MirrorPad\"]=function(){return(_MirrorPad=Module[\"_MirrorPad\"]=Module[\"asm\"][\"xa\"]).apply(null,arguments)};var
_Multiply=Module[\"_Multiply\"]=function(){return(_Multiply=Module[\"_Multiply\"]=Module[\"asm\"][\"ya\"]).apply(null,arguments)};var
_Neg=Module[\"_Neg\"]=function(){return(_Neg=Module[\"_Neg\"]=Module[\"asm\"][\"za\"]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module[\"_NonMaxSuppressionV3\"]=function(){return(_NonMaxSuppressionV3=Module[\"_NonMaxSuppressionV3\"]=Module[\"asm\"][\"Aa\"]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module[\"_NonMaxSuppressionV4\"]=function(){return(_NonMaxSuppressionV4=Module[\"_NonMaxSuppressionV4\"]=Module[\"asm\"][\"Ba\"]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module[\"_NonMaxSuppressionV5\"]=function(){return(_NonMaxSuppressionV5=Module[\"_NonMaxSuppressionV5\"]=Module[\"asm\"][\"Ca\"]).apply(null,arguments)};var
_NotEqual=Module[\"_NotEqual\"]=function(){return(_NotEqual=Module[\"_NotEqual\"]=Module[\"asm\"][\"Da\"]).apply(null,arguments)};var
_OneHot=Module[\"_OneHot\"]=function(){return(_OneHot=Module[\"_OneHot\"]=Module[\"asm\"][\"Ea\"]).apply(null,arguments)};var
_PadV2=Module[\"_PadV2\"]=function(){return(_PadV2=Module[\"_PadV2\"]=Module[\"asm\"][\"Fa\"]).apply(null,arguments)};var
_Pow=Module[\"_Pow\"]=function(){return(_Pow=Module[\"_Pow\"]=Module[\"asm\"][\"Ga\"]).apply(null,arguments)};var
_Prelu=Module[\"_Prelu\"]=function(){return(_Prelu=Module[\"_Prelu\"]=Module[\"asm\"][\"Ha\"]).apply(null,arguments)};var
_Prod=Module[\"_Prod\"]=function(){return(_Prod=Module[\"_Prod\"]=Module[\"asm\"][\"Ia\"]).apply(null,arguments)};var
_RealDiv=Module[\"_RealDiv\"]=function(){return(_RealDiv=Module[\"_RealDiv\"]=Module[\"asm\"][\"Ja\"]).apply(null,arguments)};var
_Relu=Module[\"_Relu\"]=function(){return(_Relu=Module[\"_Relu\"]=Module[\"asm\"][\"Ka\"]).apply(null,arguments)};var
_Relu6=Module[\"_Relu6\"]=function(){return(_Relu6=Module[\"_Relu6\"]=Module[\"asm\"][\"La\"]).apply(null,arguments)};var
_ResizeBilinear=Module[\"_ResizeBilinear\"]=function(){return(_ResizeBilinear=Module[\"_ResizeBilinear\"]=Module[\"asm\"][\"Ma\"]).apply(null,arguments)};var
_Reverse=Module[\"_Reverse\"]=function(){return(_Reverse=Module[\"_Reverse\"]=Module[\"asm\"][\"Na\"]).apply(null,arguments)};var
_RotateWithOffset=Module[\"_RotateWithOffset\"]=function(){return(_RotateWithOffset=Module[\"_RotateWithOffset\"]=Module[\"asm\"][\"Oa\"]).apply(null,arguments)};var
_Round=Module[\"_Round\"]=function(){return(_Round=Module[\"_Round\"]=Module[\"asm\"][\"Pa\"]).apply(null,arguments)};var
_Rsqrt=Module[\"_Rsqrt\"]=function(){return(_Rsqrt=Module[\"_Rsqrt\"]=Module[\"asm\"][\"Qa\"]).apply(null,arguments)};var
_ScatterNd=Module[\"_ScatterNd\"]=function(){return(_ScatterNd=Module[\"_ScatterNd\"]=Module[\"asm\"][\"Ra

\"]).apply(null,arguments)};var
_SelectV2=Module[\"_SelectV2\"]=function(){return(_SelectV2=Module[\"_SelectV2\"]=Module[\"asm\"][\"Sa\"]).apply(null,arguments)};var
_Sigmoid=Module[\"_Sigmoid\"]=function(){return(_Sigmoid=Module[\"_Sigmoid\"]=Module[\"asm\"][\"Ta\"]).apply(null,arguments)};var
_Sin=Module[\"_Sin\"]=function(){return(_Sin=Module[\"_Sin\"]=Module[\"asm\"][\"Ua\"]).apply(null,arguments)};var
_Softmax=Module[\"_Softmax\"]=function(){return(_Softmax=Module[\"_Softmax\"]=Module[\"asm\"][\"Va\"]).apply(null,arguments)};var
_Sqrt=Module[\"_Sqrt\"]=function(){return(_Sqrt=Module[\"_Sqrt\"]=Module[\"asm\"][\"Wa\"]).apply(null,arguments)};var
_Square=Module[\"_Square\"]=function(){return(_Square=Module[\"_Square\"]=Module[\"asm\"][\"Xa\"]).apply(null,arguments)};var
_SquaredDifference=Module[\"_SquaredDifference\"]=function(){return(_SquaredDifference=Module[\"_SquaredDifference\"]=Module[\"asm\"][\"Ya\"]).apply(null,arguments)};var
_Step=Module[\"_Step\"]=function(){return(_Step=Module[\"_Step\"]=Module[\"asm\"][\"Za\"]).apply(null,arguments)};var
_StridedSlice=Module[\"_StridedSlice\"]=function(){return(_StridedSlice=Module[\"_StridedSlice\"]=Module[\"asm\"][\"_a\"]).apply(null,arguments)};var
_Sub=Module[\"_Sub\"]=function(){return(_Sub=Module[\"_Sub\"]=Module[\"asm\"][\"$a\"]).apply(null,arguments)};var
_Sum=Module[\"_Sum\"]=function(){return(_Sum=Module[\"_Sum\"]=Module[\"asm\"][\"ab\"]).apply(null,arguments)};var
_Tan=Module[\"_Tan\"]=function(){return(_Tan=Module[\"_Tan\"]=Module[\"asm\"][\"bb\"]).apply(null,arguments)};var
_Tanh=Module[\"_Tanh\"]=function(){return(_Tanh=Module[\"_Tanh\"]=Module[\"asm\"][\"cb\"]).apply(null,arguments)};var
_Tile=Module[\"_Tile\"]=function(){return(_Tile=Module[\"_Tile\"]=Module[\"asm\"][\"db\"]).apply(null,arguments)};var
_TopK=Module[\"_TopK\"]=function(){return(_TopK=Module[\"_TopK\"]=Module[\"asm\"][\"eb\"]).apply(null,arguments)};var
_Transform=Module[\"_Transform\"]=function(){return(_Transform=Module[\"_Transform\"]=Module[\"asm\"][\"fb\"]).apply(null,arguments)};var
_Transpose=Module[\"_Transpose\"]=function(){return(_Transpose=Module[\"_Transpose\"]=Module[\"asm\"][\"gb\"]).apply(null,arguments)};var
__FusedMatMul=Module[\"__FusedMatMul\"]=function(){return(__FusedMatMul=Module[\"__FusedMatMul\"]=Module[\"asm\"][\"hb\"]).apply(null,arguments)};var
_malloc=Module[\"_malloc\"]=function(){return(_malloc=Module[\"_malloc\"]=Module[\"asm\"][\"ib\"]).apply(null,arguments)};var
_free=Module[\"_free\"]=function(){return(_free=Module[\"_free\"]=Module[\"asm\"][\"jb\"]).apply(null,arguments)};var
___errno_location=Module[\"___errno_location\"]=function(){return(___errno_location=Module[\"___errno_location\"]=Module[\"asm\"][\"kb\"]).apply(null,arguments)};var
_emscripten_get_global_libc=Module[\"_emscripten_get_global_libc\"]=function(){return(_emscripten_get_global_libc=Module[\"_emscripten_get_global_libc\"]=Module[\"asm\"][\"lb\"]).apply(null,arguments)};var
_pthread_self=Module[\"_pthread_self\"]=function(){return(_pthread_self=Module[\"_pthread_self\"]=Module[\"asm\"][\"mb\"]).apply(null,arguments)};var
___pthread_tsd_run_dtors=Module[\"___pthread_tsd_run_dtors\"]=function(){return(___pthread_tsd_run_dtors=M

odule[\"___pthread_tsd_run_dtors\"]=Module[\"asm\"][\"nb\"]).apply(null,arguments)};var
_emscripten_main_thread_process_queued_calls=Module[\"_emscripten_main_thread_process_queued_calls\"]=fu
nction(){return(_emscripten_main_thread_process_queued_calls=Module[\"_emscripten_main_thread_process_que
ued_calls\"]=Module[\"asm\"][\"ob\"]).apply(null,arguments)};var
_emscripten_current_thread_process_queued_calls=Module[\"_emscripten_current_thread_process_queued_calls\"]
=function(){return(_emscripten_current_thread_process_queued_calls=Module[\"_emscripten_current_thread_proc
ess_queued_calls\"]=Module[\"asm\"][\"pb\"]).apply(null,arguments)};var
_emscripten_register_main_browser_thread_id=Module[\"_emscripten_register_main_browser_thread_id\"]=functi
on(){return(_emscripten_register_main_browser_thread_id=Module[\"_emscripten_register_main_browser_thread_
id\"]=Module[\"asm\"][\"qb\"]).apply(null,arguments)};var
_emscripten_main_browser_thread_id=Module[\"_emscripten_main_browser_thread_id\"]=function(){return(_ems
cripten_main_browser_thread_id=Module[\"_emscripten_main_browser_thread_id\"]=Module[\"asm\"][\"rb\"]).app
ly(null,arguments)};var
__emscripten_do_dispatch_to_thread=Module[\"__emscripten_do_dispatch_to_thread\"]=function(){return(__emsc
ripten_do_dispatch_to_thread=Module[\"__emscripten_do_dispatch_to_thread\"]=Module[\"asm\"][\"sb\"]).apply(n
ull,arguments)};var
_emscripten_sync_run_in_main_thread_4=Module[\"_emscripten_sync_run_in_main_thread_4\"]=function(){retur
n(_emscripten_sync_run_in_main_thread_4=Module[\"_emscripten_sync_run_in_main_thread_4\"]=Module[\"asm\
"][\"tb\"]).apply(null,arguments)};var
_emscripten_run_in_main_runtime_thread_js=Module[\"_emscripten_run_in_main_runtime_thread_js\"]=function(
){return(_emscripten_run_in_main_runtime_thread_js=Module[\"_emscripten_run_in_main_runtime_thread_js\"]=
Module[\"asm\"][\"ub\"]).apply(null,arguments)};var
__emscripten_call_on_thread=Module[\"__emscripten_call_on_thread\"]=function(){return(__emscripten_call_on_t
hread=Module[\"__emscripten_call_on_thread\"]=Module[\"asm\"][\"vb\"]).apply(null,arguments)};var
_emscripten_tls_init=Module[\"_emscripten_tls_init\"]=function(){return(_emscripten_tls_init=Module[\"_emscript
en_tls_init\"]=Module[\"asm\"][\"wb\"]).apply(null,arguments)};var
__emscripten_thread_init=Module[\"__emscripten_thread_init\"]=function(){return(__emscripten_thread_init=Mod
ule[\"__emscripten_thread_init\"]=Module[\"asm\"][\"xb\"]).apply(null,arguments)};var
stackSave=Module[\"stackSave\"]=function(){return(stackSave=Module[\"stackSave\"]=Module[\"asm\"][\"yb\"]).a
pply(null,arguments)};var
stackRestore=Module[\"stackRestore\"]=function(){return(stackRestore=Module[\"stackRestore\"]=Module[\"asm\"
][\"zb\"]).apply(null,arguments)};var
stackAlloc=Module[\"stackAlloc\"]=function(){return(stackAlloc=Module[\"stackAlloc\"]=Module[\"asm\"][\"Ab\"
]).apply(null,arguments)};var
_emscripten_stack_set_limits=Module[\"_emscripten_stack_set_limits\"]=function(){return(_emscripten_stack_set_
limits=Module[\"_emscripten_stack_set_limits\"]=Module[\"asm\"][\"Bb\"]).apply(null,arguments)};var
_memalign=Module[\"_memalign\"]=function(){return(_memalign=Module[\"_memalign\"]=Module[\"asm\"][\"Cb
\"]).apply(null,arguments)};var
__emscripten_allow_main_runtime_queued_calls=Module[\"__emscripten_allow_main_runtime_queued_calls\"]=1
0512;var
__emscripten_main_thread_futex=Module[\"__emscripten_main_thread_futex\"]=12148;Module[\"cwrap\"]=cwrap
;Module[\"PThread\"]=PThread;Module[\"PThread\"]=PThread;Module[\"wasmMemory\"]=wasmMemory;Module
[\"ExitStatus\"]=ExitStatus;var
calledRun;function ExitStatus(status){this.name=\"ExitStatus\";this.message=\"Program terminated with
exit(\"+status+\")\";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}if(ENVIRONMENT_IS_PTHREAD){readyPromis
eResolve(Module);initRuntime();postMessage({\"cmd\":\"loaded\"});return}preRun();if(runDependencies>0){retur

n}function
doRun(){if(calledRun)return;calledRun=true;Module[\"calledRun\"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module[\"onRuntimeInitialized\"])Module[\"onRuntimeInitialized\"]();postRun(
)}if(Module[\"setStatus\"]){Module[\"setStatus\"](\"Running...\");setTimeout(function(){setTimeout(function(){Mo
dule[\"setStatus\"](\"\")},1);doRun()},1)}else{doRun()}}Module[\"run\"]=run;function
exit(status,implicit){if(implicit&&noExitRuntime&&status===0){return}if(!implicit){if(ENVIRONMENT_IS_PT
HREAD){postMessage({\"cmd\":\"exitProcess\",\"returnCode\":status});throw
new
ExitStatus(status)}else{}}if(noExitRuntime){}else{PThread.terminateAllThreads();EXITSTATUS=status;exitRunti
me();if(Module[\"onExit\"])Module[\"onExit\"](status);ABORT=true}quit_(status,new
ExitStatus(status))}if(Module[\"preInit\"]){if(typeof
Module[\"preInit\"]==\"function\")Module[\"preInit\"]=[Module[\"preInit\"]];while(Module[\"preInit\"].length>0){
Module[\"preInit\"].pop()()}}if(ENVIRONMENT_IS_PTHREAD){noExitRuntime=false;PThread.initWorker()}run
();\n\n\n return WasmBackendModuleThreadedSimd.ready\n}\n);\n})();\nif (typeof exports === 'object' && typeof
module === 'object')\n module.exports = WasmBackendModuleThreadedSimd;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModuleThreadedSimd; });\nelse if
(typeof exports === 'object')\n exports[\"WasmBackendModuleThreadedSimd\"]
= WasmBackendModuleThreadedSimd;\n","\nvar WasmBackendModule = (function() {\n var _scriptDir = typeof
document !== 'undefined' && document.currentScript ? document.currentScript.src : undefined;\n if (typeof
__filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return (\nfunction(WasmBackendModule) {\n
WasmBackendModule = WasmBackendModule || {};\n\nvar Module=typeof
WasmBackendModule!==\"undefined\"?WasmBackendModule:{};var
readyPromiseResolve,readyPromiseReject;Module[\"ready\"]=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var
thisProgram=\"./this.program\";var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window===\"object\";ENVIRONMENT_IS_WORKER=typeof
importScripts===\"function\";ENVIRONMENT_IS_NODE=typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof
process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var scriptDirectory=\"\";function
locateFile(path){if(Module[\"locateFile\"]){return Module[\"locateFile\"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\"path\").
dirname(scriptDirectory)+\"/\"}else{scriptDirectory=__dirname+\"/\"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=n
odePath[\"normalize\"](filename);return
nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\")};readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process[\"argv\"].length>1){thisProgram=process[\"argv\"][1].replace(/\\\\/g,\"/\")}arguments_=process[\"arg
v\"].slice(2);process[\"on\"](\"uncaughtException\",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process[\"on\"](\"unhandledRejection\",abort);quit_=function(status){process[\"exit\"](status)};Module[\"insp
ect\"]=function(){return\"[Emscripten Module object]\"}}else if(ENVIRONMENT_IS_SHELL){if(typeof
read!=\"undefined\"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var
data;if(typeof readbuffer===\"function\"){return new

Uint8Array(readbuffer(f))}data=read(f,\"binary\");assert(typeof data===\"object\");return data};if(typeof scriptArgs!=\"undefined\"){arguments_=scriptArgs}else if(typeof arguments!=\"undefined\"){arguments_=arguments}if(typeof quit===\"function\"){quit_=function(status){quit(status)}}if(typeof print!==\"undefined\"){if(typeof console===\"undefined\")console={};console.log=print;console.warn=console.error=typeof printErr!==\"undefined\"?printErr:print}}else if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDirectory=self.location.href}else if(typeof document!==\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(_scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf(\"blob:\")!==0){scriptDirectory=scriptDirectory.substr(0,scriptDirectory.lastIndexOf(\"/\")+1)}else{scriptDirectory=\"\"}{read_=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.send(null);return xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.responseType=\"arraybuffer\";xhr.send(null);return new Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,true);xhr.responseType=\"arraybuffer\";xhr.onload=function(){if(xhr.status==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror()};xhr.onerror=onerror;xhr.send(null)}}setWindowTitle=function(title){document.title=title}}else{}var out=Module[\"print\"]||console.log.bind(console);var err=Module[\"printErr\"]||console.warn.bind(console);for(key in moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverrides=null;if(Module[\"arguments\"])arguments_=Module[\"arguments\"];if(Module[\"thisProgram\"])thisProgram=Module[\"thisProgram\"];if(Module[\"quit\"])quit_=Module[\"quit\"];var wasmBinary;if(Module[\"wasmBinary\"])wasmBinary=Module[\"wasmBinary\"];var noExitRuntime=Module[\"noExitRuntime\"]||true;if(typeof WebAssembly!==\"object\"){abort(\"no native wasm support detected\")}var wasmMemory;var ABORT=false;var EXITSTATUS;function assert(condition,text){if(!condition){abort(\"Assertion failed: \"+text)}}function getCFunc(ident){var func=Module[\"_\"+ident];assert(func,\"Cannot call unknown function \"+ident+\", make sure it is exported\");return func}function ccall(ident,returnType,argTypes,args,opts){var toC={\"string\":function(str){var ret=0;if(str!==null&&str!==undefined&&str!==0){var len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\"array\":function(arr){var ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function convertReturnValue(ret){if(returnType===\"string\")return UTF8ToString(ret);if(returnType===\"boolean\")return Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var i=0;i<args.length;i++){var converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i]=args[i]}}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var numericArgs=argTypes.every(function(type){return type===\"number\"});var numericRet=returnType!==\"string\";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return function(){return ccall(ident,returnType,argTypes,arguments,opts)}}var UTF8Decoder=typeof TextDecoder!==\"undefined\"?new TextDecoder(\"utf8\"):undefined;function UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var endPtr=idx;while(heap[endPtr]&&!(endPtr>=endIdx))++endPtr;if(endPtr-idx>16&&heap.subarray&&UTF8Decoder){return UTF8Decoder.decode(heap.subarray(idx,endPtr))}else{var str=\"\";while(idx<endPtr){var u0=heap[idx++];if(!(u0&128)){str+=String.fromCharCode(u0);continue}var u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var

u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[idx++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}}return str}function UTF8ToString(ptr,maxBytesToRead){return ptr?UTF8ArrayToString(HEAPU8,ptr,maxBytesToRead):\"\"}function stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var u=str.charCodeAt(i);if(u>=55296&&u<=57343){var u1=str.charCodeAt(++i);u=65536+((u&1023)<<10)|u1&1023}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function stringToUTF8(str,outPtr,maxBytesToWrite){return stringToUTF8Array(str,HEAPU8,outPtr,maxBytesToWrite)}function writeArrayToMemory(array,buffer){HEAP8.set(array,buffer)}function alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function updateGlobalBufferAndViews(buf){buffer=buf;Module[\"HEAP8\"]=HEAP8=new Int8Array(buf);Module[\"HEAP16\"]=HEAP16=new Int16Array(buf);Module[\"HEAP32\"]=HEAP32=new Int32Array(buf);Module[\"HEAPU8\"]=HEAPU8=new Uint8Array(buf);Module[\"HEAPU16\"]=HEAPU16=new Uint16Array(buf);Module[\"HEAPU32\"]=HEAPU32=new Uint32Array(buf);Module[\"HEAPF32\"]=HEAPF32=new Float32Array(buf);Module[\"HEAPF64\"]=HEAPF64=new Float64Array(buf)}var INITIAL_MEMORY=Module[\"INITIAL_MEMORY\"]||16777216;var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;__ATINIT__.push({func:function(){___wasm_call_ctors()}});function preRun(){if(Module[\"preRun\"]){if(typeof Module[\"preRun\"]==\"function\")Module[\"preRun\"]=[Module[\"preRun\"]];while(Module[\"preRun\"].length){addOnPreRun(Module[\"preRun\"].shift())}}callRuntimeCallbacks(__ATPRERUN__)}function initRuntime(){runtimeInitialized=true;callRuntimeCallbacks(__ATINIT__)}function preMain(){callRuntimeCallbacks(__ATMAIN__)}function postRun(){if(Module[\"postRun\"]){if(typeof Module[\"postRun\"]==\"function\")Module[\"postRun\"]=[Module[\"postRun\"]];while(Module[\"postRun\"].length){addOnPostRun(Module[\"postRun\"].shift())}}callRuntimeCallbacks(__ATPOSTRUN__)}function addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function addRunDependency(id){runDependencies++;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}}function removeRunDependency(id){runDependencies--;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}if(runDependencies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}if(dependenciesFulfilled){var callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}}Module[\"preloadedImages\"]={};Module[\"preloadedAudios\"]={};function abort(what){if(Module[\"onAbort\"]){Module[\"onAbort\"](what)}what+=\"\";err(what);ABORT=true;EXITSTATUS=1;what=\"abort(\"+what+\"). Build with -s ASSERTIONS=1 for more info.\";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var

dataURIPrefix=\"data:application/octet-stream; base64,\";function isDataURI(filename){return hasPrefix(filename,dataURIPrefix)}var fileURIPrefix=\"file://\";function isFileURI(filename){return hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile=\"tfjs-backend-wasm.wasm\";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function getBinary(file){try{if(file==wasmBinaryFile&&wasmBinary){return new Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw\"both async and sync fetching of the wasm failed\"}}catch(err){abort(err)}}function getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof fetch===\"function\"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){if(!response[\"ok\"]){throw\"failed to load wasm binary file at '\"+wasmBinaryFile+\"'\"}return response[\"arrayBuffer\"]()}).catch(function(){return getBinary(wasmBinaryFile)})}else{if(readAsync){return new Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new Uint8Array(response))},reject)})}}}return Promise.resolve().then(function(){return getBinary(wasmBinaryFile)})}function createWasm(){var info={\"a\":asmLibraryArg};function receiveInstance(instance,module){var exports=instance.exports;Module[\"asm\"]=exports;wasmMemory=Module[\"asm\"][\"j\"];updateGlobalBufferAndViews(wasmMemory.buffer);wasmTable=Module[\"asm\"][\"r\"];removeRunDependency(\"wasm-instantiate\")}addRunDependency(\"wasm-instantiate\");function receiveInstantiatedSource(output){receiveInstance(output[\"instance\"])}function instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err(\"failed to asynchronously prepare wasm: \"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof WebAssembly.instantiateStreaming===\"function\"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFile)&&typeof fetch===\"function\"){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return result.then(receiveInstantiatedSource,function(reason){err(\"wasm streaming compile failed: \"+reason);err(\"falling back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)})})}else{return instantiateArrayBuffer(receiveInstantiatedSource)}}if(Module[\"instantiateWasm\"]){try{var exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports}catch(e){err(\"Module.instantiateWasm callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}function callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof callback==\"function\"){callback(Module);continue}var func=callback.func;if(typeof func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)()}else{wasmTable.get(func)(callback.arg)}}else{func(callback.arg===undefined?null:callback.arg)}}}function _abort(){abort()}function _emscripten_memcpy_big(dest,src,num){HEAPU8.copyWithin(dest,src,src+num)}function _emscripten_get_heap_size(){return HEAPU8.length}function emscripten_realloc_buffer(size){try{wasmMemory.grow(size-buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return 1}catch(e){}}function _emscripten_resize_heap(requestedSize){var oldSize=_emscripten_get_heap_size();var maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var cutDown=1;cutDown<=4;cutDown*=2){var overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize+100663296);var newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));

buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var ret=HEAP32[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function _fd_close(fd){return 0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){}function _fd_write(fd,iov,iovcnt,pnum){var num=0;for(var i=0;i<iovcnt;i++){var ptr=HEAP32[iov+i*8>>2];var len=HEAP32[iov+(i*8+4)>>2];for(var j=0;j<len;j++){SYSCALLS.printChar(fd,HEAPU8[ptr+j])}num+=len}HEAP32[pnum>>2]=num;return 0}function _pthread_create(){return 6}function _pthread_join(){return 28}function setErrNo(value){HEAP32[___errno_location()>>2]=value;return value}function _sysconf(name){switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return -1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return -1}var asmLibraryArg={\"a\":_abort,\"d\":_emscripten_memcpy_big,\"e\":_emscripten_resize_heap,\"f\":_fd_close,\"c\":_fd_seek,\"b\":_fd_write,\"h\":_pthread_create,\"g\":_pthread_join,\"i\":_sysconf};var asm=createWasm();var ___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=function(){return(___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=Module[\"asm\"][\"k\"]).apply(null,arguments)};var _init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"l\"]).apply(null,arguments)};var _init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Module[\"_init_with_threads_count\"]=Module[\"asm\"][\"m\"]).apply(null,arguments)};var _get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads_count\"]=Module[\"asm\"][\"n\"]).apply(null,arguments)};var _register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=Module[\"asm\"][\"o\"]).apply(null,arguments)};var _dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"asm\"][\"p\"]).apply(null,arguments)};var _dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"q\"]).apply(null,arguments)};var _Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"s\"]).apply(null,arguments)};var _Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"t\"]).apply(null,arguments)};var _AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"u\"]).apply(null,arguments)};var _All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"v\"]).apply(null,arguments)};var _Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"w\"]).apply(null,argumen

ts)};var
_ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"x\"]).apply(null,arguments)};var
_AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"y\"]).apply(null,arguments)};var
_BatchMatMul=Module[\"_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\"_BatchMatMul\"]=Module[\"asm\"][\"z\"]).apply(null,arguments)};var
_Ceil=Module[\"_Ceil\"]=function(){return(_Ceil=Module[\"_Ceil\"]=Module[\"asm\"][\"A\"]).apply(null,arguments)};var
_ClipByValue=Module[\"_ClipByValue\"]=function(){return(_ClipByValue=Module[\"_ClipByValue\"]=Module[\"asm\"][\"B\"]).apply(null,arguments)};var
_Conv2D=Module[\"_Conv2D\"]=function(){return(_Conv2D=Module[\"_Conv2D\"]=Module[\"asm\"][\"C\"]).apply(null,arguments)};var
_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=function(){return(_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var
_Cos=Module[\"_Cos\"]=function(){return(_Cos=Module[\"_Cos\"]=Module[\"asm\"][\"E\"]).apply(null,arguments)};var
_Cosh=Module[\"_Cosh\"]=function(){return(_Cosh=Module[\"_Cosh\"]=Module[\"asm\"][\"F\"]).apply(null,arguments)};var
_CropAndResize=Module[\"_CropAndResize\"]=function(){return(_CropAndResize=Module[\"_CropAndResize\"]=Module[\"asm\"][\"G\"]).apply(null,arguments)};var
_Cumsum=Module[\"_Cumsum\"]=function(){return(_Cumsum=Module[\"_Cumsum\"]=Module[\"asm\"][\"H\"]).apply(null,arguments)};var
_DepthToSpace=Module[\"_DepthToSpace\"]=function(){return(_DepthToSpace=Module[\"_DepthToSpace\"]=Module[\"asm\"][\"I\"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=function(){return(_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=Module[\"asm\"][\"J\"]).apply(null,arguments)};var
_Elu=Module[\"_Elu\"]=function(){return(_Elu=Module[\"_Elu\"]=Module[\"asm\"][\"K\"]).apply(null,arguments)};var
_Equal=Module[\"_Equal\"]=function(){return(_Equal=Module[\"_Equal\"]=Module[\"asm\"][\"L\"]).apply(null,arguments)};var
_Exp=Module[\"_Exp\"]=function(){return(_Exp=Module[\"_Exp\"]=Module[\"asm\"][\"M\"]).apply(null,arguments)};var
_FlipLeftRight=Module[\"_FlipLeftRight\"]=function(){return(_FlipLeftRight=Module[\"_FlipLeftRight\"]=Module[\"asm\"][\"N\"]).apply(null,arguments)};var
_Floor=Module[\"_Floor\"]=function(){return(_Floor=Module[\"_Floor\"]=Module[\"asm\"][\"O\"]).apply(null,arguments)};var
_FloorDiv=Module[\"_FloorDiv\"]=function(){return(_FloorDiv=Module[\"_FloorDiv\"]=Module[\"asm\"][\"P\"]).apply(null,arguments)};var
_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=function(){return(_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=Module[\"asm\"][\"Q\"]).apply(null,arguments)};var
_FusedConv2D=Module[\"_FusedConv2D\"]=function(){return(_FusedConv2D=Module[\"_FusedConv2D\"]=Module[\"asm\"][\"R\"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=function(){return(_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=Module[\"asm\"][\"S\"]).apply(null,arguments)};var
_Gather=Module[\"_Gather\"]=function(){return(_Gather=Module[\"_Gather\"]=Module[\"asm\"][\"T\"]).apply(null,arguments)};var
_GatherNd=Module[\"_GatherNd\"]=function(){return(_GatherNd=Module[\"_GatherNd\"]=Module[\"asm\"][\"U\"

]).apply(null,arguments)};var
_Greater=Module[\"_Greater\"]=function(){return(_Greater=Module[\"_Greater\"]=Module[\"asm\"][\"V\"]).apply(
null,arguments)};var
_GreaterEqual=Module[\"_GreaterEqual\"]=function(){return(_GreaterEqual=Module[\"_GreaterEqual\"]=Module[\
"asm\"][\"W\"]).apply(null,arguments)};var
_LeakyRelu=Module[\"_LeakyRelu\"]=function(){return(_LeakyRelu=Module[\"_LeakyRelu\"]=Module[\"asm\"][\
"X\"]).apply(null,arguments)};var
_Less=Module[\"_Less\"]=function(){return(_Less=Module[\"_Less\"]=Module[\"asm\"][\"Y\"]).apply(null,argume
nts)};var
_LessEqual=Module[\"_LessEqual\"]=function(){return(_LessEqual=Module[\"_LessEqual\"]=Module[\"asm\"][\"
Z\"]).apply(null,arguments)};var
_Log=Module[\"_Log\"]=function(){return(_Log=Module[\"_Log\"]=Module[\"asm\"][\"_\"]).apply(null,arguments
)};var
_LogicalAnd=Module[\"_LogicalAnd\"]=function(){return(_LogicalAnd=Module[\"_LogicalAnd\"]=Module[\"asm
\"][\"$\"]).apply(null,arguments)};var
_Max=Module[\"_Max\"]=function(){return(_Max=Module[\"_Max\"]=Module[\"asm\"][\"aa\"]).apply(null,argume
nts)};var
_MaxPool=Module[\"_MaxPool\"]=function(){return(_MaxPool=Module[\"_MaxPool\"]=Module[\"asm\"][\"ba\"]).
apply(null,arguments)};var
_Maximum=Module[\"_Maximum\"]=function(){return(_Maximum=Module[\"_Maximum\"]=Module[\"asm\"][\"ca\"]).apply(null,arguments)};var
_Mean=Module[\"_Mean\"]=function(){return(_Mean=Module[\"_Mean\"]=Module[\"asm\"][\"da\"]).apply(null,ar
guments)};var
_Min=Module[\"_Min\"]=function(){return(_Min=Module[\"_Min\"]=Module[\"asm\"][\"ea\"]).apply(null,argumen
ts)};var
_Minimum=Module[\"_Minimum\"]=function(){return(_Minimum=Module[\"_Minimum\"]=Module[\"asm\"][\"fa\
"]).apply(null,arguments)};var
_MirrorPad=Module[\"_MirrorPad\"]=function(){return(_MirrorPad=Module[\"_MirrorPad\"]=Module[\"asm\"][\"g
a\"]).apply(null,arguments)};var
_Multiply=Module[\"_Multiply\"]=function(){return(_Multiply=Module[\"_Multiply\"]=Module[\"asm\"][\"ha\"]).a
pply(null,arguments)};var
_Neg=Module[\"_Neg\"]=function(){return(_Neg=Module[\"_Neg\"]=Module[\"asm\"][\"ia\"]).apply(null,argument
s)};var
_NonMaxSuppressionV3=Module[\"_NonMaxSuppressionV3\"]=function(){return(_NonMaxSuppressionV3=Mod
ule[\"_NonMaxSuppressionV3\"]=Module[\"asm\"][\"ja\"]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module[\"_NonMaxSuppressionV4\"]=function(){return(_NonMaxSuppressionV4=Mod
ule[\"_NonMaxSuppressionV4\"]=Module[\"asm\"][\"ka\"]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module[\"_NonMaxSuppressionV5\"]=function(){return(_NonMaxSuppressionV5=Mod
ule[\"_NonMaxSuppressionV5\"]=Module[\"asm\"][\"la\"]).apply(null,arguments)};var
_NotEqual=Module[\"_NotEqual\"]=function(){return(_NotEqual=Module[\"_NotEqual\"]=Module[\"asm\"][\"ma\"
]).apply(null,arguments)};var
_OneHot=Module[\"_OneHot\"]=function(){return(_OneHot=Module[\"_OneHot\"]=Module[\"asm\"][\"na\"]).appl
y(null,arguments)};var
_PadV2=Module[\"_PadV2\"]=function(){return(_PadV2=Module[\"_PadV2\"]=Module[\"asm\"][\"oa\"]).apply(nul
l,arguments)};var
_Pow=Module[\"_Pow\"]=function(){return(_Pow=Module[\"_Pow\"]=Module[\"asm\"][\"pa\"]).apply(null,argume
nts)};var
_Prelu=Module[\"_Prelu\"]=function(){return(_Prelu=Module[\"_Prelu\"]=Module[\"asm\"][\"qa\"]).apply(null,argu

ments)};var
_Prod=Module[\"_Prod\"]=function(){return(_Prod=Module[\"_Prod\"]=Module[\"asm\"][\"ra\"]).apply(null,argum
ents)};var
_RealDiv=Module[\"_RealDiv\"]=function(){return(_RealDiv=Module[\"_RealDiv\"]=Module[\"asm\"][\"sa\"]).app
ly(null,arguments)};var
_Relu=Module[\"_Relu\"]=function(){return(_Relu=Module[\"_Relu\"]=Module[\"asm\"][\"ta\"]).apply(null,argume
nts)};var
_Relu6=Module[\"_Relu6\"]=function(){return(_Relu6=Module[\"_Relu6\"]=Module[\"asm\"][\"ua\"]).apply(null,ar
guments)};var
_ResizeBilinear=Module[\"_ResizeBilinear\"]=function(){return(_ResizeBilinear=Module[\"_ResizeBilinear\"]=Mo
dule[\"asm\"][\"va\"]).apply(null,arguments)};var
_Reverse=Module[\"_Reverse\"]=function(){return(_Reverse=Module[\"_Reverse\"]=Module[\"asm\"][\"wa\"]).app
ly(null,arguments)};var
_RotateWithOffset=Module[\"_RotateWithOffset\"]=function(){return(_RotateWithOffset=Module[\"_RotateWith
Offset\"]=Module[\"asm\"][\"xa\"]).apply(null,arguments)};var
_Round=Module[\"_Round\"]=function(){return(_Round=Module[\"_Round\"]=Module[\"asm\"][\"ya\"]).apply(nul
l,arguments)};var
_Rsqrt=Module[\"_Rsqrt\"]=function(){return(_Rsqrt=Module[\"_Rsqrt\"]=Module[\"asm\"][\"za\"]).apply(null,arg
uments)};var
_ScatterNd=Module[\"_ScatterNd\"]=function(){return(_ScatterNd=Module[\"_ScatterNd\"]=Module[\"asm\"][\"Aa
\"]).apply(null,arguments)};var
_SelectV2=Module[\"_SelectV2\"]=function(){return(_SelectV2=Module[\"_SelectV2\"]=Module[\"asm\"][\"Ba\"])
.apply(null,arguments)};var
_Sigmoid=Module[\"_Sigmoid\"]=function(){return(_Sigmoid=Module[\"_Sigmoid\"]=Module[\"asm\"][\"Ca\"]).ap
ply(null,arguments)};var
_Sin=Module[\"_Sin\"]=function(){return(_Sin=Module[\"_Sin\"]=Module[\"asm\"][\"Da\"]).apply(null,arguments)
};var
_Softmax=Module[\"_Softmax\"]=function(){return(_Softmax=Module[\"_Softmax\"]=Module[\"asm\"][\"Ea\"]).ap
ply(null,arguments)};var
_Sqrt=Module[\"_Sqrt\"]=function(){return(_Sqrt=Module[\"_Sqrt\"]=Module[\"asm\"][\"Fa\"]).apply(null,argumen
ts)};var
_Square=Module[\"_Square\"]=function(){return(_Square=Module[\"_Square\"]=Module[\"asm\"][\"Ga\"]).apply(n
ull,arguments)};var
_SquaredDifference=Module[\"_SquaredDifference\"]=function(){return(_SquaredDifference=Module[\"_Squared
Difference\"]=Module[\"asm\"][\"Ha\"]).apply(null,arguments)};var
_Step=Module[\"_Step\"]=function(){return(_Step=Module[\"_Step\"]=Module[\"asm\"][\"Ia\"]).apply(null,argume
nts)};var
_StridedSlice=Module[\"_StridedSlice\"]=function(){return(_StridedSlice=Module[\"_StridedSlice\"]=Module[\"as
m\"][\"Ja\"]).apply(null,arguments)};var
_Sub=Module[\"_Sub\"]=function(){return(_Sub=Module[\"_Sub\"]=Module[\"asm\"][\"Ka\"]).apply(null,argument
s)};var
_Sum=Module[\"_Sum\"]=function(){return(_Sum=Module[\"_Sum\"]=Module[\"asm\"][\"La\"]).apply(null,argum
ents)};var
_Tan=Module[\"_Tan\"]=function(){return(_Tan=Module[\"_Tan\"]=Module[\"asm\"][\"Ma\"]).apply(null,argumen
ts)};var
_Tanh=Module[\"_Tanh\"]=function(){return(_Tanh=Module[\"_Tanh\"]=Module[\"asm\"][\"Na\"]).apply(null,argu
ments)};var

_Tile=Module[\"_Tile\"]=function(){return(_Tile=Module[\"_Tile\"]=Module[\"asm\"][\"Oa\"]).apply(null,arguments)};var
_TopK=Module[\"_TopK\"]=function(){return(_TopK=Module[\"_TopK\"]=Module[\"asm\"][\"Pa\"]).apply(null,arguments)};var
_Transform=Module[\"_Transform\"]=function(){return(_Transform=Module[\"_Transform\"]=Module[\"asm\"][\"Qa\"]).apply(null,arguments)};var
_Transpose=Module[\"_Transpose\"]=function(){return(_Transpose=Module[\"_Transpose\"]=Module[\"asm\"][\"Ra\"]).apply(null,arguments)};var
__FusedMatMul=Module[\"__FusedMatMul\"]=function(){return(__FusedMatMul=Module[\"__FusedMatMul\"]=Module[\"asm\"][\"Sa\"]).apply(null,arguments)};var
_malloc=Module[\"_malloc\"]=function(){return(_malloc=Module[\"_malloc\"]=Module[\"asm\"][\"Ta\"]).apply(null,arguments)};var
_free=Module[\"_free\"]=function(){return(_free=Module[\"_free\"]=Module[\"asm\"][\"Ua\"]).apply(null,arguments)};var
___errno_location=Module[\"___errno_location\"]=function(){return(___errno_location=Module[\"___errno_location\"]=Module[\"asm\"][\"Va\"]).apply(null,arguments)};var
stackSave=Module[\"stackSave\"]=function(){return(stackSave=Module[\"stackSave\"]=Module[\"asm\"][\"Wa\"]).apply(null,arguments)};var
stackRestore=Module[\"stackRestore\"]=function(){return(stackRestore=Module[\"stackRestore\"]=Module[\"asm\"][\"Xa\"]).apply(null,arguments)};var
stackAlloc=Module[\"stackAlloc\"]=function(){return(stackAlloc=Module[\"stackAlloc\"]=Module[\"asm\"][\"Ya\"]).apply(null,arguments)};Module[\"cwrap\"]=cwrap;var calledRun;function
ExitStatus(status){this.name=\"ExitStatus\";this.message=\"Program terminated with
exit(\"+status+\")\";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}preRun();if(runDependencies>0){return}function
doRun(){if(calledRun)return;calledRun=true;Module[\"calledRun\"]=true;if(ABORT)return;initRuntime();preMain();readyPromiseResolve(Module);if(Module[\"onRuntimeInitialized\"])Module[\"onRuntimeInitialized\"]();postRun()}if(Module[\"setStatus\"]){Module[\"setStatus\"](\"Running...\");setTimeout(function(){setTimeout(function(){Module[\"setStatus\"](\"\")},1);doRun()},1)}else{doRun()}}Module[\"run\"]=run;if(Module[\"preInit\"]){if(typeof
Module[\"preInit\"]==\"function\")Module[\"preInit\"]=[Module[\"preInit\"]];while(Module[\"preInit\"].length>0){
Module[\"preInit\"].pop()()}}run();\n\n\n return WasmBackendModule.ready\n}\n);\n})();\nif (typeof exports ===
'object' && typeof module === 'object')\n module.exports = WasmBackendModule;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModule; });\nelse if (typeof exports ===
'object')\n exports[\"WasmBackendModule\"] = WasmBackendModule;\n","/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under
 the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
==\n
*/\nimport './flags_wasm';\n\nimport {backend_util, BackendTimingInfo, DataStorage, DataType, deprecationWarn,
engine, env, KernelBackend, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasmModule,
WasmFactoryConfig} from '../wasm-out/tfjs-backend-wasm';\nimport {BackendWasmThreadedSimdModule} from
'../wasm-out/tfjs-backend-wasm-threaded-simd';\nimport

```
wasmFactoryThreadedSimd from '../wasm-out/tfjs-backend-wasm-threaded-simd.js';\n// @ts-ignore\nimport {wasmWorkerContents} from '../wasm-out/tfjs-backend-wasm-threaded-simd.worker.js';\nimport wasmFactory from '../wasm-out/tfjs-backend-wasm.js';\n\ninterface TensorData {\n  id: number;\n  memoryOffset: number;\n  shape: number[];\n  dtype: DataType;\n  refCount: number;\n  /** Only used for string tensors, storing encoded bytes. */\n  stringBytes?: Uint8Array[];\n}\n\nexport type DataId = object;  // object instead of {} to force non-primitive.\n\nexport class BackendWasm extends KernelBackend {\n  // 0 is reserved for null data ids.\n  private dataIdNextNumber = 1;\n  dataIdMap: DataStorage<TensorData>;\n\n  constructor(public wasm: BackendWasmModule|BackendWasmThreadedSimdModule) {\n    super();\n this.wasm.tfjs.initWithThreadsCount(threadsCount);\n    actualThreadsCount = this.wasm.tfjs.getThreadsCount();\n    this.dataIdMap = new DataStorage(this, engine());\n  }\n\n  write(values: backend_util.BackendValues, shape: number[], dtype: DataType):\n      DataId {\n    const dataId = {id: this.dataIdNextNumber++};\n    this.move(dataId, values, shape, dtype, 1);\n    return dataId;\n  }\n\n  numDataIds(): number {\n    return this.dataIdMap.numDataIds();\n  }\n\n  async time(f: () => void): Promise<BackendTimingInfo> {\n    const start = util.now();\n    f();\n    const kernelMs = util.now() - start;\n    return {kernelMs};\n  }\n\n  move(\n      dataId: DataId, values: backend_util.BackendValues, shape: number[],\n      dtype: DataType, refCount: number): void {\n    const id = this.dataIdNextNumber++;\n    if (dtype === 'string') {\n      const stringBytes = values as Uint8Array[];\n      this.dataIdMap.set(\n          dataId,\n          {id, stringBytes, shape, dtype, memoryOffset: null, refCount});\n      return;\n    }\n\n    const size = util.sizeFromShape(shape);\n    const numBytes = size * util.bytesPerElement(dtype);\n    const memoryOffset = this.wasm._malloc(numBytes);\n\n    this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount});\n\n    this.wasm.tfjs.registerTensor(id, size, memoryOffset);\n\n    if (values != null) {\n      this.wasm.HEAPU8.set(\n          new Uint8Array(\n              (values as backend_util.TypedArray).buffer,\n              (values as backend_util.TypedArray).byteOffset, numBytes),\n          memoryOffset);\n    }\n  }\n\n  async read(dataId: DataId): Promise<backend_util.BackendValues> {\n    return this.readSync(dataId);\n  }\n\n  readSync(dataId: DataId): backend_util.BackendValues {\n    const {memoryOffset, dtype, shape, stringBytes} =\n        this.dataIdMap.get(dataId);\n    if (dtype === 'string') {\n      return stringBytes;\n    }\n    const bytes = this.wasm.HEAPU8.slice(\n        memoryOffset,\n        memoryOffset + util.sizeFromShape(shape) * util.bytesPerElement(dtype));\n    return typedArrayFromBuffer(bytes.buffer, dtype);\n  }\n\n  /**\n   * Dispose the memory if the dataId has 0 refCount. Return true if the memory\n   * is released, false otherwise.\n   * @param dataId\n   * @oaram force Optional, remove the data regardless of refCount\n   */\n  disposeData(dataId: DataId, force = false): boolean {\n    if (this.dataIdMap.has(dataId)) {\n      const data = this.dataIdMap.get(dataId);\n      data.refCount--;\n      if (!force && data.refCount > 0) {\n        return false;\n      }\n\n      this.wasm._free(data.memoryOffset);\n      this.wasm.tfjs.disposeData(data.id);\n      this.dataIdMap.delete(dataId);\n    }\n    return true;\n  }\n\n  /** Return refCount of a `TensorData`. */\n  refCount(dataId: DataId): number {\n    if (this.dataIdMap.has(dataId)) {\n      const tensorData = this.dataIdMap.get(dataId);\n      return tensorData.refCount;\n    }\n    return 0;\n  }\n\n  incRef(dataId: DataId) {\n    const data = this.dataIdMap.get(dataId);\n    if (data != null) {\n      data.refCount++;\n    }\n  }\n\n  floatPrecision(): 32 {\n    return 32;\n  }\n\n  // Returns the memory offset of a tensor. Useful for debugging and unit\n  // testing.\n  getMemoryOffset(dataId: DataId): number {\n    return this.dataIdMap.get(dataId).memoryOffset;\n  }\n\n  dispose() {\n    this.wasm.tfjs.dispose();\n    if ('PThread' in this.wasm) {\n      this.wasm.PThread.terminateAllThreads();\n    }\n    this.wasm = null;\n  }\n\n  memory() {\n    return {unreliable: false};\n  }\n\n  /**\n   * Make a tensor info for the output of an op. If `memoryOffset` is not\n   * present, this method allocates memory on the WASM heap. If `memoryOffset`\n   * is present, the memory was allocated elsewhere (in c++) and we just record\n   * the pointer where that memory lives.\n   */\n  makeOutput(shape: number[], dtype: DataType, memoryOffset?: number):\n      TensorInfo {\n    let dataId: {};\n    if (memoryOffset == null) {\n      dataId = this.write(null /* values */, shape, dtype);\n    } else {\n      const id = this.dataIdNextNumber++;\n      dataId = {id};\n
```

```
    this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount: 1});\n      const size =
util.sizeFromShape(shape);\n      this.wasm.tfjs.registerTensor(id, size, memoryOffset);\n    }\n    return {dataId,
shape, dtype};\n  }\n\n  typedArrayFromHeap({shape, dtype, dataId}: TensorInfo):\n      backend_util.TypedArray
{\n    const buffer = this.wasm.HEAPU8.buffer;\n    const {memoryOffset} = this.dataIdMap.get(dataId);\n    const
size = util.sizeFromShape(shape);\n    switch (dtype) {\n      case 'float32':\n        return new Float32Array(buffer,
memoryOffset, size);\n      case 'int32':\n        return new Int32Array(buffer, memoryOffset, size);\n      case 'bool':\n
    return new Uint8Array(buffer, memoryOffset, size);\n      default:\n        throw new Error(`Unknown dtype
${dtype}`);\n    }\n  }\n}\n\nfunction createInstantiateWasmFunc(path: string) {\n  // this will be replace by rollup
plugin patchWechatWebAssembly in\n  // minprogram's output.\n  // tslint:disable-next-line:no-any\n
  return (imports: any, callback: any) => {\n    util.fetch(path, {credentials: 'same-origin'}).then((response) => {\n
if (!response['ok']) {\n        imports.env.a(`failed to load wasm binary file at '${path}'`);\n      }\n
response.arrayBuffer().then(binary => {\n        WebAssembly.instantiate(binary, imports).then(output => {\n
callback(output.instance, output.module);\n        });\n      });\n    });\n    return {};\n  };\n}\n\n/**\n * Returns the
path of the WASM binary.\n * @param simdSupported whether SIMD is supported\n * @param threadsSupported
whether multithreading is supported\n * @param wasmModuleFolder the directory containing the WASM
binaries.\n */\nfunction getPathToWasmBinary(\n    simdSupported: boolean, threadsSupported: boolean,\n
wasmModuleFolder: string) {\n  if (wasmPath != null) {\n    // If wasmPath is defined, the user has supplied a full
path to\n    // the vanilla .wasm binary.\n    return wasmPath;\n  }\n\n  let path:
 WasmBinaryName = 'tfjs-backend-wasm.wasm';\n  if (simdSupported && threadsSupported) {\n    path = 'tfjs-
backend-wasm-threaded-simd.wasm';\n  } else if (simdSupported) {\n    path = 'tfjs-backend-wasm-simd.wasm';\n
}\n\n  if (wasmFileMap != null) {\n    if (wasmFileMap[path] != null) {\n      return wasmFileMap[path];\n    }\n
}\n\n  return wasmModuleFolder + path;\n}\n\n/**\n * Initializes the wasm module and creates the js <--> wasm
bridge.\n *\n * NOTE: We wrap the wasm module in a object with property 'wasm' instead of\n * returning
Promise<BackendWasmModule> to avoid freezing Chrome (last tested\n * in Chrome 76).\n */\nexport async
function init(): Promise<{wasm: BackendWasmModule}> {\n  const [simdSupported, threadsSupported] = await
Promise.all([\n    env().getAsync('WASM_HAS_SIMD_SUPPORT'),\n
env().getAsync('WASM_HAS_MULTITHREAD_SUPPORT')\n  ]);\n\n  return new Promise((resolve, reject) =>
{\n    const factoryConfig: WasmFactoryConfig = {};\n\n    /**\n     * This function
 overrides the Emscripten module locateFile utility.\n     * @param path The relative path to the file that needs to be
loaded.\n     * @param prefix The path to the main JavaScript file's directory.\n     */\n    factoryConfig.locateFile =
(path, prefix) => {\n      if (path.endsWith('.worker.js')) {\n        const response = wasmWorkerContents;\n        const
blob = new Blob([response], {type: 'application/javascript'});\n        return URL.createObjectURL(blob);\n      }\n\n
  if (path.endsWith('.wasm')) {\n        return getPathToWasmBinary(\n            simdSupported as boolean,
threadsSupported as boolean,\n            wasmPathPrefix != null ? wasmPathPrefix : prefix);\n      }\n      return prefix
+ path;\n    };\n\n    // Use the instantiateWasm override when system fetch is not available.\n    // Reference:\n    //
https://github.com/emscripten-
core/emscripten/blob/2bca083cbbd5a4133db61fbd74d04f7feecfa907/tests/manual_wasm_instantiate.html#L170\n
if (customFetch) {\n
    factoryConfig.instantiateWasm =\n        createInstantiateWasmFunc(getPathToWasmBinary(\n
simdSupported as boolean, threadsSupported as boolean,\n            wasmPathPrefix != null ? wasmPathPrefix :
''));\n    }\n\n    let initialized = false;\n    factoryConfig.onAbort = () => {\n      if (initialized) {\n        // Emscripten
already called console.warn so no need to double log.\n        return;\n      }\n      if (initAborted) {\n        //
Emscripten calls `onAbort` twice, resulting in double error\n        // messages.\n        return;\n      }\n      initAborted
= true;\n      const rejectMsg =\n          'Make sure the server can serve the `.wasm` file relative to the ' +\n
'bundled js file. For more details see https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-
wasm/README.md#using-bundlers';\n      reject({message: rejectMsg});\n    };\n\n    let wasm:
Promise<BackendWasmModule>;\n    // If `wasmPath` has been defined we must initialize
```

```
 the vanilla module.\n    if (threadsSupported && simdSupported && wasmPath == null) {\n
factoryConfig.mainScriptUrlOrBlob = new Blob(\n          [`var WasmBackendModuleThreadedSimd = ` +\n
wasmFactoryThreadedSimd.toString()],\n          {type: 'text/javascript'});\n      wasm =
wasmFactoryThreadedSimd(factoryConfig);\n    } else {\n      // The wasmFactory works for both vanilla and SIMD
binaries.\n      wasm = wasmFactory(factoryConfig);\n    }\n\n    // The WASM module has been successfully
created by the factory.\n    // Any error will be caught by the onAbort callback defined above.\n
wasm.then((module) => {\n      initialized = true;\n      initAborted = false;\n\n      const voidReturnType: string =
null;\n      // Using the tfjs namespace to avoid conflict with emscripten's API.\n      module.tfjs = {\n        init:
module.cwrap('init', null, []),\n        initWithThreadsCount:\n            module.cwrap('init_with_threads_count', null,
['number']),\n
 getThreadsCount: module.cwrap('get_threads_count', 'number', []),\n        registerTensor: module.cwrap(\n
'register_tensor', null,\n            [\n              'number',  // id\n              'number',  // size\n              'number',  //
memoryOffset\n            ]),\n        disposeData: module.cwrap('dispose_data', voidReturnType, ['number']),\n
dispose: module.cwrap('dispose', voidReturnType, []),\n      };\n\n      resolve({wasm: module});\n    });\n
});\n}\n\nfunction typedArrayFromBuffer(\n    buffer: ArrayBuffer, dtype: DataType): backend_util.TypedArray {\n
switch (dtype) {\n    case 'float32':\n      return new Float32Array(buffer);\n    case 'int32':\n      return new
Int32Array(buffer);\n    case 'bool':\n      return new Uint8Array(buffer);\n    default:\n      throw new
Error(`Unknown dtype ${dtype}`);\n  }\n}\n\nconst wasmBinaryNames = [\n  'tfjs-backend-wasm.wasm', 'tfjs-
backend-wasm-simd.wasm',\n  'tfjs-backend-wasm-threaded-simd.wasm'\n] as const
 ;\ntype WasmBinaryName = typeof wasmBinaryNames[number];\n\nlet wasmPath: string = null;\nlet
wasmPathPrefix: string = null;\nlet wasmFileMap: {[key in WasmBinaryName]?: string} = {};\nlet initAborted =
false;\nlet customFetch = false;\n\n/**\n * @deprecated Use `setWasmPaths` instead.\n * Sets the path to the
`.wasm` file which will be fetched when the wasm\n * backend is initialized. See\n *
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n * for more
details.\n * @param path wasm file path or url\n * @param usePlatformFetch optional boolean to use platform fetch
to download\n *     the wasm file, default to false.\n *\n * @doc {heading: 'Environment', namespace: 'wasm'}\n
*/\nexport function setWasmPath(path: string, usePlatformFetch = false): void {\n  deprecationWarn(\n
'setWasmPath has been deprecated in favor of setWasmPaths and' +\n      ' will be removed in a future release.');\n  if
(initAborted) {\n    throw new Error(\n
  'The WASM backend was already initialized. Make sure you call ' +\n          '`setWasmPath()` before you call
`tf.setBackend()` or `tf.ready()`');\n  }\n  wasmPath = path;\n  customFetch = usePlatformFetch;\n}\n\n/**\n *
Configures the locations of the WASM binaries.\n *\n * ```js\n * setWasmPaths({\n *  'tfjs-backend-wasm.wasm':
'renamed.wasm',\n *  'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n *  'tfjs-backend-wasm-threaded-
simd.wasm': 'renamed-threaded-simd.wasm'\n * });\n * tf.setBackend('wasm');\n * ```\n *\n * @param
prefixOrFileMap This can be either a string or object:\n *  - (string) The path to the directory where the WASM
binaries are located.\n *     Note that this prefix will be used to load each binary (vanilla,\n *     SIMD-enabled,
threading-enabled, etc.).\n *  - (object) Mapping from names of WASM binaries to custom\n *     full paths
specifying the locations of those binaries. This is useful if\n *     your WASM binaries are not all located in the same
directory,
 or if your\n *     WASM binaries have been renamed.\n * @param usePlatformFetch optional boolean to use
platform fetch to download\n *     the wasm file, default to false.\n *\n * @doc {heading: 'Environment', namespace:
'wasm'}\n */\nexport function setWasmPaths(\n    prefixOrFileMap: string|{[key in WasmBinaryName]?: string},\n
usePlatformFetch = false): void {\n  if (initAborted) {\n    throw new Error(\n        'The WASM backend was already
initialized. Make sure you call ' +\n          '`setWasmPaths()` before you call `tf.setBackend()` or ' +\n
'`tf.ready()`');\n  }\n\n  if (typeof prefixOrFileMap === 'string') {\n    wasmPathPrefix = prefixOrFileMap;\n  } else
{\n    wasmFileMap = prefixOrFileMap;\n    const missingPaths =\n        wasmBinaryNames.filter(name =>
wasmFileMap[name] == null);\n    if (missingPaths.length > 0) {\n      throw new Error(\n          `There were no
entries found for the following binaries: ` +\n          `${missingPaths.join(',')}. Please either
```

call setWasmPaths with a ` +\n `map providing a path for each binary, or with a string indicating ` +\n `the directory where all the binaries can be found.`);\n }\n }\n\n customFetch = usePlatformFetch;\n}\n\n/** Used in unit tests. */\nexport function resetWasmPath(): void {\n wasmPath = null;\n wasmPathPrefix = null;\n wasmFileMap = {};\n customFetch = false;\n initAborted = false;\n}\n\nlet threadsCount = -1;\nlet actualThreadsCount = -1;\n\n/**\n * Sets the number of threads that will be used by XNNPACK to create\n * threadpool (default to the number of logical CPU cores).\n *\n * This must be called before calling `tf.setBackend('wasm')`.\n */\nexport function setThreadsCount(numThreads: number) {\n threadsCount = numThreads;\n}\n\n/**\n * Gets the actual threads count that is used by XNNPACK.\n *\n * It is set after the backend is intialized.\n */\nexport function getThreadsCount(): number {\n if (actualThreadsCount === -1) {\n throw new Error(`WASM
backend not initialized.`);\n }\n return actualThreadsCount;\n}\n","export const wasmWorkerContents = 'var Module={};function threadPrintErr(){var text=Array.prototype.slice.call(arguments).join(\" \");console.error(text)}function threadAlert(){var text=Array.prototype.slice.call(arguments).join(\" \");postMessage({cmd:\"alert\",text:text,threadId:Module[\"_pthread_self\"]()})}var err=threadPrintErr;this.alert=threadAlert;Module[\"instantiateWasm\"]=function(info,receiveInstance){var instance=new WebAssembly.Instance(Module[\"wasmModule\"],info);Module[\"wasmModule\"]=null;receiveInstance(instance);return instance.exports};function moduleLoaded(){}this.onmessage=function(e){try{if(e.data.cmd===\"load\"){Module[\"wasmModule\"]=e.data.wasmModule;Module[\"wasmMemory\"]=e.data.wasmMemory;Module[\"buffer\"]=Module[\"wasmMemory\"].buffer;Module[\"ENVIRONMENT_IS_PTHREAD\"]=true;if(typeof e.data.urlOrBlob===\"string\"){importScripts(e.data.urlOrBlob)}else{var objectUrl=URL.createObjectURL(e.data.urlOrBlob);importScripts(objectUrl);URL.revokeObjectURL(objectUrl)}WasmBackendModuleThreadedSimd(Module).then(function(instance){Module=instance;moduleLoaded()})}else if(e.data.cmd===\"objectTransfer\"){Module[\"PThread\"].receiveObjectTransfer(e.data)}else if(e.data.cmd===\"run\"){Module[\"__performance_now_clock_drift\"]=performance.now()-e.data.time;Module[\"__emscripten_thread_init\"](e.data.threadInfoStruct,0,0);var max=e.data.stackBase;var top=e.data.stackBase+e.data.stackSize;Module[\"establishStackSpace\"](top,max);Module[\"_emscripten_tls_init\"]();Module[\"PThread\"].receiveObjectTransfer(e.data);Module[\"PThread\"].setThreadStatus(Module[\"_pthread_self\"](),1);try{var result=Module[\"invokeEntryPoint\"](e.data.start_routine,e.data.arg);if(!Module[\"getNoExitRuntime\"]())Module[\"PThread\"].threadExit(result)}catch(ex){if(ex===\"Canceled!\"){Module[\"PThread\"].threadCancel()}else if(ex!=\"unwind\"){if(ex instanceof Module[\"ExitStatus\"]){if(Module[\"getNoExitRuntime\"]()){}else{Module[\"PThread\"].threadExit(ex.status)}}else{Module[\"PThread\"].threadExit(-2);throw ex}}}}else if(e.data.cmd===\"cancel\"){if(Module[\"_pthread_self\"]()){Module[\"PThread\"].threadCancel()}}else if(e.data.target===\"setimmediate\"){}else if(e.data.cmd===\"processThreadQueue\"){if(Module[\"_pthread_self\"]()){Module[\"_emscripten_current_thread_process_queued_calls\"]()}}else{err(\"worker.js received unknown command \"+e.data.cmd);err(e.data)}}catch(ex){err(\"worker.js onmessage() captured an uncaught exception: \"+ex);if(ex&&ex.stack)err(ex.stack);throw ex}};if(typeof process===\"object\"&&typeof process.versions===\"object\"&&typeof process.versions.node===\"string\"){self={location:{href:__filename}};var onmessage=this.onmessage;var nodeWorkerThreads=require(\"worker_threads\");global.Worker=nodeWorkerThreads.Worker;var parentPort=nodeWorkerThreads.parentPort;parentPort.on(\"message\",function(data){onmessage({data:data})});var nodeFS=require(\"fs\");var nodeRead=function(filename){return

nodeFS.readFileSync(filename,\"utf8\")};function globalEval(x){global.require=require;global.Module=Module;eval.call(null,x)}importScripts=function(f){globalEval(nodeRead(f))};postMessage=function(msg){parentPort.postMessage(msg)};if(typeof performance===\"undefined\"){performance={now:function(){return Date.now()}}}';","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ===\n */\n\nimport './flags_wasm';\n\nimport {registerBackend} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm, init} from './backend_wasm';\n\nexport {BackendWasm, getThreadsCount, setThreadsCount, setWasmPath, setWasmPaths} from './backend_wasm';\nexport {version as version_wasm} from './version';\n\nconst WASM_PRIORITY = 2;\nregisterBackend('wasm', async () => {\n const {wasm} = await init();\n return new BackendWasm(wasm);\n}, WASM_PRIORITY);\n","/** @license See the LICENSE file. */\n\n// This code is auto-generated, do not modify this file!\nconst version = '3.11.0';\nexport {version};\n"],"names":["CppDType","FusableActivation","wasmFusedMatMul","fusedMatMulConfig","kernelName","_FusedMatMul","backendName","setupFunc","backend","wasm","cwrap","kernelFunc","args","inputs","attrs","a","b","bias","preluActivationWeights","dtype","Error","transposeA","transposeB","activation","leakyreluAlpha","aId","dataIdMap","get","dataId","id","bId","biasId","biasData","shape","length","preluActivationWeightsId","fusedActivation","leftDim","rightDim","batchDim","out","makeOutput","outId","aShapeBytes","Uint8Array","Int32Array","buffer","bShapeBytes","createUnaryKernelConfig","outType","wasmFunc","x","xId","util","sizeFromShape","absConfig","Abs","createBinaryKernelConfig","supportsFullBroadcast","outputType","newShape","backend_util","assertAndGetBroadcastShape","aBroadcastDims","getBroadcastDims","bBroadcastDims","loopsOverAllOfA","every","v","i","loopsOverAllOfB","addConfig","Add","addNConfig","AddN","inputIds","map","inputIdsBytes","identity","inVals","typedArrayFromHeap","set","identityConfig","Identity","wasmTranspose","transpose","reducedShape","perm","newPerm","push","minValIdx","j","removeOneSizeDims","permIsNoOp","outShape","inShape","Array","computeOutShape","cloned","permBytes","xShapeBytes","transposeConfig","Transpose","permuteAxesAndTranspose","axis","xShape","xRank","originalAxes","parseAxisParam","axes","permutedAxes","getAxesPermutation","xTransposed","inputWasTransposed","getInnerMostAxes","transposed","wasmAll","allConfig","All","keepDims","inputId","input","inputRank","assertAxesAreInnerMostDims","reduceShape","computeOutAndReduceShapes","reduceSize","disposeData","expandShapeToKeepDim","wasmAny","anyConfig","Any","argMaxConfig","ArgMax","transposedId","slice","outerSize","innerSize","wasmAvgPool","avgPoolConfig","AvgPool","filterSize","strides","pad","dimRoundingMode","convInfo","computePool2DInfo","filterHeight","filterWidth","padTop","padInfo","top","padRight","right","padBottom","bottom","padLeft","left","strideHeight","strideWidth","channels","inChannels","dataFormat","dilationWidth","dilationHeight","reshape","xSize","$shape","inferFromImplicitShape","assert","incRef","reshapeConfig","Reshape","wasmBatchMatMul","batchMatMulConfig","BatchMatMul","aRank","bRank","innerShapeA","innerShapeB","outerShapeA","outerShapeB","outerDimsA","outerDimsB","batchDimA","batchDimB","batchDimsCompatible","concat","b3dShape","a3d","b3d","a3dId","b3dId","Math","max","sliceImpl","vals","begin","size","isContinous","slice_util","isSliceContinous","xStrides","computeStrides","flatOffset","computeFlatOffset","subarray","decodedData","fromUint8ToStringArray","inBuf","outBuf","outLoc","indexToLoc","inLoc","idx","fromStringArrayToUint8","values","begin_","size_","parseSliceParams","xVals","readSync","outData","stringBytes","res","sliceImplCPU","outVals","rank","xStride","outOffset","beginI","beginJ","endI","xOffset","slice2d","xStride1","xStride2","beginK","endJ","slice3d","xStride3","endK","beginL","k","slice4d","sliceConfig","Slice","batchToSpaceNDConfig","BatchToSpaceND","blockShape","crops","prod","reduce","reshaped","getReshaped","permuted","getPermuted","reshapedPermuted","getReshapedPermuted","sliceBeginCoords","getSliceBeginCoords","sliceSize","getSliceSize","xReshaped","result","cast","castConfig","Cast","ceilConfig","Ceil","wasmClip","clipByValueConfig","Clip

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rkers","cancelThread","cmd","cleanupThread","returnWorkerToPool","_emscripten_get_now","initMainThreadBlo
ck","allocateUnusedWorker","tb","_malloc","headPtr","tlsMemory","store","__emscripten_thread_init","_emscripte
n_register_main_browser_thread_id","initWorker","threadExitHandlers","setThreadStatus","runExitHandlers","pop
","_pthread_self","___pthread_tsd_run_dtors","runExitHandlersAndDeinitThread","exitCode","threadExit","thread
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edCalls","__emscripten_allow_main_runtime_queued_calls","receiveObjectTransfer","onFinishedLoading","onmes
sage","d","currentProxiedOperationCallerThread","thread","targetThread","_emscripten_main_thread_process_queu
ed_calls","spawnThread","loaded","runPthread","alert","exit","target","lineno","message","on","urlOrBlob","pthrea
dMainJs","getNewWorker","busySpinWait","msecs","now","establishStackSpace","stackTop","stackMax","_emscri
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","_main","setErrNo","___errno_location","_atexit","_emscripten_proxy_to_main_thread_js","__emscripten_notify
_thread_queue","targetThreadId","mainThreadId","_abort","_emscripten_asm_const_int","code","sigPtr","argbuf","
readAsmConstArgs","_emscripten_conditional_set_current_thread_status","expectedStatus","newStatus","_emscrip
ten_futex_wait","val","timeout","tNow","tEnd","exchange","wait","_emscripten_memcpy_big","dest","num","copy
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llArgs","readAsmConstArgsArray","double","_emscripten_receive_on_main_thread_js","proxiedFunctionTable","_
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Object]","super","tfjs","initWithThreadsCount","threadsCount","actualThreadsCount","getThreadsCount","DataStorage","engine","dataIdNextNumber","move","numDataIds","kernelMs","refCount","memoryOffset","numBytes","bytesPerElement","registerTensor","byteOffset","typedArrayFromBuffer","force","has","delete","dispose","unreliable","write","getPathToWasmBinary","simdSupported","threadsSupported","wasmModuleFolder","wasmPath","wasmFileMap","init","all","getAsync","factoryConfig","endsWith","blob","Blob","URL","createObjectURL","wasmPathPrefix","customFetch","instantiateWasm","imports","arrayBuffer","createInstantiateWasmFunc","initialized","onAbort","initAborted","mainScriptUrlOrBlob","wasmFactoryThreadedSimd","toString","wasmFactory","wasmBinaryNames","numThreads","usePlatformFetch","deprecationWarn","prefixOrFileMap","missingPaths","join"],"mappings":";;;;;;;;;;;;;;;;oeAkBA,IAAYA,EASAC,ECJZ,IAAIC,iVDLJ,SAAYF,GAAAA,EAAAA,EAAAA,E

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in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/tf-backend-wasm.es2017.min.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Sin.js","sourceRoot":"","sources":["../../src/kernels/Sin.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;;GAeG;AACH,OAAO,EAAe,GAAG,EAAC,MAAM,uBAAuB,CAAC;AAExD,OAAO,EAAC,uBAAuB,EAAC,MAAM,gBAAgB,CAAC;AACvD,OAAO,EAAC,GAAG,EAAC,MAAM,SAAS,CAAC;AAE5B,MAAM,CAAC,MAAM,SAAS,GAAgB,uBAAuB,CAAC,GAAG,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n
 * ==\n
*/\nimport {KernelConfig, Sin} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Sin.js.map
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{"version":3,"file":"AvgPool.js","sourceRoot":"","sources":["../../src/kernels/AvgPool.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAAE,eAAe,EAAqC,MAAM,uBAAuB,CAAC;AAExG,OAAO,EAAC,iBAAiB,EAAC,MAAM,kBAAkB,CAAC;AACnD,OAAO,EAAC,GAAG,EAAC,MAAM,SAAS,CAAC;AAE5B,MAAM,CAAC,MAAM,aAAa,GAAgB,uBAAuB,CAAC,OAAO,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n
 * ==\n
*/\nimport {AvgPool, AvgPoolAttrs, AvgPoolInputs, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nimport {sin} from '../sin';\n\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n"]}

,CAAC,CAAC,EAAE,CAAC;IAEnD,WAAW,CACP,GAAG,EAAE,CAAC,CAAC,KAAK,CAAC,CAAC,CAAC,EAAE,CAAC,CAAC,KAAK,CAAC,CAAC,CAAC,EAAE,CAAC,CAAC,KAAK,CAAC,CAAC,CAAC,EAAE,YAAY,EAAE,WAAW,EAAClE,MAAM,EAAE,QAAQ,EAAE,SAAS,EAAE,OAAO,EAAE,YAAY,EAAE,WAAW,EAAE,QAAQ,EACzE,KAAK,CAAC,CAAC;IACX,OAAO,GAAG,CAAC;AACb,CAAC;AAED,MAAM,CAAC,MAAM,aAAa,GAAG,CAAC,CAAC,CAAC

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Found in path(s):
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* limitations under the License.
* ===
*/
/**
* @deprecated Use `setWasmPaths` instead.
* Sets the path to the `.wasm` file which will be fetched when the wasm
 * backend is initialized. See
* https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers
* for more details.
* @param path wasm file path or url
* @param usePlatformFetch optional boolean to use platform fetch to download
*   the wasm file, default to false.
*
* @doc {heading: 'Environment', namespace: 'wasm'}
*/

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/tf-backend-wasm.fesm.js
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{"version":3,"file":"tf-backend-wasm.fesm.js","sources":["../src/kernels/types.ts","../src/kernels/_FusedMatMul.ts","../src/kernels/unary_kernel.ts","../src/kernels/Abs.ts","../src/kernels/binary_kernel.ts","../src/kernels/Add.ts","../src/kernels/AddN.ts","../src/kernels/Identity.ts","../src/kernels/Transpose.ts","../src/kernels/kernel_utils.ts","../src/kernels/All.ts","../src/kernels/Any.ts","../src/kernels/ArgMax.ts","../src/kernels/AvgPool.ts","../src/kernels/Reshape.ts","../src/kernels/BatchMatMul.ts","../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Concat_impl.js","../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Range_impl.js","../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Slice.js","../src/kernels/Slice.ts","../src/kernels/BatchToSpaceND.ts","../src/kernels/Cast.ts","../src/k

ernels/Ceil.ts","../src/kernels/ClipByValue.ts","../src/kernels/Concat.ts","../src/kernels/Conv2D.ts","../src/kernels/Conv2DBackpropInput.ts","../src/kernels/Cos.ts","../src/kernels/Cosh.ts","../src/kernels/CropAndResize.ts","../src/kernels/Cumsum.ts","../src/kernels/DepthToSpace.ts","../src/kernels/DepthwiseConv2dNative.ts","../src/kernels/Elu.ts","../src/kernels/Equal.ts","../src/kernels/Exp.ts","../src/kernels/ExpandDims.ts","../src/kernels/Fill.ts","../src/kernels/FlipLeftRight.ts","../src/kernels/Floor.ts","../src/kernels/FloorDiv.ts","../src/kernels/FusedBatchNorm.ts","../src/kernels/FusedConv2D.ts","../src/kernels/FusedDepthwiseConv2D.ts","../src/kernels/GatherNd.ts","../src/kernels/GatherV2.ts","../src/kernels/Greater.ts","../src/kernels/GreaterEqual.ts","../src/kernels/LeakyRelu.ts","../src/kernels/Less.ts","../src/kernels/LessEqual.ts","../src/kernels/Log.ts","../src/kernels/LogicalAnd.ts","../src/kernels/Max.ts","../src/kernels/Maximum.ts","../src/kernels/MaxPool.ts","../src/kernels/Mean.ts","../src/kernels/Min.ts","../src/kernels/Minimum.ts","../src/kernels/MirrorPad.ts","../src/kernels/Multiply.ts","../src/kernels/Neg.ts","../src/kernels/NonMaxSuppression_util.ts","../src/kernels/NonMaxSuppressionV3.ts","../src/kernels/NonMaxSuppressionV4.ts","../src/kernels/NonMaxSuppressionV5.ts","../src/kernels/NotEqual.ts","../src/kernels/OneHot.ts","../src/kernels/OnesLike.ts","../src/kernels/Pack.ts","../src/kernels/PadV2.ts","../src/kernels/Pow.ts","../src/kernels/Prelu.ts","../src/kernels/Prod.ts","../src/kernels/Range.ts","../src/kernels/RealDiv.ts","../src/kernels/Relu.ts","../src/kernels/Relu6.ts","../src/kernels/ResizeBilinear.ts","../src/kernels/Reverse.ts","../src/kernels/RotateWithOffset.ts","../src/kernels/Round.ts","../src/kernels/Rsqrt.ts","../src/kernels/ScatterNd.ts","../src/kernels/Select.ts","../src/kernels/Sigmoid.ts","../src/kernels/Sin.ts","../src/kernels/Softmax.ts","../src/kernels/SpaceToBatchND.ts","../src/kernels/SplitV.ts","../src/kernels/Sqrt.ts","../src/kernels/Square.ts","../src/kernels/SquaredDifference.ts","../src/kernels/Step.ts","../src/kernels/StridedSlice.ts","../src/kernels/Sub.ts","../src/kernels/Sum.ts","../src/kernels/Tan.ts","../src/kernels/Tanh.ts","../src/kernels/Tile.ts","../src/kernels/TopK.ts","../src/kernels/Transform.ts","../src/kernels/Unpack.ts","../src/kernels/ZerosLike.ts","../src/register_all_kernels.ts","../src/flags_wasm.ts","../wasm-out/tfjs-backend-wasm-threaded-simd.js","../wasm-out/tfjs-backend-wasm-threaded-simd.worker.js","../wasm-out/tfjs-backend-wasm.js","../src/backend_wasm.ts","../src/version.ts","../src/base.ts"],"sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT
 WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\n// This enum must align with the enum defined in cc/backend.h.\nexport enum CppDType {\n float32 = 0,\n int32 = 1,\n bool = 2,\n string = 3,\n complex64 = 4\n}\n\n// Must match enum in cc/fusable_activations.h.\nexport enum FusableActivation {\n linear = 0,\n relu = 1,\n relu6 = 2,\n prelu = 3,\n leakyrelu = 4,\n sigmoid = 5,\n elu = 6\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n
 * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {_FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet wasmFusedMatMul:\n   (aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n   transposeB: boolean, activation: number, biasId: number,\n   preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedMatMul = backend.wasm.cwrap(_FusedMatMul,

null /* void */, [\n   'number',
  // a_id\n   'array', // a_shape\n   'number', // a_shape.length\n   'number', // b_id\n   'array', // b_shape\n 'number', // b_shape.length\n   'number', // transpose_a\n   'number', // transpose_b\n   'number', // activation\n 'number', // biasId\n   'number', // preluActivationWeightsId\n   'number', // leakyreluAlpha\n   'number' // out_id\n]);\n}\n\nfunction fusedBatchMatMul(args: {\n inputs: _FusedMatMulInputs,\n backend: BackendWasm,\n attrs: _FusedMatMulAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {a, b, bias, preluActivationWeights} = inputs;\n\n if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n   throw new Error(\n `_FusedMatMul for non non-float32 tensors not yet supported.`);\n }\n\n const {transposeA, transposeB, activation, leakyreluAlpha} = attrs;\n const aId = backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n\n let biasId = 0;\n if (bias != null) {\n   const biasData = backend.dataIdMap.get(bias.dataId);\n   if (biasData.shape.length !== 1) {\n   throw new Error(\n   `_FusedMatMul only supports rank-1 bias but got ` +\n   `rank ${biasData.shape.length}.`);\n   }\n   biasId = biasData.id;\n }\n const preluActivationWeightsId = preluActivationWeights == null ?\n   0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n const fusedActivation =\n FusableActivation[activation as {} as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n   throw new Error(\n   `${activation} activation not yet supported for FusedConv2D ` +\n   `in the wasm backend.`);\n }\n\n const leftDim = transposeA ? a.shape[2] : a.shape[1];\n const rightDim = transposeB ? b.shape[1] : b.shape[2];\n const batchDim = a.shape[0];\n\n const out = backend.makeOutput([batchDim, leftDim, rightDim], a.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n\n wasmFusedMatMul(\n   aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n   transposeA, transposeB, fusedActivation, biasId, preluActivationWeightsId,\n   leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedMatMulConfig: KernelConfig = {\n kernelName: _FusedMatMul,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchMatMul as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
/\n\nimport {DataType, KernelConfig, TensorInfo, UnaryInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nexport function createUnaryKernelConfig(\n   kernelName: string, outType?: DataType): KernelConfig {\n let wasmFunc: (xId: number, dtype: number, outId: number) => void;\n\n function setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(kernelName, null / void */, [\n   'number', // x_id\n   'number', // dtype\n 'number', // out_id\n   ]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: UnaryInputs}):\n TensorInfo {\n   const {backend, inputs: {x}} = args;\n   const xId = backend.dataIdMap.get(x.dataId).id;\n   const out = backend.makeOutput(x.shape, outType || x.dtype);\n   const outId = backend.dataIdMap.get(out.dataId).id;\n\n   // Short-circuit zero-sized tensors.\n   if (util.sizeFromShape(out.shape) === 0) {\n   return out;\n   }\n\n   wasmFunc(xId, CppDType[x.dtype], outId);\n   return out;\n }\n\n return {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language

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==========\n
*/\nimport {Abs, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'./unary_kernel';\n\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n","/**\n * @license\n
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==========\n
*/\n\nimport {backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nexport
function createBinaryKernelConfig(\n kernelName: string, supportsFullBroadcast: boolean,\n dtype?:
DataType): KernelConfig {\n let wasmFunc:\n (aId: number, aShape: Uint8Array, aShapeLen: number, bId:
number,\n bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) =>\n void;\n\n
function setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(kernelName, null /*
void */, [\n 'number', // a_id,\n 'array', // a_shape\n 'number', // a_shape.length\n 'number', // b_id\n
'array', // b_shape\n 'number', // b_shape.length\n 'number', // dtype\n 'number' // out_id\n]);\n }\n\n
function kernelFunc(args: {backend: BackendWasm, inputs: BinaryInputs}):\n
  TensorInfo {\n const {backend, inputs} = args;\n const {a, b} = inputs;\n const aId =
backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n\n const outputType =
dtype != null ? dtype : a.dtype;\n const newShape = backend_util.assertAndGetBroadcastShape(a.shape,
b.shape);\n const out = backend.makeOutput(newShape, outputType);\n\n // Short-circuit zero-sized tensors.\n
if (util.sizeFromShape(newShape) === 0) {\n return out;\n }\n\n const aShapeBytes = new Uint8Array(new
Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n const
outId = backend.dataIdMap.get(out.dataId).id;\n const kernelFunc = () => wasmFunc(\n aId, aShapeBytes,
a.shape.length, bId, bShapeBytes, b.shape.length,\n CppDType[a.dtype], outId);\n\n // Currently only some
float operations support full broadcast.\n if (supportsFullBroadcast && a.dtype === 'float32')
{\n kernelFunc();\n return out;\n }\n\n const aBroadcastDims = backend_util.getBroadcastDims(a.shape,
newShape);\n const bBroadcastDims = backend_util.getBroadcastDims(b.shape, newShape);\n const
loopsOverAllOfA = aBroadcastDims.every((v, i) => v === i);\n const loopsOverAllOfB =
bBroadcastDims.every((v, i) => v === i);\n if (loopsOverAllOfA && loopsOverAllOfB) {\n kernelFunc();\n
return out;\n } else {\n throw new Error(\n `Broadcasting along outer dims is not yet ` +\n
`supported for ${a.dtype} ${kernelName}.`);\n }\n }\n\n return {kernelName, backendName: 'wasm', setupFunc,
kernelFunc};\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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==========\n
*/\n\nimport {Add, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const addConfig: KernelConfig =\n
createBinaryKernelConfig(Add, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All
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file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {AddN, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmFunc:\n (inputIds: Uint8Array, inputIdsLen: number, dtype: number, outId: number) =>\n void;\n\nfunction setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(AddN, null /* void */, [\n 'array', // input_ids\n 'number', // input_ids.length\n 'number', // dtype\n 'number', // out_id\n]);\n}\n\nfunction addn(args: {inputs: TensorInfo[], backend: BackendWasm}) {\n const {inputs, backend} = args;\n const out = backend.makeOutput(inputs[0].shape, inputs[0].dtype);\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n const inputIds = inputs.map(x => backend.dataIdMap.get(x.dataId).id);\n const inputIdsBytes = new Uint8Array(new Int32Array(inputIds).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(inputIdsBytes, inputIds.length, CppDType[out.dtype], outId);\n\n return out;\n}\n\nexport const addNConfig: KernelConfig = {\n kernelName: AddN,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: addn as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function identity(args: {inputs: IdentityInputs, backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const inVals = backend.typedArrayFromHeap(x);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const identityConfig: KernelConfig = {\n kernelName: Identity,\n backendName: 'wasm',\n kernelFunc: identity as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {identity} from './Identity';\nimport {CppDType} from './types';\n\nlet wasmTranspose: (\n xId: number, xShape: Uint8Array, xShapeLength: number, dtype: CppDType,\n outId: number, perm: Uint8Array, permLength: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTranspose = backend.wasm.cwrap(Transpose, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // dtype\n 'number', // outId\n 'array', // perm\n 'number', // perm.length\n]);\n}\n\nexport function transpose(\n args:\n {inputs: TransposeInputs, backend:

BackendWasm, attrs: TransposeAttrs}):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n // Reduce any dimensions with size one. Lower-rank transpose kernel performs\n // better due to simpler memory access pattern.\n const [reducedShape, perm] = removeOneSizeDimsinputs.x.shape, attrs.perm);\n\n let permIsNoOp = true;\n for (let i = 0; i < perm.length; i++) {\n if (perm[i] !== i) {\n permIsNoOp
 = false;\n }\n }\n const outShape = computeOutShapeinputs.x.shape, attrs.perm);\n const x = {\n dataId: inputs.x.dataId,\n shape: reducedShape,\n dtype: inputs.x.dtype\n };\n\n if permIsNoOp) {\n const cloned = identity{inputs, backend});\n cloned.shape = outShape;\n return cloned;\n }\n\n const out = backend.makeOutputoutShape, x.dtype);\n const xId = backend.dataIdMap.getx.dataId).id;\n const outId = backend.dataIdMap.getout.dataId).id;\n const permBytes = new Uint8Arraynew Int32Arrayperm).buffer);\n const xShapeBytes = new Uint8Arraynew Int32Arrayx.shape).buffer);\n\n wasmTranspose(\n xId, xShapeBytes, x.shape.length, CppDType[x.dtype], outId, permBytes,\n perm.length);\n return out;\n}\n\nfunction computeOutShapeinShape: number[], perm: number[]): number[] {\n const outShape = new Arrayinshape.length);\n for (let i = 0; i < outShape.length; i++) {\n outShape[i] = inShape[perm[i]];\n }\n return outShape;\n}\n\nfunction
 removeOneSizeDims(\n shape: number[], perm: number[]): [number[], number[]] {\n const newShape: number[] = [];\n const newPerm: number[] = [];\n for (let i = 0; i < shape.length; ++i) {\n if (shape[i] !== 1) {\n newShape.push(shape[i]);\n }\n if (shape[perm[i]] !== 1) {\n newPerm.push(perm[i]);\n }\n }\n for (let i = 0; i < newPerm.length; ++i) {\n let minValIdx = -1;\n for (let j = 0; j < newPerm.length; ++j) {\n if (newPerm[j] >= i &&\n (minValIdx === -1 || newPerm[minValIdx] > newPerm[j])) {\n minValIdx = j;\n }\n }\n newPerm[minValIdx] = i;\n }\n return [newShape, newPerm];\n}\n\nexport const transposeConfig: KernelConfig = {\n kernelName: Transpose,\n backendName: 'wasm',\n kernelFunc: transpose as {} as KernelFunc,\n setupFunc: setup,\n};\n","/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
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==\n
*/\n\nimport {backend_util, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {transpose} from './Transpose';\n\n/**\n * Compute permutation axes and do a transpose if necessary.\n *\n * Used by reduction ops.\n * @param x input TensorInfo\n * @param axis reduction axes\n * @param backend wasm backend instance\n */\nexport function permuteAxesAndTranspose(\n x: TensorInfo, axis: number|number[],
 backend: BackendWasm): {\n transposed: TensorInfo|null,\n axes: number[],\n originalAxes: number[],\n inputWasTransposed: boolean\n} {\n const xShape = x.shape;\n const xRank = x.shape.length;\n\n const originalAxes = util.parseAxisParamaxis, xShape);\n let axes = originalAxes;\n const permutedAxes = backend_util.getAxesPermutationaxes, xRank);\n let xTransposed = null;\n let inputWasTransposed = false;\n if (permutedAxes != null) {\n const newShape: number[] = new ArrayxRank);\n for (let i = 0; i < newShape.length; i++) {\n newShape[i] = xShape[permutedAxes[i]];\n }\n\n axes = backend_util.getInnerMostAxesaxes.length, xRank);\n xTransposed =\n transpose{inputs: {x}, attrs: {perm: permutedAxes}, backend});\n\n const xId = backend.dataIdMap.getx.dataId).id;\n const transposedId = backend.dataIdMap.getxTransposed.dataId).id;\n if transposedId !== xId) {\n inputWasTransposed = true;\n }\n }\n\n return {transposed:
 xTransposed, originalAxes, axes, inputWasTransposed};\n}\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,

software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\n\nlet
 wasmAll: (xId: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmAll = backend.wasm.cwrap(All, null /*void*/, ['number, number, number']);\n}\n\nfunction all(args: {backend: BackendWasm, inputs: AllInputs, attrs: AllAttrs}):\n   TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n   const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   input = transposed;\n   inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('all', axes, inputRank);\n const [outShape, reduceShape] =\n   backend_util.computeOutAndReduceShapes(input.shape, axes);\n
  const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n   wasmAll(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n return out;\n}\n\nexport const allConfig: KernelConfig = {\n kernelName: All,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: all as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n
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==========\n */\n\nimport {Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmAny: (xId: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmAny = backend.wasm.cwrap(Any, null /*void*/, ['number, number, number']);\n}\n\nfunction any(args: {backend: BackendWasm, inputs: AnyInputs, attrs: AnyAttrs}):\n   TensorInfo {\n const {backend, inputs,
 attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n   const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   input = transposed;\n   inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('any', axes, inputRank);\n const [outShape, reduceShape] =\n   backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n   wasmAny(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n

}\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n return out;\n}\n\nexport const anyConfig: KernelConfig = {\n kernelName: Any,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: any as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n
 * ==\n */\n\nimport {ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmFunc: (\n   xId: number, dtype: number, outerSize: number, innerSize: number,\n   outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n   'number', // x_id\n   'number', // dtype\n   'number', // outer_size\n   'number', // inner_size\n   'number'   // out_id\n]);\n}\n\nfunction argmax(\n   args: {inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs}) {\n const {backend, inputs, attrs} = args;\n const {axis} = attrs as {} as ArgMaxAttrs;\n const {x} = inputs as {} as ArgMaxInputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId
 = xId;\n let input = x;\n\n const {transposed, axes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n   const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   if (transposedId !== xId) {\n   // transpose was not a no-op. We will need to dispose of this\n   // once we are done.\n   input = transposed;\n   inputId = transposedId;\n   }\n }\n\n const outShape = input.shape.slice(0, -1);\n const out = backend.makeOutput(outShape, 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const outerSize = util.sizeFromShape(out.shape);\n const innerSize = input.shape[axes[0]];\n wasmFunc(inputId, CppDType[input.dtype], outerSize, innerSize, outId);\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n return out;\n}\n\nexport const argMaxConfig: KernelConfig = {\n kernelName: ArgMax,\n backendName: 'wasm',\n
  kernelFunc: argmax as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 * ==\n */\n\nimport {AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmAvgPool: (\n   xId:
  number, batchSize: number, inputHeight: number, inputWidth: number,\n   filterHeight: number, filterWidth: number, padTop: number, padRight: number,\n   padBottom: number, padLeft: number, strideHeight: number,\n strideWidth: number, channels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmAvgPool = backend.wasm.cwrap(AvgPool, null /* void */, [\n   'number', // xId\n   'number', // batchSize\n   'number', // inputHeight\n   'number', // inputWidth\n   'number', // filterHeight\n   'number', // filterWidth\n   'number', // padTop\n   'number', // padRight\n   'number', // padBottom\n   'number', // padLeft\n   'number', // strideHeight\n   'number', // strideWidth\n   'number', // channels\n   'number', // outId\n]);\n}\n\nfunction avgPool(\n   args: {inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs}) {\n const {inputs, attrs,

backend} = args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n const {filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n   x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const channels = convInfo.inChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n   `wasm backend does not support dataFormat:` +\n   `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n   throw new Error(\n   `was backend only supports average pooling with dilation = [1, 1], ` +\n   `got [${convInfo.dilationHeight}, ${convInfo.dilationWidth}].`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmAvgPool(\n   xId, x.shape[0], x.shape[1], x.shape[2], filterHeight, filterWidth,\n   padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels,\n   outId);\n return out;\n}\n\nexport const avgPoolConfig: KernelConfig = {\n kernelName: AvgPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: avgPool as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
 on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function reshape(\n   args: {inputs: ReshapeInputs, attrs: ReshapeAttrs, backend: BackendWasm}) {\n const {inputs, attrs} = args;\n const {x} = inputs;\n const {shape} = attrs;\n\n const xSize = util.sizeFromShape(x.shape);\n const $shape = util.inferFromImplicitShape(shape, xSize);\n\n util.assert(\n   xSize === util.sizeFromShape($shape),\n   () => `new shape: ${$shape}, old shape: ${x.shape}. New shape and old ` +\n   `shape must have the same number of elements.`);\n\n // Backend needs to track refCount
 for the dataId for reshape op\n args.backend.incRef(x.dataId);\n return {dataId: x.dataId, shape: $shape, dtype: x.dtype};\n}\n\nexport const reshapeConfig: KernelConfig = {\n kernelName: Reshape,\n backendName: 'wasm',\n kernelFunc: reshape as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport
 {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from './Reshape';\n\nlet wasmBatchMatMul: (\n   aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n   bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n   transposeB: boolean, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul, null /* void */, [\n   'number', // a_id\n   'array',   // a_shape\n   'number', // a_shape.length\n   'number', // b_id\n

'array', // b_shape\n 'number', // b_shape.length\n 'number', // transpose_a\n 'number', // transpose_b\n 'number' // out_id\n]);\n}\n\nfunction batchMatMul(args: {\n inputs: BatchMatMulInputs,\n backend: BackendWasm,\n attrs: BatchMatMulAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {a, b} = inputs;\n const
{transposeA, transposeB} = attrs;\n\n if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n throw new Error(\n `BatchMatMul for non non-float32 tensors not yet supported.`);\n }\n\n const aRank = a.shape.length;\n const bRank = b.shape.length;\n\n const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];\n const innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];\n\n const outerShapeA = transposeA ? a.shape[aRank - 1] : a.shape[aRank - 2];\n const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank - 1];\n\n const outerDimsA = a.shape.slice(0, -2);\n const outerDimsB = b.shape.slice(0, -2);\n\n const batchDimA = util.sizeFromShape(outerDimsA);\n const batchDimB = util.sizeFromShape(outerDimsB);\n\n const batchDimsCompatible =\n batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;\n\n util.assert(\n aRank >= 2 && bRank >= 2 && batchDimsCompatible,\n () => `Error in matMul: the input batch dimensions
must either be the ` +\n `same or at least one input batch dimension must be 1. Got input ` +\n `batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);\n\n const outShapeOuterDims =\n batchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);\n const outShape = outShapeOuterDims.concat([outerShapeA, outerShapeB]);\n\n util.assert(\n innerShapeA === innerShapeB,\n () => `Error in matMul: inner shapes (${innerShapeA}) and (` +\n `${innerShapeB}) of Tensors with shapes ${a.shape} and ` +\n `${b.shape} and transposeA=${transposeA}` +\n ` and transposeB=${transposeB} must match.`);\n\n const a3dShape = transposeA ? [batchDimA, innerShapeA, outerShapeA] :\n [batchDimA, outerShapeA, innerShapeA];\n const b3dShape = transposeB ? [batchDimB, outerShapeB, innerShapeB] :\n [batchDimB, innerShapeB, outerShapeB];\n\n // The rest of the implementation is
designed to operate on rank-3 tensors\n const a3d = reshape({inputs: {x: a}, backend, attrs: {shape: a3dShape}});\n const b3d = reshape({inputs: {x: b}, backend, attrs: {shape: b3dShape}});\n\n const a3dId = backend.dataIdMap.get(a3d.dataId).id;\n const b3dId = backend.dataIdMap.get(b3d.dataId).id;\n\n const leftDim = transposeA ? a3d.shape[2] : a3d.shape[1];\n const rightDim = transposeB ? b3d.shape[1] : b3d.shape[2];\n const batchDim = Math.max(batchDimA, batchDimB);\n\n const out = backend.makeOutput([batchDim, leftDim, rightDim], a3d.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new Uint8Array(new Int32Array(a3d.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b3d.shape).buffer);\n\n wasmBatchMatMul(\n a3dId, aShapeBytes, a3d.shape.length, b3dId, bShapeBytes,\n b3d.shape.length, transposeA, transposeB, outId);\n\n backend.disposeData(a3d.dataId);\n backend.disposeData(b3d.dataId);\n\n out.shape =
outShape;\n return out;\n}\n\nexport const batchMatMulConfig: KernelConfig = {\n kernelName: BatchMatMul,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: batchMatMul as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\nimport { backend_util, util } from '@tensorflow/tfjs-core';\nexport function
concatImpl(inputs, outShape, dtype, simplyConcat) {\n const outVals = util.getArrayFromDType(dtype, util.sizeFromShape(outShape));\n if (simplyConcat && dtype !== 'string') {\n // Use built-in TypedArray.set() method for speed.\n let offset = 0;\n inputs.forEach(input => {\n const size =

util.sizeFromShape(input.shape);\n outVals.set(input.vals, offset);\n offset += size;\n });\n }\n else {\n let colOffset = 0;\n inputs.forEach(input => {\n const decodedData = dtype === 'string' ?\n backend_util.fromUint8ToStringArray(input.vals) :\n input.vals;\n let tIdx = 0;\n for (let row = 0; row < input.shape[0]; ++row) {\n const resIdx = row * outShape[1] + colOffset;\n for (let col = 0; col < input.shape[1]; ++col) {\n outVals[resIdx + col] = decodedData[tIdx++];\n }\n }\n colOffset += input.shape[1];\n });\n }\n return outVals;\n}\n//#
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UZyb21TaGFwZShpbnB1dC5zaGFwZSk7XG4gICAgICAgIGNvdXRWYWxzIGFzIR5cGVkQXJyYXkpLnNldCh
pbnB1dC52YWxzIGFzIR5cGVkQXJyYXksIG9mZnNldCk7XG4gICAgICBvZmZzZXQgKz0gc2l6ZTtcbiAgICB
9KTtcbiAgfSBlbHNlIHtcbiAgICBsZXQgY29sT2Zmc2V0ID0gMDtcblxuICAgIGlucHV0cy5mb3JFYWNoKCg
inputs.forEach((input, i) => {\n   const shape = util.sizeToSquarishShape(input.size);\n   const
offset = colOffsets[i];\n   const texR = offset % maxTexSize;\n   const texC = (offset -
texR) / maxTexSize;\n   gl.texSubImage2D(gl.TEXTURE_2D, 0, texR, texC, shape[1], shape[0],
gl.RGBA, gl.FLOAT, input);\n });\n}\n//# sourceMappingURL=data:application/json; base64,eyJ2ZXJzaW9uIjozLCJmaWxlIjoiUmFuZ2VfaW1wbC5qcyIsInNvdXJjZVJvb3QiOiIiLCJzb3VyY2VzIjpbIi4uLy4uLy4uLy4uLy4uLy4uL3RmanMtYmFja2VuZC1jcHUvc3JjL3tlcm5lbHMvUmFuZ2VfaW1wbC50cyJdLCJuYW1lcyI6W10sIm1hcHBpbmdzIjoiQUFBQTs7Ozs7Ozs7Ozs7O0dBZUc7QUFFSCxPQUFPLEVBQUMsSUFBSSxFQUFDLE1BQU0sc0JBQXNCLENBQUM7QUFFMUMsTUFBTSxVQUFVLGFBQWEsQ0FBQyxLQUFhLEVBQUUsSUFBWSxFQUFFLElBQVksRUFBRSxLQUFlO0lBQ3hGLE1BQU0sZUFBZSxHQUFHLEtBQUssS0FBSyxJQUFJLENBQUM7SUFDdkMsTUFBTSx5QkFBeUIsR0FBRyxLQUFLLEdBQUcsSUFBSSxJQUFJLEdBQUcsQ0FBQyxDQUFDO0lBQ3ZELE1BQU0sMEJBQTBCLEdBQUcsSUFBSSxHQUFHLEtBQUssSUFBSSxJQUFJLEdBQUcsQ0FBQyxDQUFDO0lBQzVELElBQUksZUFBZSxJQUFJLHlCQUF5QixJQUFJLDBCQUEwQixFQUFFO1FBQzlFLE9BQU8sSUFBSSxDQUFDLHlCQUF5QixDQUFDLENBQUMsRUFBRSxLQUFLLENBQUMsQ0FBQztLQUNqRDtJQUNELE1BQU0sY0FBYyxHQUFHLENBQUMsSUFBSSxHQUFHLEtBQUssQ0FBQyxHQUFHLElBQUksQ0FBQyxDQUFDO0lBQzlDLE1BQU0sTUFBTSxHQUFHLElBQUksQ0FBQyx5QkFBeUIsQ0FBQyxjQUFjLEVBQUUsS0FBSyxDQUFDLENBQUM7SUFDckUsSUFBSSxLQUFLLEdBQUcsS0FBSyxJQUFJLElBQUksS0FBSyxDQUFDLEVBQUU7UUFDL0IsZUFBZTtRQUNmLGlDQUFpQztRQUNqQyxJQUFJLEdBQUcsQ0FBQyxDQUFDLENBQUM7S0FDWDtJQUNELE1BQU0sQ0FBQyxDQUFDLENBQUMsR0FBRyxLQUFLLENBQUM7SUFDbEIsS0FBSyxJQUFJLENBQUMsR0FBRyxDQUFDLEVBQUUsQ0FBQyxHQUFHLGNBQWMsRUFBRSxDQUFDLEVBQUUsRUFBRTtRQUN2QyxNQUFNLENBQUMsQ0FBQyxDQUFDLEdBQUcsTUFBTSxDQUFDLENBQUMsR0FBRyxDQUFDLENBQUMsR0FBRyxJQUFJLENBQUM7S0FDakM7SUFDRCxPQUFPLE1BQU0sQ0FBQztBQUNoQixDQUFDO0FBRUQsTUFBTSxVQUFVLHlCQUF5QixDQUFDLEtBQWEsRUFBRSxJQUFZLEVBQUUsSUFBWSxFQUFFLEtBQWU7SUFDbEcsTUFBTSxlQUFlLEdBQUcsS0FBSyxLQUFLLElBQUksQ0FBQztJQUN2QyxNQUFNLHlCQUF5QixHQUFHLEtBQUssR0FBRyxJQUFJLElBQUksR0FBRyxDQUFDLENBQUM7SUFDdkQsTUFBTSwwQkFBMEIsR0FBRyxJQUFJLEdBQUcsS0FBSyxJQUFJLElBQUksR0FBRyxDQUFDLENBQUM7SUFDNUQsSUFBSSxlQUFlLElBQUkseUJBQXlCLElBQUksMEJBQTBCLEVBQUU7UUFDOUUsT0FBTyxJQUFJLENBQUMseUJBQXlCLENBQUMsQ0FBQyxFQUFFLEtBQUssQ0FBQyxDQUFDO0tBQ2pEO0lBQ0QsTUFBTSxjQUFjLEdBQUcsQ0FBQyxJQUFJLEdBQUcsS0FBSyxDQUFDLEdBQUcsSUFBSSxDQUFDLENBQUM7SUFDOUMsTUFBTSxNQUFNLEdBQUcsSUFBSSxDQUFDLHlCQUF5QixDQUFDLGNBQWMsRUFBRSxLQUFLLENBQUMsQ0FBQztJQUNyRSxJQUFJLEtBQUssR0FBRyxLQUFLLElBQUksSUFBSSxLQUFLLENBQUMsRUFBRTtRQUMvQixlQUFlO1FBQ2YsaUNBQWlDO1FBQ2pDLElBQUksR0FBRyxDQUFDLENBQUMsQ0FBQztLQUNYO0lBQ0QsTUFBTSxDQUFDLENBQUMsQ0FBQyxHQUFHLEtBQUssQ0FBQztJQUNsQixLQUFLLElBQUksQ0FBQyxHQUFHLENBQUMsRUFBRSxDQUFDLEdBQUcsY0FBYyxFQUFFLENBQUMsRUFBRSxFQUFFO1FBQ3ZDLE1BQU0sQ0FBQyxDQUFDLENBQUMsR0FBRyxNQUFNLENBQUMsQ0FBQyxHQUFHLENBQUMsQ0FBQyxHQUFHLElBQUksQ0FBQztLQUNqQztJQUNELE9BQU8sTUFBTSxDQUFDO0FBQ2hCLENBQUM7QUFFRCxNQUFNLFVBQVUsZUFBZSxDQUFDLEtBQWEsRUFBRSxJQUFZLEVBQUUsSUFBWSxFQUFFLEtBQWU7SUFDeEY

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gKiBsaW1pdGF0aW9ucyB1bmRlciB0aGUgTGljZW5zZS5cbiAqID09PT09PT09PT

outBuf.set(inBuf.get(...inLoc), ...outLoc);\n }\n if (dtype === 'string') {\n return backend_util.fromStringArrayToUint8(outBuf.values);\n }\n return outBuf.values;\n}\nexport function slice(args) {\n const { inputs, backend, attrs } = args;\n const { x } = inputs;\n const { begin, size } = attrs;\n assertNotComplex(x, 'slice');\n const [$begin, $size] = slice_util.parseSliceParams(x, begin, size);\n slice_util.assertParamsValid(x, $begin, $size);\n const vals = backend.data.get(x.dataId).values;\n const outVals = sliceImpl(vals, $begin, $size, x.shape, x.dtype);\n return backend.makeTensorInfo($size, x.dtype, outVals);\n}\nexport const sliceConfig = {\n kernelName: Slice,\n backendName: 'cpu',\n kernelFunc: slice\n};\n//# sourceMappingURL=data:application/json; base64,eyJ2ZXJzaW9uIjozLCJmaWxlIjoiU2xpY2UuanMiLCJzb3VyY2VSb290IjoiIiwic291cmNlcyI6WyIuLi8uLi8uLi8uLi8uLi8uLi90ZmpzLWJhY2tlbmQtY3B1L3NyYy9rZXJuZWxzL1NsaWNlLnRzIl0sIm5hbWVzIjpbXSwibWFwcGluZ3MiOiJBQUFBOzs7Ozs7Ozs7Ozs7R0FlRztBQUU8sRUFBQWlCLE1BQUEsRUFBQUMsTUFBQSxFQUFBQyxLQUFBLEVBQUFDLEtBQUEsRUFBQUMsS0F

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EtJTkQsIGVpdGhlciBleHByZXNzIG9yIGltcGxpZWQuXG4gKiBiZWUgdGhlIExpY2Vuc2UgZm9yIHRoZSBzc
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RlciB0aGUgTGljZW5zZS5cbiAqLyAgICAgICAgIC

```
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All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========================================================================\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Slice, slice_util, SliceAttrs, SliceInputs, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {sliceImplCPU} from '../kernel_utils/shared';\n\nexport function slice(\n    args: {inputs: SliceInputs, attrs: SliceAttrs, backend: BackendWasm}) {\n  const {inputs: {x}, attrs: {begin, size}, backend} = args;\n\n  const [begin_, size_] = slice_util.parseSliceParams(x, begin, size);\n\n  const isContinous = slice_util.isSliceContinous(x.shape, begin_, size_);\n  const xVals = backend.readSync(x.dataId);\n  const out = backend.makeOutput(size_, x.dtype);\n  const xStrides = util.computeStrides(x.shape);\n  const outData = backend.dataIdMap.get(out.dataId);\n\n  if (isContinous) {\n    const flatOffset = slice_util.computeFlatOffset(begin_, xStrides);\n\n    if (x.dtype === 'string') {\n      outData.stringBytes =\n          (xVals as Uint8Array[])\n              .slice(flatOffset, flatOffset + util.sizeFromShape(size_));\n    } else {\n      const outVals = backend.typedArrayFromHeap(out);\n      outVals.set(\n          (xVals as TypedArray)\n              .subarray(flatOffset, flatOffset + util.sizeFromShape(size_)));\n    }\n\n    return out;\n  }\n\n  if (x.dtype === 'string') {\n    const res = sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype);\n    outData.stringBytes = res as Uint8Array[];\n    return out;\n  }\n\n  const outVals = backend.typedArrayFromHeap(out);\n  const rank = x.shape.length;\n  if (rank === 2) {\n    slice2d(\n        xVals as TypedArray, xStrides[0], outVals, begin_ as [number, number],\n        size_ as [number, number]);\n  } else if (rank === 3) {\n    slice3d(\n        xVals as TypedArray, xStrides[0], xStrides[1], outVals,\n        begin_ as [number, number, number], size_ as [number, number, number]);\n  } else if (rank === 4) {\n    slice4d(\n        xVals as TypedArray, xStrides[0], xStrides[1], xStrides[2], outVals,\n        begin_ as [number, number, number, number],\n        size_ as [number, number, number, number]);\n  } else {\n    const res =\n        sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype) as TypedArray;\n    outVals.set(res);\n  }\n\n  return out;\n}\n\nfunction slice2d(\n    xVals: backend_util.TypedArray, xStride: number,\n    outVals: backend_util.TypedArray, begin: [number, number],\n    size: [number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const endI = beginI + size[0];\n  for (let i = beginI; i < endI; i++) {\n    const xOffset = i * xStride + beginJ;\n    outVals.set(xVals.subarray(xOffset, xOffset + size[1]), outOffset);\n    outOffset += size[1];\n  }\n}\n\nfunction slice3d(\n    xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n    outVals: backend_util.TypedArray, begin: [number, number, number],\n    size: [number, number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const beginK = begin[2];\n  const endI = beginI + size[0];\n  const endJ = beginJ + size[1];\n  for (let i = beginI; i < endI; i++) {\n    for (let j = beginJ; j < endJ; j++) {\n      const xOffset = i * xStride1 + j * xStride2 + beginK;\n      outVals.set(xVals.subarray(xOffset, xOffset + size[2]), outOffset);\n      outOffset += size[2];\n    }\n  }\n}\n\nfunction slice4d(\n    xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n    xStride3: number, outVals: backend_util.TypedArray,\n    begin: [number, number, number, number],\n    size: [number, number, number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const beginK = begin[2];\n\n  const endI = beginI + size[0];\n  const endJ = beginJ + size[1];\n  const endK = beginK + size[2];\n  const beginL = begin[3];\n\n  for (let i = beginI; i < endI; i++) {\n    for (let j = beginJ; j < endJ; j++) {\n      for (let k = beginK; k < endK; k++) {\n        const xOffset = i * xStride1 + j * xStride2 + k * xStride3 + beginL;\n        outVals.set(xVals.subarray(xOffset, xOffset + size[3]), outOffset);\n        outOffset += size[3];\n      }\n    }\n  }\n}\n\nexport const sliceConfig: KernelConfig = {\n  kernelName: Slice,\n  backendName: 'wasm',\n  kernelFunc: slice as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. 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under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from './Reshape';\nimport {slice} from './Slice';\nimport {transpose} from './Transpose';\n\nfunction batchToSpaceND(args: {\n inputs: BatchToSpaceNDInputs,\n backend: BackendWasm,\n attrs: BatchToSpaceNDAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {blockShape, crops} = attrs;\n\n const prod = blockShape.reduce((a, b) => a * b);\n\n const reshaped = backend_util.getReshaped(x.shape, blockShape, prod);\n const
permuted = backend_util.getPermuted(reshaped.length, blockShape.length);\n const reshapedPermuted =\n backend_util.getReshapedPermuted(x.shape, blockShape, prod);\n const sliceBeginCoords =\n backend_util.getSliceBeginCoords(crops, blockShape.length);\n const sliceSize =\n backend_util.getSliceSize(reshapedPermuted, crops, blockShape.length);\n\n const xReshaped = reshape({inputs: {x}, backend, attrs: {shape: reshaped}});\n const xTransposed =\n   transpose({inputs: {x: xReshaped}, backend, attrs: {perm: permuted}});\n const xTransposedReshaped = reshape(\n   {inputs: {x: xTransposed}, backend, attrs: {shape: reshapedPermuted}});\n const result = slice({\n   inputs: {x: xTransposedReshaped},\n   backend,\n attrs: {begin: sliceBeginCoords, size: sliceSize}\n });\n\n backend.disposeData(xReshaped.dataId);\n backend.disposeData(xTransposed.dataId);\n backend.disposeData(xReshaped.dataId);\n\n return result;\n}\n\nexport const batchToSpaceNDConfig: KernelConfig
= {\n kernelName: BatchToSpaceND,\n backendName: 'wasm',\n kernelFunc: batchToSpaceND as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {TensorInfo} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nexport function cast(\n   args: {inputs: CastInputs, attrs: CastAttrs, backend: BackendWasm}):\n   TensorInfo {\n const {inputs: {x}, attrs: {dtype}, backend} = args;\n const out = backend.makeOutput(x.shape, dtype);\n const inVals = backend.typedArrayFromHeap(x);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const castConfig: KernelConfig = {\n kernelName: Cast,\n backendName: 'wasm',\n kernelFunc: cast as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n
* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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==========\n*/\nimport {KernelConfig, Ceil} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n
 * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n*/\n\nimport {ClipByValue, ClipByValueAttrs, ClipByValueInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmClip: (xId: number, min: number, max: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmClip = backend.wasm.cwrap(ClipByValue, null /* void */, [\n    'number',  // x_id\n    'number',  // min\n    'number',  // max\n    'number'   // out_id\n  ]);\n}\n\nfunction clip(args: {\n  inputs: ClipByValueInputs,\n  backend: BackendWasm,\n  attrs: ClipByValueAttrs\n}) {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {clipValueMin, clipValueMax} = attrs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n
  wasmClip(xId, clipValueMin, clipValueMax, outId);\n  return out;\n}\n\nexport const clipByValueConfig: KernelConfig = {\n  kernelName: ClipByValue,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: clip as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n*/\n\nimport
 {backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {concatImplCPU} from '../kernel_utils/shared';\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\n\nexport function concat(\n    args: {inputs: ConcatInputs, backend: BackendWasm, attrs: ConcatAttrs}) {\n  const {inputs, backend} = args;\n\n  const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];\n\n  let outShape = backend_util.computeOutShape(inputs.map(t => t.shape), axis);\n\n  // Keep only non-empty tensors (ignore tensors with 0 in their shape).\n  const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);\n  if ($inputs.length === 1) {\n    return identity({inputs: {x: $inputs[0]}, backend});\n  }\n\n  const out = backend.makeOutput(outShape, inputs[0].dtype);\n\n  if (util.sizeFromShape(outShape) === 0) {\n    return out;\n  }\n\n  const shapes = $inputs.map(t
 => t.shape);\n  backend_util.assertParamsConsistent(shapes, axis);\n\n  if ($inputs[0].dtype === 'string') {\n    // Any concat of n-dimensional tensors across any axis can be reduced to\n    // a concatenation of two-dimensional tensors across the axis 1 by first\n    // partitioning the axes of the original tensors into those less than the\n    // axis to be concatenated and the rest. Then reshape the tensors\n    // into a two-dimensional tensor by collapsing these two sets of axes and\n    // concatenate the resulting matrices across the axis 1, finally reshaping\n    // the result to have the proper shape.\n    const inputs2D = $inputs.map(t => {\n      const innerSize = util.sizeFromShape(t.shape.slice(axis));\n      const shape = [-1, innerSize];\n      return reshape({inputs: {x: t}, backend, attrs: {shape}});\n    });\n\n    const inputsValShapes = inputs2D.map(t => {\n      return {vals: backend.readSync(t.dataId), shape: t.shape};\n    });\n\n    // Concats 2d tensors
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along axis=1.\n outShape =\n backend_util.computeOutShape(inputs2D.map(t => t.shape), 1 /* axis */);\n const simplyConcat = inputs2D[0].shape[0] === 1;\n const outVals = concatImplCPU(\n inputsValShapes, outShape, inputs[0].dtype,\n simplyConcat) as string[];\n\n const finalOutShape =\n backend_util.computeOutShape($inputs.map(t => t.shape), axis);\n\n out.shape = finalOutShape;\n const outData = backend.dataIdMap.get(out.dataId);\n outData.stringBytes = backend_util.fromStringArrayToUint8(outVals);\n\n inputs2D.forEach(t => backend.disposeData(t.dataId));\n\n return out;\n }\n\n const batchDim = util.sizeFromShape($inputs[0].shape.slice(0, axis));\n let sumInnerDims = 0;\n const innerDims = $inputs.map(input => {\n const innerDim = util.sizeFromShape(input.shape.slice(axis));\n sumInnerDims += innerDim;\n return innerDim;\n });\n const inVals = $inputs.map(input => backend.typedArrayFromHeap(input));\n
const outVals = backend.typedArrayFromHeap(out);\n for (let b = 0; b < batchDim; b++) {\n let outOffset = b * sumInnerDims;\n for (let i = 0; i < inVals.length; i++) {\n const innerDim = innerDims[i];\n const inOffset = b * innerDim;\n const vals = inVals[i].subarray(inOffset, inOffset + innerDim);\n outVals.set(vals, outOffset);\n outOffset += innerDim;\n }\n }\n return out;\n}\n\nexport const concatConfig: KernelConfig = {\n kernelName: Concat,\n backendName: 'wasm',\n kernelFunc: concat as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is
distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {backend_util, Conv2D, Conv2DAttrs, Conv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmConv2d: (\n xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number, padTop: number,\n padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n dilationHeight: number, dilationWidth: number, strideHeight: number,\n strideWidth: number, inputChannels: number, outputChannels: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmConv2d = backend.wasm.cwrap(Conv2D,
null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n}\n\nfunction conv2d(\n args: {inputs: Conv2DInputs, backend: BackendWasm, attrs: Conv2DAttrs}) {\n const {inputs, attrs, backend} = args;\n\n const {x, filter} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const {strides, dilations, pad, dimRoundingMode, dataFormat} = attrs;\n const $dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n
const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode, false, $dataFormat);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n if

(convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend Conv2D does not support dataFormat:'` +\n `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmConv2d(\n xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n dilationHeight, dilationWidth, strideHeight, strideWidth, inputChannels,\n outputChannels, outId);\n return out;\n}\n\nexport const conv2DConfig: KernelConfig = {\n kernelName: Conv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: conv2d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==*/\n\nimport {backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmConv2DBackpropInput: (\n dyId: number, filterId: number, batchSize: number, filterHeight: number,\n filterWidth: number, inHeight: number, inWidth: number, inChannels: number,\n outHeight: number, outWidth: number, outChannels: number,\n strideHeight: number, strideWidth: number, topPad: number, leftPad: number,\n fltS0: number, fltS1: number, fltS2: number, xBatchStride: number,\n xRowStride: number, xColStride: number,\n xChannelStride: number,\n yBatchStride: number, yRowStride: number, yColStride: number,\n yChannelStride: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmConv2DBackpropInput = backend.wasm.cwrap(Conv2DBackpropInput, null, [\n 'number', // dyId\n 'number', // filterId\n 'number', // batchSize\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // inHeight\n 'number', // inWidth\n 'number', // inChannels\n 'number', // outHeight\n 'number', // outWidth\n 'number', // outChannels\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // topPad\n 'number', // leftPad\n 'number', // fltS0\n 'number', // fltS1\n 'number', // fltS2\n 'number', // xBatchStride\n 'number', // xRowStride\n 'number', // xColStride\n 'number', // xChannelStride\n 'number', // yBatchStride\n 'number', // yRowStride\n 'number', // yColStride\n 'number', // yChannelStride\n 'number', // outId\n]);\n}\n\nfunction conv2DBackpropInput(args: {\n backend: BackendWasm,\n inputs: Conv2DBackpropInputInputs,\n attrs: Conv2DBackpropInputAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {dy, filter} = inputs;\n const {strides, pad, dataFormat, dimRoundingMode, inputShape} = attrs;\n\n const dilations = 1;\n\n const $dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n inputShape, filter.shape as [number, number, number, number], strides,\n dilations, pad, dimRoundingMode, false /* depthwise */, $dataFormat);\n const {\n batchSize,\n filterHeight,\n filterWidth,\n inChannels,\n inHeight,\n inWidth,\n outChannels,\n outHeight,\n outWidth,\n strideHeight,\n strideWidth\n } = convInfo;\n\n const topPad = filterHeight - 1 - convInfo.padInfo.top;\n const leftPad = filterWidth - 1 - convInfo.padInfo.left;\n\n const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n const dxStrides = util.computeStrides(convInfo.inShape);\n const dyStrides = util.computeStrides(dy.shape);\n const [fltS0, fltS1, fltS2] = util.computeStrides(filter.shape);\n const xBatchStride = dxStrides[0];\n const xRowStride = isChannelsLast ? dxStrides[1] : dxStrides[2];\n const xColStride = isChannelsLast ? dxStrides[2] : 1;\n const xChannelStride = isChannelsLast ? 1 : dxStrides[1];\n const yBatchStride = dyStrides[0];\n const yRowStride = isChannelsLast ? dyStrides[1] : dyStrides[2];\n const yColStride = isChannelsLast ? dyStrides[2] : 1;\n const

yChannelStride = isChannelsLast ? 1 : dyStrides[1];\n\n const out = backend.makeOutput(convInfo.inShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const dyId = backend.dataIdMap.get(dy.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n wasmConv2DBackpropInput(\n   dyId, filterId, batchSize,
  filterHeight, filterWidth, inHeight, inWidth,\n   inChannels, outHeight, outWidth, outChannels, strideHeight, strideWidth,\n   topPad, leftPad, fltS0, fltS1, fltS2, xBatchStride, xRowStride,\n   xColStride, xChannelStride, yBatchStride, yRowStride, yColStride,\n   yChannelStride, outId);\n return out;\n}\n\nexport const conv2DBackpropInputConfig: KernelConfig = {\n kernelName: Conv2DBackpropInput,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: conv2DBackpropInput as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
  OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {Cos, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const cosConfig: KernelConfig = createUnaryKernelConfig(Cos);\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the
  specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport {Cosh, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
  ==\n
*/\n\nimport {CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from './Cast';\n\n// Must match enum in CropAndResize.cc\nenum InterpolationMethod {\n bilinear = 0,\n nearest = 1\n}\n\nlet wasmCropAndResize: (\n   imagesId: number, boxesId: number, boxIndId: number, numBoxes: number,\n   imagesShape: Uint8Array, cropHeight: number, cropWidth: number,\n   method: number, extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n   'number', // imagesId\n   'number', // boxesId\n   'number', // boxIndId\n   'number', // numBoxes\n   'array',   // images shape\n   'number', // cropHeight\n   'number', // cropWidth\n   'number', // method\n
    'number', // extrapolation value\n   'number'   // out id\n]);\n}\n\nfunction cropAndResize(args: {\n backend: BackendWasm,\n inputs: CropAndResizeInputs,\n attrs: CropAndResizeAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {method, extrapolationValue, cropSize} = attrs;\n const {image, boxes, boxInd} =

inputs;\n\n const numBoxes = boxes.shape[0];\n\n const [cropHeight, cropWidth] = cropSize as [number, number];\n const outShape = [numBoxes, cropHeight, cropWidth, image.shape[3]];\n\n let imagesData = backend.dataIdMap.get(image.dataId);\n let castedData;\n if (image.dtype !== 'float32') {\n   castedData = cast({backend, inputs: {x: image}, attrs: {dtype: 'float32'}});\n   imagesData = backend.dataIdMap.get(castedData.dataId);\n }\n\n const imagesId = imagesData.id;\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const boxIndId = backend.dataIdMap.get(boxInd.dataId).id;\n\n const out = backend.makeOutput(outShape, 'float32');\n
  const outId = backend.dataIdMap.get(out.dataId).id;\n\n const imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n\n wasmCropAndResize(\n   imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n   cropWidth,\n   InterpolationMethod[method as {} as keyof typeof InterpolationMethod],\n   extrapolationValue, outId);\n\n if (castedData != null) {\n   backend.disposeData(castedData.dataId);\n }\n\n return out;\n}\n\nexport const cropAndResizeConfig: KernelConfig = {\n kernelName: CropAndResize,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: cropAndResize as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
 law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Cumsum, CumsumAttrs, CumsumInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nimport {transpose} from './Transpose';\n\nlet wasmCumsum: (xId: number, exclusive: number, reverse: number,\n   finalDim: number, outId: number, dtype: CppDType) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmCumsum = backend.wasm.cwrap(Cumsum, null /* void */, [\n   'number', // x_id\n   'number', // exclusive\n   'number', // reverse\n   'number', // final_dim\n
    'number', // out_id\n   'number' // dtype\n]);\n}\n\nexport function cumsum(\n args: {inputs: CumsumInputs, backend: BackendWasm, attrs: CumsumAttrs}):\nTensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {axis, exclusive, reverse} = attrs;\n const xRank = x.shape.length;\n\n util.assert(x.dtype === 'float32' || x.dtype === 'int32',\n   () => `cumsum does not support ${x.dtype} tensors in the WASM backend`);\n // permute required axis to inner most axis\n const permutation = backend_util.getAxesPermutation([axis], xRank);\n let permutedX = x;\n if (permutation !== null) {\n   permutedX = transpose({inputs: {x}, attrs: {perm: permutation}, backend});\n }\n const permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];\n backend_util.assertAxesAreInnerMostDims('cumsum', [permutedAxis], xRank);\n\n const permutedOut = backend.makeOutput(permutedX.shape, permutedX.dtype);\n const finalDim = permutedX.shape[permutedAxis];\n const permutedXId
 = backend.dataIdMap.get(permutedX.dataId).id;\n const permutedOutId = backend.dataIdMap.get(permutedOut.dataId).id;\n wasmCumsum(permutedXId, exclusive ? 1 : 0, reverse ? 1 : 0, finalDim,\n   permutedOutId, CppDType[x.dtype]);\n\n // transpose data back if permuted\n let out = permutedOut;\n if (permutation !== null) {\n   const undoPermutation = backend_util.getUndoAxesPermutation(permutation);\n   out = transpose(\n   {inputs: {x: permutedOut}, attrs: {perm: undoPermutation}, backend});\n   backend.disposeData(permutedX.dataId);\n   backend.disposeData(permutedOut.dataId);\n }\n return out;\n}\n\nexport const cumsumConfig: KernelConfig = {\n kernelName: Cumsum,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: cumsum as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the

License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n===\n*/\n\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthToSpace: (\n xId: number, blockSize: number, channelsLast: number, xStrides: Uint8Array,\n xStridesLength: number, outputShape: Uint8Array, outputStrides: Uint8Array,\n outSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmDepthToSpace = backend.wasm.cwrap(DepthToSpace, null /*void*/, [\n 'number', // xId\n 'number', // blockSize\n 'number', // channelsLast\n 'array', // xStrides\n 'number', // xStridesLength\n 'array', // outputShape\n 'array', // outputStrides\n 'number', // outSize\n 'number', // outId\n]);\n}\n\nexport function depthToSpace(args: {\n backend: BackendWasm,\n inputs: DepthToSpaceInputs,\n attrs: DepthToSpaceAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x} = inputs;\n const {blockSize, dataFormat} = attrs;\n\n const batchSize = x.shape[0];\n const inputHeight = (dataFormat === 'NHWC') ? x.shape[1] : x.shape[2];\n const inputWidth = (dataFormat === 'NHWC') ? x.shape[2] : x.shape[3];\n const inputDepth = (dataFormat === 'NHWC') ? x.shape[3] : x.shape[1];\n\n const outputHeight = inputHeight * blockSize;\n const outputWidth = inputWidth * blockSize;\n const outputDepth = inputDepth / (blockSize * blockSize);\n\n const outputShape = (dataFormat === 'NHWC') ?\n [batchSize, outputHeight, outputWidth, outputDepth] :\n [batchSize, outputDepth, outputHeight, outputWidth];\n\n const out = backend.makeOutput(outputShape, 'float32');\n\n const xData = backend.dataIdMap.get(x.dataId);\n const xId = xData.id;\n const xStridesBytes =\n new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n\n const outputShapeBytes = new Uint8Array(new Int32Array(outputShape).buffer);\n const outStridesBytes =\n new Uint8Array(new Int32Array(util.computeStrides(outputShape)).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n const channelsLast = dataFormat === 'NHWC' ? 1 : 0;\n wasmDepthToSpace(\n xId, blockSize, channelsLast, xStridesBytes, x.shape.length - 1,\n outputShapeBytes, outStridesBytes, outputShape.length, outId);\n\n return out;\n}\n\nexport const depthToSpaceConfig: KernelConfig = {\n kernelName: DepthToSpace,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: depthToSpace as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n===\n*/\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs, DepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthwiseConv2d: (\n xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number, padTop: number,\n padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n dilationHeight: number, dilationWidth: number, strideHeight: number,\n strideWidth: number, inputChannels: number, outputChannels: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmDepthwiseConv2d =\n backend.wasm.cwrap(DepthwiseConv2dNative, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', //

filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n}\n\nfunction depthwiseConv2d(args: {\n inputs: DepthwiseConv2dNativeInputs,\n backend: BackendWasm,\n attrs: DepthwiseConv2dNativeAttrs\n}) {\n const {inputs, attrs, backend} = args;\n\n const {x, filter} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const {strides, dilations, pad, dimRoundingMode} = attrs;\n\n const $dilations = dilations == null ? [1, 1] : dilations;\n\n const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides,\n ($dilations as number | [number, number]), pad, dimRoundingMode,\n true /* depthwise */);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend DepthwiseConv2dNative does not support dataFormat:'` +\n `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmDepthwiseConv2d(\n xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n dilationHeight, dilationWidth, strideHeight, strideWidth, inputChannels,\n outputChannels, outId);\n return out;\n}\n\nexport const depthwiseConv2dNativeConfig: KernelConfig = {\n kernelName: DepthwiseConv2dNative,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: depthwiseConv2d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport {Elu, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const eluConfig: KernelConfig = createUnaryKernelConfig(Elu);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport {Equal, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const equalConfig: KernelConfig =\n createBinaryKernelConfig(Equal, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,

software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const expConfig: KernelConfig = createUnaryKernelConfig(Exp, 'float32');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs,
KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from './Reshape';\n\nexport function expandDims(args: {\n inputs: ExpandDimsInputs,\n attrs: ExpandDimsAttrs,\n backend: BackendWasm\n}) {\n const {inputs, attrs, backend} = args;\n const {input} = inputs;\n const {dim} = attrs;\n\n const inputRank = input.shape.length;\n const newShape = input.shape.slice();\n let $dim = dim;\n if (dim < 0) {\n // Negative value is counted from the tail of rank.\n util.assert(\n -(inputRank + 1) <= dim,\n () => `Axis must be in the interval [${- (inputRank + 1)}, ${\n inputRank}]`);\n $dim = inputRank + dim + 1;\n }\n newShape.splice($dim, 0, 1);\n\n return reshape({inputs: {x: input}, backend, attrs: {shape: newShape}});\n}\n\nexport const expandDimsConfig: KernelConfig = {\n kernelName: ExpandDims,\n backendName: 'wasm',\n kernelFunc: expandDims as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {Fill, FillAttrs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function fill(args: {attrs: FillAttrs, backend: BackendWasm}) {\n const {attrs: {shape,
value, dtype}, backend} = args;\n const out = backend.makeOutput(shape, dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(value as number);\n return out;\n}\n\nexport const fillConfig: KernelConfig = {\n kernelName: Fill,\n backendName: 'wasm',\n kernelFunc: fill as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {FlipLeftRight, FlipLeftRightInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFlipLeftRight: (\n xId: number, batch: number, imageHeight: number, imageWidth: number,\n numChannels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmFlipLeftRight = backend.wasm.cwrap(FlipLeftRight,

null /* void */, [\n   'number', // xId\n   'number', // batch\n   'number', // imageHeight\n   'number', // imageWidth\n   'number', // numChannels\n   'number', // outId\n]);\n}\n\nexport function flipLeftRight(\n args: {inputs: FlipLeftRightInputs, backend: BackendWasm}): TensorInfo {\n const {inputs, backend} = args;\n const {image} = inputs;\n\n const out = backend.makeOutput(image.shape, image.dtype);\n const imageId = backend.dataIdMap.get(image.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n\n wasmFlipLeftRight(\n   imageId, batch, imageHeight, imageWidth, numChannels, outId);\n return out;\n}\n\nexport const flipLeftRightConfig: KernelConfig = {\n kernelName: FlipLeftRight,\n backendName: 'wasm',\n kernelFunc: flipLeftRight as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the
 License.\n *
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*/\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
 */\n\nimport {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const floorDivConfig: KernelConfig =\n createBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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 /\n\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmBatchNorm: (\n   xId: number, meanId: number, varianceId: number, offsetId: number,\n   scaleId: number, varianceEpsilon: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmBatchNorm = backend.wasm.cwrap(\n   FusedBatchNorm, null / void */,\n   ['number', 'number', 'number', 'number', 'number', 'number', 'number']);\n}\n\nfunction fusedBatchNorm(args: {\n backend: BackendWasm,\n inputs: FusedBatchNormInputs,\n attrs: FusedBatchNormAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {varianceEpsilon} = attrs;\n const {x, mean, variance, offset, scale} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const meanId = backend.dataIdMap.get(mean.dataId).id;\n const varianceId = backend.dataIdMap.get(variance.dataId).id;\n const offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n const scaleId = scale != null ? backend.dataIdMap.get(scale.dataId).id : 0;\n\n const out = backend.makeOutput(x.shape, x.dtype);\n // Short-

```
circuit zero-sized tensors.\n  if (util.sizeFromShape(x.shape) === 0) {\n    return out;\n  }\n\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n\n  wasmBatchNorm(\n      xId, meanId, varianceId, offsetId, scaleId,
varianceEpsilon, outId);\n  return out;\n}\n\nexport const fusedBatchNormConfig: KernelConfig = {\n  kernelName:
FusedBatchNorm,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: fusedBatchNorm as {} as
KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either
express or implied.\n * See the License for the specific language governing permissions and\n * limitations under
the License.\n *
==========================================================================\n
*/\n\nimport {backend_util, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc,
Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport
{FusableActivation} from './types';\n\nlet wasmFusedConv2d:\n    (xId: number, batchSize: number, inputHeight:
number, inputWidth: number,\n     filterId: number, filterHeight: number, filterWidth: number,\n     biasId: number,
padTop: number, padRight: number, padBottom: number,\n     padLeft: number, isSamePad: number,
dilationHeight: number,\n     dilationWidth:
 number, strideHeight: number, strideWidth: number,\n     inputChannels: number, outputChannels: number,
activation: number,\n     preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n
void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedConv2d = backend.wasm.cwrap(FusedConv2D,
null /* void */, [\n    'number',  // xId\n    'number',  // batchSize\n    'number',  // inputHeight\n    'number',  //
inputWidth\n    'number',  // filterId\n    'number',  // filterHeight\n    'number',  // filterWidth\n    'number',  // biasId\n
  'number',  // padTop\n    'number',  // padRight\n    'number',  // padBottom\n    'number',  // padLeft\n    'number',  //
isSamePad\n    'number',  // dilationHeight\n    'number',  // dilationWidth\n    'number',  // strideHeight\n    'number',
// strideWidth\n    'number',  // inputChannels\n    'number',  // outputChannels\n    'number',  // activation\n
'number',  // preluActivationWeightsId\n    'number',  // leakyreluAlpha\n
    'number',  // outId\n  ]);\n}\n\nfunction fusedConv2d(args: {\n  inputs: FusedConv2DInputs,\n  backend:
BackendWasm,\n  attrs: FusedConv2DAttrs\n}) {\n  const {inputs, attrs, backend} = args;\n  const {x, filter, bias,
preluActivationWeights} = inputs;\n  const {\n    strides,\n    pad,\n    dilations,\n    dataFormat,\n
dimRoundingMode,\n    activation,\n    leakyreluAlpha\n  } = attrs;\n\n  const convInfo =
backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n
pad, dimRoundingMode);\n\n  const fusedActivation =\n      FusableActivation[activation as {} as keyof typeof
FusableActivation];\n  if (fusedActivation == null) {\n    throw new Error(\n        `${activation} activation not yet
supported for FusedConv2D ` +\n        `in the wasm backend.`);\n  }\n\n  const xId =
backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n  const
outputChannels = convInfo.outChannels;\n\n
  let biasId = 0;\n  if (bias != null) {\n    const biasData = backend.dataIdMap.get(bias.dataId);\n    if
(biasData.shape.length !== 1) {\n      throw new Error(\n          `FusedConv2D only supports rank-1 bias but got ` +\n
+\n          `rank ${biasData.shape.length}.`);\n    }\n    if (biasData.shape[0] !== outputChannels) {\n      throw new
Error(\n          `FusedConv2D bias shape (${biasData.shape}) does not ` +\n          `match the number of output
channels (${outputChannels})`);\n    }\n    biasId = biasData.id;\n  }\n\n  const filterHeight =
convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const
padRight = convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft =
convInfo.padInfo.left;\n  const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth =
convInfo.dilationWidth;\n  const strideHeight = convInfo.strideHeight;\n  const strideWidth =
convInfo.strideWidth;\n
```

```
  const inputChannels = convInfo.inChannels;\n  const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n
const batchSize = convInfo.batchSize;\n  const inHeight = convInfo.inHeight;\n  const inWidth =
convInfo.inWidth;\n\n  if (dataFormat !== 'NHWC') {\n    throw new Error(\n        `wasm backend FusedConv2D
does not support dataFormat:'` +\n        `${dataFormat}'. Please use 'NHWC'.`);\n  }\n\n  const out =
backend.makeOutput(convInfo.outShape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const
preluActivationWeightsId = preluActivationWeights == null ?\n      0 :\n
backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n  wasmFusedConv2d(\n      xId, batchSize, inHeight,
inWidth, filterId, filterHeight, filterWidth,\n      biasId, padTop, padRight, padBottom, padLeft, isSamePad,
dilationHeight,\n      dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n      fusedActivation,
preluActivationWeightsId, leakyreluAlpha ||
  0, outId);\n\n  return out;\n}\n\nexport const fusedConv2DConfig: KernelConfig = {\n  kernelName:
FusedConv2D,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: fusedConv2d as {} as
KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
==========================================================================\n
*/\n\nimport {backend_util, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs,
  FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet
wasmFusedDepthwiseConv2d:\n    (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n
filterId: number, filterHeight: number, filterWidth: number,\n      biasId: number, padTop: number, padRight:
number, padBottom: number,\n      padLeft: number, isSamePad: number, dilationHeight: number,\n
dilationWidth: number, strideHeight: number, strideWidth: number,\n      inputChannels: number, outputChannels:
number, activation: number,\n      preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n
    void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedDepthwiseConv2d =\n
backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n        'number',  // xId\n        'number',  //
batchSize\n        'number',  // inputHeight\n
  'number',  // inputWidth\n        'number',  // filterId\n        'number',  // filterHeight\n        'number',  // filterWidth\n
   'number',  // biasId\n        'number',  // padTop\n        'number',  // padRight\n        'number',  // padBottom\n
'number',  // padLeft\n        'number',  // isSamePad\n        'number',  // dilationHeight\n        'number',  //
dilationWidth\n        'number',  // strideHeight\n        'number',  // strideWidth\n        'number',  // inputChannels\n
'number',  // outputChannels\n        'number',  // activation\n        'number',  // preluActivationWeightsId\n
'number',  // leakyreluAlpha\n        'number',  // outId\n      ]);\n}\n\nfunction fusedDepthwiseConv2d(args: {\n
inputs: FusedDepthwiseConv2DInputs,\n  backend: BackendWasm,\n  attrs: FusedDepthwiseConv2DAttrs\n}) {\n
const {inputs, attrs, backend} = args;\n  const {x, filter, bias, preluActivationWeights} = inputs;\n  const {\n
strides,\n    pad,\n    dilations,\n
    dataFormat,\n    dimRoundingMode,\n    activation,\n    leakyreluAlpha\n  } = attrs;\n\n  const convInfo =
backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n
pad, dimRoundingMode, true /* depthwise */);\n\n  const fusedActivation =\n      FusableActivation[activation as {}
as keyof typeof FusableActivation];\n  if (fusedActivation == null) {\n    throw new Error(\n        `${activation}
activation not yet supported for FusedDepthwiseConv2D ` +\n        `in the wasm backend.`);\n  }\n\n  const xId =
backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n  const
outputChannels = convInfo.outChannels;\n\n  let biasId = 0;\n  if (bias != null) {\n    const biasData =
backend.dataIdMap.get(bias.dataId);\n    if (biasData.shape.length !== 1) {\n      throw new Error(\n
```

`FusedDepthwiseConv2D only supports rank-1 bias but got ` +\n `rank ${biasData.shape.length}.`);\n }\n if (biasData.shape[0] !== outputChannels) {\n throw new Error(\n `FusedDepthwiseConv2D bias shape (${biasData.shape}) does not ` +\n `match the number of output channels (${outputChannels})`);\n }\n biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize = convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if (dataFormat !== 'NHWC') {\n throw new Error(\n `wasm backend FusedDepthwiseConv2D does not support dataFormat:` +\n `${dataFormat}'. Please use 'NHWC'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const preluActivationWeightsId = preluActivationWeights == null ?\n 0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedDepthwiseConv2d(\n xId, batchSize, inHeight, inWidth, filterId, filterHeight, filterWidth,\n biasId, padTop, padRight, padBottom, padLeft, isSamePad, dilationHeight,\n dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedDepthwiseConv2DConfig: KernelConfig = {\n kernelName: FusedDepthwiseConv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedDepthwiseConv2d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmGatherNd: (\n xId: number, dtype: CppDType, indicesId: number, numSlices: number,\n sliceRank: number, sliceSize: number, strides: Uint8Array, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n 'number', // xId\n 'number', // dtype\n 'number', // indicesId\n 'number', // numSlices\n 'number', // sliceRank\n 'number', // sliceSize\n 'array', // strides\n 'number' // outId\n]);\n}\n\nfunction gatherNd(args: {backend: BackendWasm, inputs: GatherNdInputs}):\n TensorInfo {\n const {backend, inputs} = args;\n const {params, indices} = inputs;\n\n const [resultShape, numSlices, sliceSize, strides] =\n gather_util.prepareAndValidate(params, indices);\n\n const out = backend.makeOutput(resultShape, params.dtype);\n if (numSlices === 0) {\n return out;\n }\n\n const indicesShape = indices.shape;\n const sliceRank = indicesShape[indicesShape.length - 1];\n\n const xData = backend.dataIdMap.get(params.dataId);\n const xId = xData.id;\n\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const stridesBytes = new Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmGatherNd(\n xId, CppDType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n stridesBytes, outId);\n\n return out;\n}\n\nexport const gatherNdConfig: KernelConfig = {\n kernelName: GatherNd,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherNd\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *

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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc, Tensor, TensorInfo, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from './Reshape';\nimport {CppDType} from './types';\n\nlet wasmGather: (\n xId: number, dtype: CppDType, xStrides: Uint8Array, stridesSize: number,\n indicesId: number, batchSize: number, outStrides: Uint8Array,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmGather = backend.wasm.cwrap('Gather', null /*void*/, [\n 'number', // xId\n 'number', // dtype\n 'array', // xStrides\n 'number', // stridesSize\n 'number', // indicesId\n 'number', // batchSize\n
'array', // outStrides\n 'number' // outId\n]);\n}\n\nfunction gatherV2(\n args: {backend: BackendWasm, inputs: GatherV2Inputs, attrs: GatherV2Attrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x, indices} = inputs;\n const {axis, batchDims} = attrs;\n\n // Throw error when any index is out of bound.\n const parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n const indicesVals = backend.readSync(indices.dataId) as TypedArray;\n const axisDim = x.shape[parsedAxis];\n for (let i = 0; i < indicesVals.length; ++i) {\n const index = indicesVals[i];\n util.assert(\n index <= axisDim - 1 && index >= 0,\n () =>\n `GatherV2: the index value ${index} is not in [0, ${axisDim - 1}]`);\n }\n\n const shapeInfo = backend_util.segment_util.collectGatherOpShapeInfo(\n x as Tensor, indices as Tensor, parsedAxis, batchDims);\n\n const flattenX = reshape({\n inputs: {x},\n attrs: {\n shape: [\n shapeInfo.batchSize, shapeInfo.outerSize, shapeInfo.dimSize,\n shapeInfo.sliceSize\n]\n },\n backend\n });\n const indicesSize = util.sizeFromShape(indices.shape);\n const flattenIndex = reshape({\n inputs: {x: indices},\n attrs: {shape: [shapeInfo.batchSize, indicesSize / shapeInfo.batchSize]},\n backend\n });\n const flattenOutputShape = [\n shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n shapeInfo.sliceSize\n];\n\n const out = backend.makeOutput(flattenOutputShape, x.dtype);\n if (util.sizeFromShape(x.shape) === 0) {\n return out;\n }\n const stridesSize = flattenX.shape.length - 1;\n\n const xData = backend.dataIdMap.get(flattenX.dataId);\n const xId = xData.id;\n\n const indicesData = backend.dataIdMap.get(flattenIndex.dataId);\n const indicesId = indicesData.id;\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const xStridesBytes = new Uint8Array(\n new Int32Array(util.computeStrides(flattenX.shape)).buffer);\n
const outStridesBytes = new Uint8Array(\n new Int32Array(util.computeStrides(flattenOutputShape)).buffer);\n\n wasmGather(\n xId, CppDType[x.dtype], xStridesBytes, stridesSize, indicesId,\n shapeInfo.batchSize, outStridesBytes, outId);\n\n backend.disposeData(flattenX.dataId);\n backend.disposeData(flattenIndex.dataId);\n\n // reshape\n out.shape = shapeInfo.outputShape;\n return out;\n}\n\nexport const gatherV2Config: KernelConfig = {\n kernelName: GatherV2,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherV2 as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed
under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\nimport {Greater, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterConfig: KernelConfig =\n createBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google

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 * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\nimport {GreaterEqual, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterEqualConfig: KernelConfig =\n createBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in
 writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
/\n\nimport {KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmFunc: (\n xId: number, dtype: number, leakyreluAlpha: number, outId: number) => void;\n\nfunction setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(LeakyRelu, null / void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // leakyrelu_alpha\n 'number', // out_id\n]);\n}\n\nexport function leakyRelu(\n args:\n {inputs: LeakyReluInputs, attrs: LeakyReluAttrs,
 backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, attrs: {alpha}, backend} = args;\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n // According to TF API, LeakyRelu returns float32 when input is either float32\n // or int32.\n const out = backend.makeOutput(x.shape, 'float32');\n\n if (util.sizeFromShape(x.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(xId, CppDType[x.dtype], alpha, outId);\n }\n\n return out;\n}\n\nexport const leakyReluConfig: KernelConfig = {\n kernelName: LeakyRelu,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: leakyRelu as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
 law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\nimport {KernelConfig, Less} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessConfig: KernelConfig =\n createBinaryKernelConfig(Less, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law
 or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {KernelConfig, LessEqual} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from

'./binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessEqualConfig: KernelConfig =\n createBinaryKernelConfig(LessEqual, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {KernelConfig, Log} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const logConfig: KernelConfig = createUnaryKernelConfig(Log);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {KernelConfig, LogicalAnd} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const logicalAndConfig: KernelConfig =\n createBinaryKernelConfig(LogicalAnd, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License
is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmMax: (xId: number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMax = backend.wasm.cwrap(Max, null /*void*/, [\n 'number', // x_id\n 'number', // dtype\n 'number', // reduce_size\n 'number', // out_id\n]);\n}\n\nfunction max(args: {backend: BackendWasm, inputs: MaxInputs, attrs: MaxAttrs}):\n TensorInfo {\n const
{backend, inputs, attrs} = args;\n const {reductionIndices: axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n input = transposed;\n inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('max', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize =
util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmMax(inputId, CppDType[x.dtype], reduceSize, outId);\n }\n\n if (inputWasTransposed)

{\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return out;\n}\n\nexport const maxConfig: KernelConfig = {\n kernelName: Max,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: max as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing
 permissions and\n * limitations under the License.\n *
==\n
*/\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const maximumConfig: KernelConfig =\n createBinaryKernelConfig(Maximum, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions
 and\n * limitations under the License.\n *
==\n
/\n\nimport {backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmMaxPool: (\n xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterHeight: number, filterWidth: number, padTop: number, padRight: number,\n padBottom: number, padLeft: number, dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmMaxPool = backend.wasm.cwrap(MaxPool, null / void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n}\n\nfunction maxPool(\n args: {inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n const {inputs, attrs, backend} = args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n // TF API supports int32 input. CPU and WebGL backend also support int32\n // input. WASM backend doesn't support it because it uses xnnpack which only\n // supports float32.\n //\n // Add the following assert only for the WASM backend instead of at core op\n // level.\n //\n // TODO: add support for int32 input.\n util.assert(\n   x.dtype === 'float32',\n   () =>\n   `Error in MaxPool: only float32 input
 is supported. Got ${x.dtype}.`);\n\n const {filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n   x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n   `wasm

backend does not support dataFormat:'` +\n `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmMaxPool(\n xId, x.shape[0], x.shape[1], x.shape[2], filterHeight, filterWidth,\n padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n strideHeight, strideWidth, inputChannels, outputChannels, outId);\n return out;\n}\n\nexport const maxPoolConfig: KernelConfig = {\n kernelName: MaxPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: maxPool as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {cast} from './Cast';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmMean: (xId: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMean =\n backend.wasm.cwrap(Mean, null /*void*/, ['number, number, number']);\n}\n\nexport function mean(\n args: {backend: BackendWasm, inputs: MeanInputs, attrs: MeanAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n
let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was not a no-op. We will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n reductionAxes.length, input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'mean', reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize = util.sizeFromShape(reduceShape);\n let castedInput = input;\n if (input.dtype !== 'float32') {\n castedInput =\n cast({backend, inputs: {x: input}, attrs: {dtype:
'float32'}});\n inputId = backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(outShape, 'float32');\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmMean(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n if (input.dtype !== 'float32') {\n backend.disposeData(castedInput.dataId);\n }\n\n return out;\n}\n\nexport const meanConfig: KernelConfig = {\n kernelName: Mean,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: mean as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
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```
==========\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmMin: (xId:
number, dtype: number, reduceSize: number, outId: number) =>\n    void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmMin = backend.wasm.cwrap(Min,
 null /*void*/, [\n    'number',  // x_id\n    'number',  // dtype\n    'number',  // reduce_size\n    'number',  // out_id\n
]);\n}\n\nfunction min(args: {backend: BackendWasm, inputs: MinInputs, attrs: MinAttrs}):\n    TensorInfo {\n
const {backend, inputs, attrs} = args;\n  const {axis, keepDims} = attrs;\n  const {x} = inputs;\n  const xId =
backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const {transposed, axes, originalAxes,
inputWasTransposed} =\n      permuteAxesAndTranspose(x, axis, backend);\n\n  if (inputWasTransposed) {\n
const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId !== xId) {\n      // transpose
was not a no-op. We will need to dispose of this\n      // once we are done.\n      input = transposed;\n      inputId =
transposedId;\n    }\n  }\n\n  const inputRank = input.shape.length;\n\n
backend_util.assertAxesAreInnerMostDims('min', axes, inputRank);\n  const [outShape, reduceShape] =\n
    backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =
util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, input.dtype);\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmMin(inputId, CppDType[x.dtype], reduceSize, outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of the
transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const
newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n
return out;\n}\n\nexport const minConfig: KernelConfig = {\n  kernelName: Min,\n  backendName: 'wasm',\n
setupFunc: setup,\n  kernelFunc: min as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google
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\"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n
* See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\nimport {KernelConfig, Minimum} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\nconst supportsFullBroadcast = false;\nexport const minimumConfig: KernelConfig =\n
createBinaryKernelConfig(Minimum, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2021 Google
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==========\n
*/\n\nimport {KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\n// Must match
enum in MirrorPad.cc\nenum MirrorPaddingMode {\n  reflect = 0,\n  symmetric = 1\n}\n\nlet wasmMirrorPad: (\n
xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n    prePaddingsBytes:
Uint8Array, postPaddingsBytes: Uint8Array, mode: number,\n
 outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmMirrorPad =
backend.wasm.cwrap(MirrorPad, null /* void */, [\n    'number',  // xId\n    'array',   // x.shape\n    'number',  //
x.shape.length\n    'number',  // x.dtype\n    'array',   // pre-paddings\n    'array',   // post-paddings\n    'number',  //
```

mode\n   'number', // outId\n]);\n}\n\nfunction mirrorPad(args: {\n inputs: MirrorPadInputs,\n backend: BackendWasm,\n attrs: MirrorPadAttrs\n}) {\n const {inputs: {x}, backend, attrs: {paddings, mode}} = args;\n\n const outShape = paddings.map(\n   (p, i) => p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(outShape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple
 => padTuple[1]);\n const prePaddingsBytes =\n   new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const postPaddingsBytes =\n   new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmMirrorPad(\n   xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n   postPaddingsBytes, MirrorPaddingMode[mode], outId);\n return out;\n}\n\nexport const mirrorPadConfig: KernelConfig = {\n kernelName: MirrorPad,\n backendName: 'wasm',\n kernelFunc: mirrorPad as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
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==========\n */\n\nimport {KernelConfig, Multiply} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = true;\nexport const multiplyConfig: KernelConfig =\n createBinaryKernelConfig(Multiply, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
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 BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {KernelConfig, Neg} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const negConfig: KernelConfig = createUnaryKernelConfig(Neg);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n
 * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {BackendWasm} from '../backend_wasm';\n\n// Analogous to `struct Result` in `non_max_suppression_impl.h`.\ninterface Result {\n pSelectedIndices: number;\n selectedSize: number;\n pSelectedScores: number;\n pValidOutputs: number;\n}\n/**\n * Parse the result of the c++ method, which has the shape equivalent to\n * `Result`.\n */\nexport function parseResultStruct(\n   backend: BackendWasm, resOffset: number): Result {\n const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);\n const pSelectedIndices = result[0];\n const selectedSize = result[1];\n const pSelectedScores = result[2];\n const pValidOutputs = result[3];\n // Since the result was allocated on the heap, we have to delete it.\n backend.wasm._free(resOffset);\n return {pSelectedIndices, selectedSize,

pSelectedScores, pValidOutputs};\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs, NonMaxSuppressionV3Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number) => number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n NonMaxSuppressionV3,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', // scoreThreshold\n]);\n}\n\nfunction kernelFunc(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV3Inputs,\n attrs: NonMaxSuppressionV3Attrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold} = attrs;\n const {boxes, scores} = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset =\n wasmFunc(boxesId, scoresId, maxOutputSize, iouThreshold,\n scoreThreshold);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V3, we have to delete it from the heap.\n backend.wasm._free(pSelectedScores);\n backend.wasm._free(pValidOutputs);\n\n const selectedIndicesTensor =\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n return selectedIndicesTensor;\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n kernelName: NonMaxSuppressionV3,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs, NonMaxSuppressionV4Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number,\n padToMaxOutputSize: boolean) => number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n NonMaxSuppressionV4,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', // scoreThreshold\n 'bool', // padToMaxOutputSize\n]);\n}\n\nfunction nonMaxSuppressionV4(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV4Inputs,\n attrs: NonMaxSuppressionV4Attrs\n}): TensorInfo[] {\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold, padToMaxOutputSize} =\n attrs;\n const {boxes, scores} = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const

resOffset = wasmFunc(\n boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n padToMaxOutputSize);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V4, we have to delete it from the heap.\n backend.wasm._free(pSelectedScores);\n\n
const selectedIndicesTensor =\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n const validOutputsTensor = backend.makeOutput([], 'int32', pValidOutputs);\n\n return [selectedIndicesTensor, validOutputsTensor];\n}\n\nexport const nonMaxSuppressionV4Config: KernelConfig = {\n kernelName: NonMaxSuppressionV4,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: nonMaxSuppressionV4 as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See
the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs, NonMaxSuppressionV5Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc:\n (boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number, softNmsSigma: number) =>\n number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n NonMaxSuppressionV5,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', // scoreThreshold\n 'number', // softNmsSigma\n]);\n}\n\nfunction
kernelFunc(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV5Inputs,\n attrs: NonMaxSuppressionV5Attrs\n}): TensorInfo[] {\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold, softNmsSigma} = attrs;\n const {boxes, scores} = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset = wasmFunc(\n boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n softNmsSigma);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using validOutputs for V5, we have to delete it from the\n // heap.\n backend.wasm._free(pValidOutputs);\n\n const selectedIndicesTensor =\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n const selectedScoresTensor =\n backend.makeOutput([selectedSize], 'float32', pSelectedScores);\n\n
return [selectedIndicesTensor, selectedScoresTensor];\n}\n\nexport const nonMaxSuppressionV5Config: KernelConfig = {\n kernelName: NonMaxSuppressionV5,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\nimport
{KernelConfig, NotEqual} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const notEqualConfig: KernelConfig =\n createBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2020

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==========\n
*/\n\nimport
{KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmOneHot: (\n indicesId: number, depth: number, onValue: number, offValue: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmOneHot = backend.wasm.cwrap(OneHot, null /* void */, [\n 'number', // indices_id\n 'number', // depth,\n 'number', // onValue\n 'number', // offValue\n 'number' // out_id\n]);\n}\n\nfunction oneHot(\n args: {inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm}) {\n const {inputs, backend, attrs} = args;\n const {indices} = inputs;\n const {depth, onValue, offValue} = attrs;\n\n const out = backend.makeOutput([...indices.shape, depth], 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n wasmOneHot(indicesId, depth,
onValue, offValue, outId);\n\n return out;\n}\n\nexport const oneHotConfig: KernelConfig = {\n kernelName: OneHot,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: oneHot as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {KernelConfig, KernelFunc, OnesLike, OnesLikeInputs} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nfunction onesLike(args: {inputs: OnesLikeInputs, backend: BackendWasm}) {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(1);\n return out;\n}\n\nexport const onesLikeConfig: KernelConfig = {\n kernelName: OnesLike,\n backendName: 'wasm',\n kernelFunc: onesLike as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express
or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nimport {concat} from './Concat';\nimport {expandDims} from './ExpandDims';\n\nexport function pack(\n args: {inputs: PackInputs, backend: BackendWasm, attrs: PackAttrs}):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n const {axis} = attrs;\n\n if (inputs.length === 1) {\n return expandDims(\n {inputs: {input: inputs[0]}, backend, attrs: {dim: axis}});\n }\n\n const shape = inputs[0].shape;\n const dtype = inputs[0].dtype;\n\n inputs.forEach(t => {\n util.assertShapesMatch(\n shape, t.shape,\n 'All tensors passed to stack must have matching shapes');\n

util.assert(\n
dtype === t.dtype,\n () => 'All tensors passed to stack must have matching dtypes');\n });\n\n const intermediateTensorInfos: TensorInfo[] = [];\n const expandedTensors = inputs.map(t => {\n const expandedT =\n expandDims({inputs: {input: t}, backend, attrs: {dim: axis}});\n intermediateTensorInfos.push(expandedT);\n return expandedT;\n });\n\n const result = concat({inputs: expandedTensors, backend, attrs: {axis}});\n\n intermediateTensorInfos.forEach(t => backend.disposeData(t.dataId));\n\n return result;\n}\n\nexport const packConfig: KernelConfig = {\n kernelName: Pack,\n backendName: 'wasm',\n kernelFunc: pack as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {fill} from './Fill';\n\nimport {CppDType} from './types';\n\nlet wasmPadV2: (\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array,\n constantValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmPadV2 = backend.wasm.cwrap(PadV2, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n 'array', // pre-paddings\n 'array', // post-paddings\n 'number', // constantValue\n 'number', // outId\n]);\n}\n\nfunction pad(\n args: {inputs: PadV2Inputs, backend: BackendWasm, attrs: PadV2Attrs}) {\n const {inputs: {x}, backend, attrs: {paddings, constantValue}} = args;\n\n const outShape = paddings.map(\n (p, i) => p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n\n if (util.sizeFromShape(x.shape) === 0) {\n // Short-circuit the computation, since x doesn't have value, only\n // the shape is used to compute output shape to pad.\n return fill({\n backend,\n attrs: {shape: outShape, value: constantValue, dtype: x.dtype}\n });\n }\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(outShape, x.dtype);\n const outTensorData = backend.dataIdMap.get(out.dataId);\n const outId = outTensorData.id;\n\n const xShapeBytes =\n new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n const prePaddingsBytes =\n new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const postPaddingsBytes =\n new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmPadV2(\n xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n postPaddingsBytes, constantValue, outId);\n return out;\n}\n\nexport const padV2Config: KernelConfig = {\n kernelName: PadV2,\n backendName: 'wasm',\n kernelFunc: pad as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport {KernelConfig, Pow} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const powConfig: KernelConfig =\n createBinaryKernelConfig(Pow, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All

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applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
/\n\nimport {KernelConfig, KernelFunc, Prelu, PreluInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from './Cast';\n\nlet wasmPrelu: (xId: number, weightsId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmPrelu = backend.wasm.cwrap(Prelu, null / void */, [\n 'number', // x_id\n 'number', // weights_id\n 'number' // out_id\n]);\n}\n\nfunction prelu(args: {inputs: PreluInputs, backend: BackendWasm}) {\n const {inputs, backend} = args;\n const {x, alpha} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n
const weightsId = backend.dataIdMap.get(alpha.dataId).id;\n\n let inputId = xId;\n const input = x;\n let castedInput = input;\n if (input.dtype !== 'float32') {\n castedInput = cast({backend, inputs: {x}, attrs: {dtype: 'float32'}});\n inputId = backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(x.shape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmPrelu(inputId, weightsId, outId);\n\n if (input.dtype !== 'float32') {\n backend.disposeData(castedInput.dataId);\n }\n return out;\n}\n\nexport const preluConfig: KernelConfig = {\n kernelName: Prelu,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prelu as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n
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==========\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\n\nimport {CppDType} from './types';\n\nlet wasmProd: (\n xId: number, reduceSize: number,\n dtype: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmProd = backend.wasm.cwrap(Prod, null /*void*/, [\n 'number',\n 'number',\n 'number',\n 'number'\n
]);\n}\n\nfunction prod(args: {\n backend: BackendWasm,\n inputs: ProdInputs,\n attrs: ProdAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was not a no-op. We will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n reductionAxes.length, input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'prod', reductionAxes, input.shape.length);\n const [outShape, reduceShape]
=\n backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmProd(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n // dispose of

the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return out;\n}\n\nexport const prodConfig: KernelConfig = {\n kernelName: Prod,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prod as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\nimport {rangeImplCPU} from '../kernel_utils/shared';\n\nexport const
range =\n (args: {backend: BackendWasm, attrs: RangeAttrs}): TensorInfo => {\n const {backend, attrs} =
args;\n const {start, stop, step, dtype} = attrs;\n const values = rangeImplCPU(start, stop, step, dtype);\n\n
const
out = backend.makeOutput([values.length], dtype);\n const outVals = backend.typedArrayFromHeap(out);\n
outVals.set(values);\n return out;\n };\n\nexport const rangeConfig: KernelConfig = {\n kernelName: Range,\n
backendName: 'wasm',\n kernelFunc: range as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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==========\n
*/\n\nimport {KernelConfig, RealDiv} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\n\nconst supportsFullBroadcast = true;\nexport const realDivConfig: KernelConfig =\n
createBinaryKernelConfig(RealDiv, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC.
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==========\n
*/\nimport {KernelConfig, Relu} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const reluConfig: KernelConfig = createUnaryKernelConfig(Relu);\n","/**\n * @license\n
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\nimport {KernelConfig, Relu6} from '@tensorflow/tfjs-core';\n\nimport

{createUnaryKernelConfig} from './unary_kernel';\nexport const relu6Config: KernelConfig = createUnaryKernelConfig(Relu6);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from './Cast';\n\nlet wasmResizeBilinear: (\n xId: number, batch: number, oldHeight: number, oldWidth: number,\n numChannels: number, newHeight: number, newWidth: number,\n alignCorners: number, halfPixelCenters: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmResizeBilinear = backend.wasm.cwrap(ResizeBilinear, null /*void*/, [\n 'number', // xId\n 'number', // batch\n 'number', // oldHeight\n 'number', // oldWidth\n 'number', // numChannels\n 'number', // newHeight\n 'number', // newWidth\n 'number', // alignCorners\n 'number', // halfPixelCenters\n 'number' // outId\n]);\n}\n\nfunction resizeBilinear(args: {\n backend: BackendWasm,\n inputs: ResizeBilinearInputs,\n attrs: ResizeBilinearAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n\n const {images} = inputs;\n const {alignCorners, halfPixelCenters, size} = attrs;\n const [newHeight, newWidth] = size;\n\n const [batch, oldHeight, oldWidth, numChannels] = images.shape;\n const outShape = [batch, newHeight, newWidth, numChannels];\n\n let xData = backend.dataIdMap.get(images.dataId);\n let castedData;\n if (xData.dtype !== 'float32') {\n castedData =\n cast({backend, inputs: {x: images}, attrs: {dtype: 'float32'}});\n xData = backend.dataIdMap.get(castedData.dataId);\n }\n const xId = xData.id;\n\n const out = backend.makeOutput(outShape, 'float32');\n if (util.sizeFromShape(images.shape) === 0) {\n return out;\n }\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmResizeBilinear(\n xId, batch, oldHeight, oldWidth, numChannels, newHeight, newWidth,\n alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId);\n\n if (castedData != null) {\n backend.disposeData(castedData.dataId);\n }\n\n return out;\n}\n\nexport const resizeBilinearConfig: KernelConfig = {\n kernelName: ResizeBilinear,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: resizeBilinear as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\n\nlet wasmReverse: (\n xId: number, axes: Uint8Array, axesLength: number, outShape: Uint8Array,\n outShapeLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmReverse = backend.wasm.cwrap(Reverse, null, [\n 'number', // x_id\n 'array', // axes\n 'number', // axes_length\n 'array', // out_shape\n 'number', // out_shape_length\n 'number' // out_id\n]);\n}\n\nexport function reverse(\n args: {inputs: ReverseInputs, backend: BackendWasm, attrs: ReverseAttrs}):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {dims} = attrs;\n\n const axes = util.parseAxisParam(dims, x.shape);\n\n if (x.shape.length === 0) {\n return identity({inputs: {x}, backend});\n }\n\n const out = backend.makeOutput(x.shape, x.dtype);\n

const xId = backend.dataIdMap.get(x.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const axesBytes = new Uint8Array(new Int32Array(axes).buffer);\n const outShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n wasmReverse(\n   xId, axesBytes, axes.length, outShapeBytes, x.shape.length, outId);\n\n const reshaped =\n   reshape({inputs: {x: out}, attrs: {shape: x.shape}, backend});\n\n backend.disposeData(out.dataId);\n return reshaped;\n}\n\nexport const reverseConfig: KernelConfig = {\n kernelName: Reverse,\n backendName: 'wasm',\n kernelFunc: reverse as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, KernelFunc, RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmRotate: (\n   xId: number, batch: number, imageHeight: number, imageWidth: number,\n   numChannels: number, radians: number, centerX: number, centerY: number,\n fillBytes: Uint8Array, fillLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmRotate = backend.wasm.cwrap(RotateWithOffset, null /* void */, [\n   'number', // xId\n   'number', // batch\n   'number', // imageHeight\n   'number', // imageWidth\n   'number', // numChannels\n   'number', // radians\n   'number', // centerX\n   'number', // centerY\n   'array',   // fillBytes\n   'number', // fillLength\n   'number', // outId\n]);\n}\n\nexport function rotateWithOffset(args: {\n inputs: RotateWithOffsetInputs,\n backend: BackendWasm,\n attrs: RotateWithOffsetAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {image} = inputs;\n const {radians, fillValue, center} = attrs;\n\n const out = backend.makeOutput(image.shape, image.dtype);\n const imageId = backend.dataIdMap.get(image.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n\n const [centerX, centerY] =\n backend_util.getImageCenter(center, imageHeight, imageWidth);\n\n const fillIsBlack = fillValue === 0;\n const fullOpacityValue = 255;\n\n const fillValues = typeof fillValue === 'number' ?\n   [fillValue, fillValue, fillValue, fillIsBlack ? 0 : fullOpacityValue] :\n   [...fillValue, fullOpacityValue];\n const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);\n\n wasmRotate(\n   imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX,\n   centerY, fillBytes, fillValues.length, outId);\n return out;\n}\n\nexport const rotateWithOffsetConfig: KernelConfig = {\n kernelName: RotateWithOffset,\n backendName: 'wasm',\n kernelFunc: rotateWithOffset as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS
 OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport {KernelConfig, Round} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable

law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
language governing permissions and\n * limitations under the License.\n *
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*/\nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {KernelConfig, KernelFunc, scatter_util, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmScatterNd: (\n indicesId: number, updatesId: number, dtype: CppDType, sliceRank: number,\n numUpdates: number, sliceSize: number, strides: Uint8Array,\n outputSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmScatterNd = backend.wasm.cwrap(ScatterNd, null /*void*/, [\n   'number', // indicesId\n   'number', // updatesId\n   'number', // dtype\n   'number', // sliceRank\n   'number', // numUpdates\n   'number', // sliceSize\n   'array',   // strides\n   'number', // outputSize\n   'number'   // outId\n]);\n}\n\nfunction scatterNd(\n args:\n   {backend: BackendWasm, inputs: ScatterNdInputs, attrs:
ScatterNdAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {indices, updates} = inputs;\n const {shape} = attrs;\n\n const out = backend.makeOutput(shape, updates.dtype);\n if (util.sizeFromShape(shape) === 0) {\n   return out;\n }\n\n const {sliceRank, numUpdates, sliceSize, strides, outputSize} =\n scatter_util.calculateShapes(updates, indices, shape);\n\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const updatesData = backend.dataIdMap.get(updates.dataId);\n const updatesId = updatesData.id;\n\n const stridesBytes = new Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmScatterNd(\n   indicesId, updatesId, CppDType[updates.dtype], sliceRank, numUpdates,\n   sliceSize, stridesBytes, outputSize, outId);\n\n return out;\n}\n\nexport const scatterNdConfig: KernelConfig = {\n kernelName: ScatterNd,\n backendName: 'wasm',\n
setupFunc: setup,\n kernelFunc: scatterNd as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {KernelConfig, KernelFunc, Select, SelectInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmSelect: (\n conditionId: number, tId: number, eId: number, offset: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmSelect = backend.wasm.cwrap('SelectV2', null, [\n   'number', // conditionId\n   'number', // tId\n   'number', // eId\n   'number', // offset\n   'number', // outId\n]);\n}\n\nfunction select(args: {inputs: SelectInputs, backend: BackendWasm}) {\n const {inputs, backend} = args;\n const {condition, t, e} = inputs;\n\n const conditionId = backend.dataIdMap.get(condition.dataId).id;\n const tId = backend.dataIdMap.get(t.dataId).id;\n const eId =

backend.dataIdMap.get(e.dataId).id;\n const out = backend.makeOutput(t.shape, t.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const cRank = condition.shape.length;\n const tRank = t.shape.length;\n\n const offset = cRank === 0 || cRank > 1 || tRank === 1 ?\n   1 :\n util.sizeFromShape(t.shape.slice(1));\n\n wasmSelect(conditionId, tId, eId, offset, outId);\n return out;\n}\n\nexport const selectConfig:
KernelConfig = {\n kernelName: Select,\n backendName: 'wasm',\n kernelFunc: select as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm}
from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Sigmoid, null /* void */, ['number', 'number']);\n}\n\nfunction sigmoid(args: {backend: BackendWasm, inputs: SigmoidInputs}):\n   TensorInfo {\n const {backend, inputs: {x}} = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n   return out;\n }\n\n wasmFunc(xId, outId);\n return out;\n}\n\nexport const sigmoidConfig: KernelConfig = {\n kernelName: 'Sigmoid',\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sigmoid as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except
in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {KernelConfig, Sin} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number, channels: number, batch: number) =>\n   void;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Softmax, null /* void */, [\n   'number', // xId\n   'number', // outId\n 'number', // channels\n   'number'   // batch\n]);\n}\n\nfunction softmax(\n   args: {backend: BackendWasm,

inputs: SoftmaxInputs, attrs: SoftmaxAttrs}):\n TensorInfo {\n const {backend, inputs: {logits}, attrs: {dim}} = args;\n const xId = backend.dataIdMap.get(logits.dataId).id;\n const out = backend.makeOutput(logits.shape, logits.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const channels = logits.shape[dim];\n const batch = util.sizeFromShape(logits.shape) / channels;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n   return out;\n }\n\n wasmFunc(xId, outId, channels, batch);\n return out;\n}\n\nexport const softmaxConfig: KernelConfig = {\n kernelName: Softmax,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: softmax as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {backend_util, KernelConfig, KernelFunc, ReshapeAttrs, ReshapeInputs, SpaceToBatchND, SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, TransposeAttrs, TransposeInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {padV2Config} from './PadV2';\nimport {reshape} from './Reshape';\nimport {transpose} from './Transpose';\n\nfunction spaceToBatchND(args: {\n inputs: SpaceToBatchNDInputs,\n backend: BackendWasm,\n attrs: SpaceToBatchNDAttrs\n}) {\n const {inputs, backend,\n attrs} = args;\n const {x} = inputs;\n const {blockShape, paddings} = attrs;\n\n const prod = util.sizeFromShape(blockShape);\n\n const completePaddings: Array<[number, number]> = [[0, 0]];\n completePaddings.push(...(paddings as Array<[number, number]>));\n\n for (let i = 1 + blockShape.length; i < x.shape.length; ++i) {\n   completePaddings.push([0, 0]);\n }\n\n const paddedX = padV2Config.kernelFunc({\n inputs: {x},\n   backend,\n   attrs: {paddings: completePaddings, constantValue: 0}\n }) as TensorInfo;\n\n const reshapedPaddedShape =\n   backend_util.getReshaped(paddedX.shape, blockShape, prod, false);\n\n const permutedReshapedPaddedPermutation = backend_util.getPermuted(\n   reshapedPaddedShape.length, blockShape.length, false);\n\n const flattenShape =\n   backend_util.getReshapedPermuted(paddedX.shape, blockShape, prod, false);\n\n const reshapeInputs: ReshapeInputs = {x: paddedX};\n const reshapeAttrs: ReshapeAttrs = {shape: reshapedPaddedShape};\n\n const paddedXReshaped =\n   reshape({inputs: reshapeInputs, backend, attrs: reshapeAttrs});\n\n const transposeInputs: TransposeInputs = {x: paddedXReshaped};\n const transposeAttrs:\n   TransposeAttrs = {perm: permutedReshapedPaddedPermutation};\n const paddedXT =\n   transpose({inputs: transposeInputs, backend, attrs: transposeAttrs});\n\n const resultReshapeInputs: ReshapeInputs = {x: paddedXT};\n const resultReshapeAttrs: ReshapeAttrs = {shape: flattenShape};\n const result = reshape(\n   {inputs: resultReshapeInputs, backend, attrs: resultReshapeAttrs});\n\n backend.disposeData(paddedX.dataId);\n backend.disposeData(paddedXReshaped.dataId);\n backend.disposeData(paddedXT.dataId);\n\n return result;\n}\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n kernelName: SpaceToBatchND,\n backendName: 'wasm',\n kernelFunc: spaceToBatchND as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under\n the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, util} from '@tensorflow/tfjs-

core';\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {slice} from './Slice';\n\nexport function splitV(\n args: {inputs: SplitVInputs, attrs: SplitVAttrs, backend: BackendWasm}) {\n const {inputs,
 attrs, backend} = args;\n const {x} = inputs;\n const {numOrSizeSplits, axis} = attrs;\n\n const $axis = util.parseAxisParam(axis, x.shape)[0];\n\n const splitSizes = backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n const begin = new Array(x.shape.length).fill(0);\n const size = x.shape.slice();\n return splitSizes.map(s => {\n   const xSliceSize = [...size];\n   xSliceSize[$axis] = s;\n   const xSlice =\n   slice({inputs: {x}, attrs: {begin, size: xSliceSize}, backend});\n   begin[$axis] += s;\n   return xSlice;\n });\n}\n\nexport const splitVConfig: KernelConfig = {\n kernelName: SplitV,\n backendName: 'wasm',\n kernelFunc: splitV as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n
 *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {KernelConfig, Sqrt} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const sqrtConfig: KernelConfig = createUnaryKernelConfig(Sqrt);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n
 * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport {KernelConfig, Square} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const squareConfig: KernelConfig = createUnaryKernelConfig(Square);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT
 WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport {KernelConfig, SquaredDifference} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const squaredDifferenceConfig: KernelConfig =\n   createBinaryKernelConfig(SquaredDifference, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS
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==\n
*/\n\nimport {KernelConfig, KernelFunc, Step, StepAttrs, StepInputs, TensorInfo} from '@tensorflow/tfjs-

```
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmStep:
(xId: number, alpha: number, dtype: number, outId: number) =>\n    void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmStep = backend.wasm.cwrap(Step, null /*void*/, [\n    'number',  // x_id\n
'number',  // alpha\n    'number',  // dtype\n    'number',  // out_id\n  ]);\n}\n\nfunction step(\n    args: {backend:
BackendWasm, inputs: StepInputs, attrs: StepAttrs}):\n    TensorInfo {\n  const {backend, inputs, attrs} = args;\n
const {alpha} = attrs;\n  const {x} = inputs;\n  const xId =
 backend.dataIdMap.get(x.dataId).id;\n\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n  wasmStep(xId, alpha, CppDType[x.dtype], outId);\n  return
out;\n}\n\nexport const stepConfig: KernelConfig = {\n  kernelName: Step,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: step as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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 License.\n *
==========================================================================\n
*/\n\nimport {KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo,
util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from
'./Reshape';\nimport {slice} from './Slice';\n\nlet wasmStridedSlice: (\n    xId: number, xStridesBytes: Uint8Array,
xRank: number,\n    beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n    outShapeBytes:
Uint8Array, outStridesBytes: Uint8Array,\n    outShapeLength: number, outId: number) => void;\n\nfunction
setup(backend: BackendWasm): void {\n  wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n
 'number',  // xId\n    'array',   // xStrides\n    'number',  // xRank\n    'array',   // beginBytes\n    'array',   // endBytes\n
'array',   // stridesBytes\n    'array',   // outShapeBytes\n    'array',   // outStridesBytes\n    'number',
  // outShapeLength\n    'number',  // outId\n  ]);\n}\n\nexport function stridedSlice(args: {\n  backend:
BackendWasm,\n  inputs: StridedSliceInputs,\n  attrs: StridedSliceAttrs\n}): TensorInfo {\n  const {backend, inputs,
attrs} = args;\n  const {x} = inputs;\n\n  const {\n    begin,\n    end,\n    strides,\n    beginMask,\n    endMask,\n
ellipsisMask,\n    newAxisMask,\n    shrinkAxisMask\n  } = attrs;\n\n  const {\n    finalShapeSparse,\n
finalShape,\n    isIdentity,\n    sliceDim0,\n    isSimpleSlice,\n    begin: $begin,\n    end: $end,\n    strides: $strides\n
  } =\n      slice_util.sliceInfo(\n          x.shape, begin, end, strides, beginMask, endMask, ellipsisMask,\n
newAxisMask, shrinkAxisMask);\n\n  let result;\n\n  if (isIdentity) {\n    // Optimization #1, slice is a no-op plus
reshape\n    result = reshape({inputs: {x}, backend, attrs: {shape: finalShape}});\n  } else if (sliceDim0 ||
isSimpleSlice) {\n    // Optimization #2, slice is memory contiguous
 (only occurs in dim 0)\n    util.assert(\n        x.shape.length >= 1,\n        () => `Input must have rank at least 1, got:
${x.shape.length}`);\n\n    const size = slice_util.computeOutShape($begin, $end, $strides);\n    // To tolerate
begin[0] > end[0] (a 0-output slice), we min(begin, end).\n    const sliced = slice({inputs: {x}, backend, attrs:
{begin: $begin, size}});\n    result =\n        reshape({inputs: {x: sliced}, backend, attrs: {shape: finalShape}});\n
backend.disposeData(sliced.dataId);\n  } else {\n    const out = backend.makeOutput(finalShapeSparse,
'float32');\n\n    const xId = backend.dataIdMap.get(x.dataId).id;\n    const xStridesBytes =\n        new
Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n    const beginBytes = new Uint8Array(new
Int32Array($begin).buffer);\n    const endBytes = new Uint8Array(new Int32Array($end).buffer);\n    const
stridesBytes = new Uint8Array(new Int32Array($strides).buffer);\n\n    const outputShapeBytes =\n
    new Uint8Array(new Int32Array(finalShapeSparse).buffer);\n    const outStridesBytes = new Uint8Array(\n
new Int32Array(util.computeStrides(finalShapeSparse)).buffer);\n    const outId =
backend.dataIdMap.get(out.dataId).id;\n\n    wasmStridedSlice(\n        xId, xStridesBytes, x.shape.length,
beginBytes, endBytes, stridesBytes,\n        outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);\n\n
```

result = reshape({inputs: {x: out}, backend, attrs: {shape: finalShape}});\n\n backend.disposeData(out.dataId);\n }\n\n return result;\n}\n\nexport const stridedSliceConfig: KernelConfig = {\n kernelName: StridedSlice,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: stridedSlice as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License

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==========\n */\nimport {KernelConfig, Sub} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const subConfig: KernelConfig =\n createBinaryKernelConfig(Sub, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n

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==========\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmSum: (xId: number, reduceSize: number, dtype: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmSum = backend.wasm.cwrap(Sum, null /*void*/, [\n   'number', // input_id\n 'number', // reduce_size\n   'number', // dtype\n

    'number', // out_id\n]);\n}\n\nfunction sum(args: {backend: BackendWasm, inputs: SumInputs, attrs: SumAttrs}):\n   TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n   const transposedId =
backend.dataIdMap.get(transposed.dataId).id;\n   if (transposedId !== xId) {\n   // transpose was not a no-op. We will need to dispose of this\n   // once we are done.\n   input = transposed;\n   inputId = transposedId;\n   reductionAxes = backend_util.getInnerMostAxes(\n   reductionAxes.length, input.shape.length);\n   }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n   'sum', reductionAxes, input.shape.length);\n const [outShape, reduceShape]

 =\n   backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n   wasmSum(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n return out;\n}\n\nexport const sumConfig: KernelConfig = {\n kernelName: Sum,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sum as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except

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core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {CppDType} from './types';\n\nlet wasmTopK: (\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number,\n xDtype: CppDType, k: number, sorted: boolean, outValuesId:
number,\n outIndicesId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n 'number', // k\n 'bool', // sorted\n 'number', // outValuesId\n 'number', // outIndicesId\n]);\n}\n\nexport const topk:\n (args: {inputs: TopKInputs, backend: BackendWasm, attrs: TopKAttrs}) =>\n TensorInfo[] | TensorInfo = ({inputs, backend, attrs}) => {\n const {x} = inputs;\n const {k, sorted} = attrs;\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n const outputShape = x.shape.slice();\n outputShape[outputShape.length - 1] = k;\n const outValues = backend.makeOutput(outputShape, x.dtype);\n const outValuesId = backend.dataIdMap.get(outValues.dataId).id;\n
const outIndices = backend.makeOutput(outputShape, 'int32');\n const outIndicesId = backend.dataIdMap.get(outIndices.dataId).id;\n\n wasmTopK(\n xId, xShapeBytes, x.shape.length, CppDType[x.dtype], k, sorted,\n outValuesId, outIndicesId);\n\n return [outValues, outIndices];\n};\n\nexport const topKConfig: KernelConfig = {\n kernelName: TopK,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: topk as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS
OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transform, TransformAttrs, TransformInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmTransform: (\n imageId: number, transformsId: number, isBatchTransform: boolean,\n batch: number, outHeight: number, outWidth: number, numChannels: number,\n imageWidth: number, imageHeight: number, strides: Uint8Array,\n stridesLength: number, interpolationModeId: number, fillModeId: number,\n fillValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmTransform = backend.wasm.cwrap(Transform, null /*void*/, [\n 'number', // imageId\n 'number', // transformsId\n 'bool', // isBatchTransform\n 'number', // batch\n 'number', // outHeight\n 'number', // outWidth\n 'number', // numChannels\n 'number', // imageWidth\n 'number', // imageHeight\n 'array', // strides\n 'number', // stridesLength\n 'number', // interpolationModeId\n 'number', // fillModeId\n 'number', // fillValue\n 'number' // outId\n]);\n}\n\nfunction transform(\n args:\n {backend: BackendWasm, inputs: TransformInputs, attrs: TransformAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {image, transforms} = inputs;\n const {interpolation, fillMode, fillValue, outputShape} = attrs;\n\n const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n const [outHeight, outWidth] =\n outputShape != null ? outputShape : [imageHeight, imageWidth];\n const outShape =\n [batch, outHeight, outWidth,\n numChannels] as [number, number, number, number];\n const strides =\n new Uint8Array(new Int32Array(util.computeStrides(image.shape)).buffer);\n\n
const out = backend.makeOutput(outShape, image.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const imageData = backend.dataIdMap.get(image.dataId);\n const imageId = imageData.id;\n\n const transformsData = backend.dataIdMap.get(transforms.dataId);\n const transformsId = transformsData.id;\n\n const interpolationModeId = interpolation === 'nearest' ? 1 : 2;\n let fillModeId;\n switch (fillMode) {\n case 'constant':\n fillModeId = 1;\n break;\n case 'reflect':\n fillModeId = 2;\n break;\n case 'wrap':\n fillModeId = 3;\n break;\n case 'nearest':\n fillModeId =

4;\n break;\n default:\n fillModeId = 1;\n break;\n }\n\n wasmTransform(\n imageId, transformsId, (transforms.shape[0] > 1), batch, outHeight,\n outWidth, numChannels, imageWidth, imageHeight, strides,\n image.shape.length - 1, interpolationModeId, fillModeId, fillValue,\n outId);\n\n
return out;\n}\n\nexport const transformConfig: KernelConfig = {\n kernelName: Transform,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: transform as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs}
from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {slice} from './Slice';\n\nfunction unpack(\n args: {inputs: UnpackInputs, backend: BackendWasm, attrs: UnpackAttrs}):\n TensorInfo[] {\n const {inputs, backend, attrs} = args;\n const {value} = inputs;\n let {axis} = attrs;\n\n if (axis < 0) {\n axis += value.shape.length;\n }\n\n const numOutputs = value.shape[axis];\n const rank = value.shape.length;\n const outShape: number[] = new Array(rank - 1);\n let outIndex = 0;\n for (let i = 0; i < rank; i++) {\n if (i !== axis) {\n outShape[outIndex++] = value.shape[i];\n }\n }\n const outs: TensorInfo[] = new Array(numOutputs);\n const begin = new Array(rank).fill(0);\n const size = value.shape.slice();\n size[axis] = 1;\n for (let i = 0; i < outs.length; i++) {\n begin[axis] = i;\n outs[i] = slice({inputs: {x: value}, attrs: {begin, size}, backend});\n }\n return outs.map(({dataId, dtype}) => ({dataId, dtype,
shape: outShape}));\n}\n\nexport const unpackConfig: KernelConfig = {\n kernelName: Unpack,\n backendName: 'wasm',\n kernelFunc: unpack as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, ZerosLike, ZerosLikeInputs} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm}
from '../backend_wasm';\n\nfunction zerosLike(args: {inputs: ZerosLikeInputs, backend: BackendWasm}) {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(0);\n return out;\n}\n\nexport const zerosLikeConfig: KernelConfig = {\n kernelName: ZerosLike,\n backendName: 'wasm',\n kernelFunc: zerosLike as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n//
We explicitly import the modular kernels so they get registered in the\n// global registry when we compile the library. A modular build would replace\n// the contents of this file and import only the kernels that are needed.\nimport {KernelConfig, registerKernel} from '@tensorflow/tfjs-core';\n\nimport {fusedMatMulConfig}

from './kernels/_FusedMatMul';\nimport {absConfig} from './kernels/Abs';\nimport {addConfig} from './kernels/Add';\nimport {addNConfig} from './kernels/AddN';\nimport {allConfig} from './kernels/All';\nimport {anyConfig} from './kernels/Any';\nimport {argMaxConfig} from './kernels/ArgMax';\nimport {avgPoolConfig} from './kernels/AvgPool';\nimport {batchMatMulConfig} from './kernels/BatchMatMul';\nimport {batchToSpaceNDConfig} from './kernels/BatchToSpaceND';\nimport {castConfig} from './kernels/Cast';\nimport {ceilConfig} from './kernels/Ceil';\nimport {clipByValueConfig} from './kernels/ClipByValue';\nimport {concatConfig} from './kernels/Concat';\nimport {conv2DConfig} from './kernels/Conv2D';\nimport {conv2DBackpropInputConfig} from './kernels/Conv2DBackpropInput';\nimport {cosConfig} from './kernels/Cos';\nimport {coshConfig} from './kernels/Cosh';\nimport {cropAndResizeConfig} from './kernels/CropAndResize';\nimport {cumsumConfig} from './kernels/Cumsum';\nimport {depthToSpaceConfig} from './kernels/DepthToSpace';\nimport {depthwiseConv2dNativeConfig} from './kernels/DepthwiseConv2dNative';\nimport {eluConfig} from './kernels/Elu';\nimport {equalConfig} from './kernels/Equal';\nimport {expConfig} from './kernels/Exp';\nimport {expandDimsConfig} from './kernels/ExpandDims';\nimport {fillConfig} from './kernels/Fill';\nimport {flipLeftRightConfig} from './kernels/FlipLeftRight';\nimport {floorConfig} from './kernels/Floor';\nimport {floorDivConfig} from './kernels/FloorDiv';\nimport {fusedBatchNormConfig} from './kernels/FusedBatchNorm';\nimport {fusedConv2DConfig} from './kernels/FusedConv2D';\nimport {fusedDepthwiseConv2DConfig} from './kernels/FusedDepthwiseConv2D';\nimport {gatherNdConfig} from './kernels/GatherNd';\nimport {gatherV2Config} from './kernels/GatherV2';\nimport {greaterConfig} from './kernels/Greater';\nimport {greaterEqualConfig} from './kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport {leakyReluConfig} from './kernels/LeakyRelu';\nimport {lessConfig} from './kernels/Less';\nimport {lessEqualConfig} from './kernels/LessEqual';\nimport {logConfig} from './kernels/Log';\nimport {logicalAndConfig} from './kernels/LogicalAnd';\nimport {maxConfig} from './kernels/Max';\nimport {maximumConfig} from './kernels/Maximum';\nimport {maxPoolConfig} from './kernels/MaxPool';\nimport {meanConfig} from './kernels/Mean';\nimport {minConfig} from './kernels/Min';\nimport {minimumConfig} from './kernels/Minimum';\nimport {mirrorPadConfig} from './kernels/MirrorPad';\nimport {multiplyConfig} from './kernels/Multiply';\nimport {negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from './kernels/NonMaxSuppressionV3';\nimport {nonMaxSuppressionV4Config} from './kernels/NonMaxSuppressionV4';\nimport {nonMaxSuppressionV5Config} from './kernels/NonMaxSuppressionV5';\nimport {notEqualConfig} from './kernels/NotEqual';\nimport {oneHotConfig} from './kernels/OneHot';\nimport {onesLikeConfig} from './kernels/OnesLike';\nimport {packConfig} from './kernels/Pack';\nimport {padV2Config} from './kernels/PadV2';\nimport {powConfig} from './kernels/Pow';\nimport {preluConfig} from './kernels/Prelu';\nimport {prodConfig} from './kernels/Prod';\nimport {rangeConfig} from './kernels/Range';\nimport {realDivConfig} from './kernels/RealDiv';\nimport {reluConfig} from './kernels/Relu';\nimport {relu6Config} from './kernels/Relu6';\nimport {reshapeConfig} from './kernels/Reshape';\nimport {resizeBilinearConfig} from './kernels/ResizeBilinear';\nimport {reverseConfig} from './kernels/Reverse';\nimport {rotateWithOffsetConfig} from './kernels/RotateWithOffset';\nimport {roundConfig} from './kernels/Round';\nimport {rsqrtConfig} from './kernels/Rsqrt';\nimport {scatterNdConfig} from './kernels/ScatterNd';\nimport {selectConfig} from './kernels/Select';\nimport {sigmoidConfig} from './kernels/Sigmoid';\nimport {sinConfig} from './kernels/Sin';\nimport {sliceConfig} from './kernels/Slice';\nimport {softmaxConfig} from './kernels/Softmax';\nimport {spaceToBatchNDConfig} from './kernels/SpaceToBatchND';\nimport {splitVConfig} from './kernels/SplitV';\nimport {sqrtConfig} from './kernels/Sqrt';\nimport {squareConfig} from './kernels/Square';\nimport {squaredDifferenceConfig} from './kernels/SquaredDifference';\nimport {stepConfig} from './kernels/Step';\nimport {stridedSliceConfig} from './kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig} from

'./kernels/Sum';\nimport {tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport {tileConfig} from './kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transformConfig} from './kernels/Transform';\nimport {transposeConfig} from './kernels/Transpose';\nimport {unpackConfig} from './kernels/Unpack';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst kernelConfigs: KernelConfig[] = [\n absConfig,\n addConfig,\n addNConfig,\n allConfig,\n anyConfig,\n argMaxConfig,\n avgPoolConfig,\n batchMatMulConfig,\n batchToSpaceNDConfig,\n castConfig,\n ceilConfig,\n clipByValueConfig,\n concatConfig,\n conv2DConfig,\n conv2DBackpropInputConfig,\n cosConfig,\n coshConfig,\n cropAndResizeConfig,\n cumsumConfig,\n depthToSpaceConfig,\n depthwiseConv2dNativeConfig,\n eluConfig,\n equalConfig,\n expConfig,\n expandDimsConfig,\n fillConfig,\n flipLeftRightConfig,\n floorConfig,\n floorDivConfig,\n fusedMatMulConfig,\n fusedBatchNormConfig,\n fusedConv2DConfig,\n fusedDepthwiseConv2DConfig,\n gatherNdConfig,\n gatherV2Config,\n greaterConfig,\n greaterEqualConfig,\n identityConfig,\n leakyReluConfig,\n lessConfig,\n lessEqualConfig,\n logConfig,\n logicalAndConfig,\n maxConfig,\n maximumConfig,\n maxPoolConfig,\n meanConfig,\n minConfig,\n minimumConfig,\n mirrorPadConfig,\n multiplyConfig,\n negConfig,\n nonMaxSuppressionV3Config,\n nonMaxSuppressionV4Config,\n nonMaxSuppressionV5Config,\n notEqualConfig,\n oneHotConfig,\n onesLikeConfig,\n packConfig,\n padV2Config,\n powConfig,\n preluConfig,\n prodConfig,\n rangeConfig,\n realDivConfig,\n reluConfig,\n relu6Config,\n reshapeConfig,\n resizeBilinearConfig,\n reverseConfig,\n rotateWithOffsetConfig,\n rsqrtConfig,\n roundConfig,\n scatterNdConfig,\n selectConfig,\n sigmoidConfig,\n sinConfig,\n sliceConfig,\n softmaxConfig,\n spaceToBatchNDConfig,\n splitVConfig,\n sqrtConfig,\n squareConfig,\n squaredDifferenceConfig,\n stepConfig,\n stridedSliceConfig,\n subConfig,\n sumConfig,\n tanConfig,\n tanhConfig,\n tileConfig,\n topKConfig,\n transformConfig,\n transposeConfig,\n unpackConfig,\n zerosLikeConfig\n];\n\nfor (const kernelConfig of kernelConfigs) {\n registerKernel(kernelConfig);\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {env} from '@tensorflow/tfjs-core';\n\nconst ENV = env();\n\n/**\n * True if SIMD is supported.\n */\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag(\n // This typed array passed in to WebAssembly.validate is WebAssembly binary\n // code. In this case it is a small program that contains SIMD\n // instructions.\n 'WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new Uint8Array([\n 0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3,\n 2, 1, 0, 10, 9, 1, 7, 0, 65, 0, 253, 15, 26, 11\n])));\n\n/**\n * True if threads are supported.\n */\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag('WASM_HAS_MULTITHREAD_SUPPORT', async () => {\n // TODO(annxingyuan): Enable node support once this is resolved:\n // https://github.com/tensorflow/tfjs/issues/3830\n if (ENV.get('IS_NODE')) {\n return false;\n }\n\n try {\n // Test for transferability of SABs (needed for Firefox)\n // https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkBZlHETpA/dwsMNchWEQAJ\n new MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n // This typed array is a WebAssembly program containing threaded\n // instructions.\n return WebAssembly.validate(new Uint8Array([\n 0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3, 2, 1, 0, 5,\n 4, 1, 3, 1, 1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26, 11\n]));\n } catch (e) {\n return false;\n }\n});\n","\nvar WasmBackendModuleThreadedSimd = (function() {\n var _scriptDir = typeof document !== 'undefined' && document.currentScript ? document.currentScript.src : undefined;\n if (typeof __filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return

(\nfunction(WasmBackendModuleThreadedSimd) {\n WasmBackendModuleThreadedSimd = WasmBackendModuleThreadedSimd || {};\n\nfunction GROWABLE_HEAP_I8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAP8}function GROWABLE_HEAP_U8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAPU8}function GROWABLE_HEAP_I32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAP32}function GROWABLE_HEAP_U32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAPU32}function GROWABLE_HEAP_F64(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAPF64}var Module=typeof WasmBackendModuleThreadedSimd!==\"undefined\"?WasmBackendModuleThreadedSimd:{};var readyPromiseResolve,readyPromiseReject;Module[\"ready\"]=new Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var moduleOverrides={};var key;for(key in Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var thisProgram=\"./this.program\";var quit_=function(status,toThrow){throw toThrow};var ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof window===\"object\";ENVIRONMENT_IS_WORKER=typeof importScripts===\"function\";ENVIRONMENT_IS_NODE=typeof process===\"object\"&&typeof process.versions===\"object\"&&typeof process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONMENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var ENVIRONMENT_IS_PTHREAD=Module[\"ENVIRONMENT_IS_PTHREAD\"]||false;if(ENVIRONMENT_IS_PTHREAD){buffer=Module[\"buffer\"]}var scriptDirectory=\"\";function locateFile(path){if(Module[\"locateFile\"]){return Module[\"locateFile\"](path,scriptDirectory)}return scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\"path\").dirname(scriptDirectory)+\"/\"}else{scriptDirectory=__dirname+\"/\"}read_=function shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=nodePath[\"normalize\"](filename);return nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\")};readBinary=function readBinary(filename){var ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return ret};if(process[\"argv\"].length>1){thisProgram=process[\"argv\"][1].replace(/\\\\/g,\"/\")}arguments_=process[\"argv\"].slice(2);process[\"on\"](\"uncaughtException\",function(ex){if(!(ex instanceof ExitStatus)){throw ex}});process[\"on\"](\"unhandledRejection\",abort);quit_=function(status){process[\"exit\"](status)};Module[\"inspect\"]=function(){return\"[Emscripten Module object]\"};var nodeWorkerThreads;try{nodeWorkerThreads=require(\"worker_threads\")}catch(e){console.error('The \"worker_threads\" module is not supported in this node.js build - perhaps a newer version is needed?');throw e}global.Worker=nodeWorkerThreads.Worker}else if(ENVIRONMENT_IS_SHELL){if(typeof read!=\"undefined\"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var data;if(typeof readbuffer===\"function\"){return new Uint8Array(readbuffer(f))}data=read(f,\"binary\");assert(typeof data===\"object\");return data};if(typeof scriptArgs!=\"undefined\"){arguments_=scriptArgs}else if(typeof arguments!=\"undefined\"){arguments_=arguments}if(typeof

quit===\"function\"){quit_=function(status){quit(status)}}if(typeof print!==\"undefined\"){if(typeof console===\"undefined\")console={};console.log=print;console.warn=console.error=typeof printErr!==\"undefined\"?printErr:print}}else if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDirectory=self.location.href}else if(typeof document!==\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(typeof _scriptDir !== \"undefined\" && _scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf(\"blob:\")!==0){scriptDirectory=scriptDirectory.substr(0,scriptDirectory.lastIndexOf(\"/\")+1)}else{scriptDirectory=\"\"}if(ENVIRONMENT_IS_NODE){read_=function shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=nodePath[\"normalize\"](filename);return nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\")};readBinary=function readBinary(filename){var ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return ret}}else{read_=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.send(null);return xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.responseType=\"arraybuffer\";xhr.send(null);return new Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,true);xhr.responseType=\"arraybuffer\";xhr.onload=function(){if(xhr.status==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror()};xhr.onerror=onerror;xhr.send(null)}}setWindowTitle=function(title){document.title=title}}else{}if(ENVIRONMENT_IS_NODE){if(typeof performance===\"undefined\"){global.performance=require(\"perf_hooks\").performance}}var out=Module[\"print\"]||console.log.bind(console);var err=Module[\"printErr\"]||console.warn.bind(console);for(key in moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverrides=null;if(Module[\"arguments\"])arguments_=Module[\"arguments\"];if(Module[\"thisProgram\"])thisProgram=Module[\"thisProgram\"];if(Module[\"quit\"])quit_=Module[\"quit\"];function warnOnce(text){if(!warnOnce.shown)warnOnce.shown={};if(!warnOnce.shown[text]){warnOnce.shown[text]=1;err(text)}}var Atomics_load=Atomics.load;var Atomics_store=Atomics.store;var Atomics_compareExchange=Atomics.compareExchange;var wasmBinary;if(Module[\"wasmBinary\"])wasmBinary=Module[\"wasmBinary\"];var noExitRuntime=Module[\"noExitRuntime\"]||true;if(typeof WebAssembly!==\"object\"){abort(\"no native wasm support detected\")}var wasmMemory;var wasmModule;var ABORT=false;var EXITSTATUS;function assert(condition,text){if(!condition){abort(\"Assertion failed: \"+text)}}function getCFunc(ident){var func=Module[\"_\"+ident];assert(func,\"Cannot call unknown function \"+ident+\", make sure it is exported\");return func}function ccall(ident,returnType,argTypes,args,opts){var toC={\"string\":function(str){var ret=0;if(str!==null&&str!==undefined&&str!==0){var len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\"array\":function(arr){var ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function convertReturnValue(ret){if(returnType===\"string\")return UTF8ToString(ret);if(returnType===\"boolean\")return Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var i=0;i<args.length;i++){var converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i]=args[i]}}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var numericArgs=argTypes.every(function(type){return type===\"number\"});var numericRet=returnType!==\"string\";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return

function(){return ccall(ident,returnType,argTypes,arguments,opts)}}function UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var str=\"\";while(!(idx>=endIdx)){var u0=heap[idx++];if(!u0)return str;if(!(u0&128)){str+=String.fromCharCode(u0);continue}var u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[idx++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function UTF8ToString(ptr,maxBytesToRead){return ptr?UTF8ArrayToString(GROWABLE_HEAP_U8(),ptr,maxBytesToRead):\"\"}function stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var u=str.charCodeAt(i);if(u>=55296&&u<=57343){var u1=str.charCodeAt(++i);u=65536+((u&1023)<<10)|u1&1023}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function stringToUTF8(str,outPtr,maxBytesToWrite){return stringToUTF8Array(str,GROWABLE_HEAP_U8(),outPtr,maxBytesToWrite)}function lengthBytesUTF8(str){var len=0;for(var i=0;i<str.length;++i){var u=str.charCodeAt(i);if(u>=55296&&u<=57343)u=65536+((u&1023)<<10)|str.charCodeAt(++i)&1023;if(u<=127)++len;else if(u<=2047)len+=2;else if(u<=65535)len+=3;else len+=4}return len}function writeArrayToMemory(array,buffer){GROWABLE_HEAP_I8().set(array,buffer)}function alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function updateGlobalBufferAndViews(buf){buffer=buf;Module[\"HEAP8\"]=HEAP8=new Int8Array(buf);Module[\"HEAP16\"]=HEAP16=new Int16Array(buf);Module[\"HEAP32\"]=HEAP32=new Int32Array(buf);Module[\"HEAPU8\"]=HEAPU8=new Uint8Array(buf);Module[\"HEAPU16\"]=HEAPU16=new Uint16Array(buf);Module[\"HEAPU32\"]=HEAPU32=new Uint32Array(buf);Module[\"HEAPF32\"]=HEAPF32=new Float32Array(buf);Module[\"HEAPF64\"]=HEAPF64=new Float64Array(buf)}var INITIAL_MEMORY=Module[\"INITIAL_MEMORY\"]||16777216;if(ENVIRONMENT_IS_PTHREAD){wasmMemory=Module[\"wasmMemory\"];buffer=Module[\"buffer\"]}else{if(Module[\"wasmMemory\"]){wasmMemory=Module[\"wasmMemory\"]}else{wasmMemory=new WebAssembly.Memory({\"initial\":INITIAL_MEMORY/65536,\"maximum\":2147483648/65536,\"shared\":true});if(!(wasmMemory.buffer instanceof SharedArrayBuffer)){err(\"requested a shared WebAssembly.Memory but the returned buffer is not a SharedArrayBuffer, indicating that while the browser has SharedArrayBuffer it does not have WebAssembly threads support - you may need to set a flag\");if(ENVIRONMENT_IS_NODE){console.log(\"(on node you may need: --experimental-wasm-threads --experimental-wasm-bulk-memory and also use a recent version)\")}throw Error(\"bad memory\")}}}if(wasmMemory){buffer=wasmMemory.buffer}INITIAL_MEMORY=buffer.byteLength;updateGlobalBufferAndViews(buffer);var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var __ATEXIT__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;var runtimeExited=false;if(!ENVIRONMENT_IS_PTHREAD)__ATINIT__.push({func:function(){___wasm_call_ctors()}});function preRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module[\"preRun\"]){if(typeof Module[\"preRun\"]==\"function\")Module[\"preRun\"]=[Module[\"preRun\"]];while(Module[\"preRun\"].length){a

ddOnPreRun(Module[\"preRun\"].shift())}}callRuntimeCallbacks(__ATPRERUN__)}function initRuntime(){runtimeInitialized=true;if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATINIT__)}function preMain(){if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATMAIN__)}function exitRuntime(){if(ENVIRONMENT_IS_PTHREAD)return;runtimeExited=true}function postRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module[\"postRun\"]){if(typeof Module[\"postRun\"]==\"function\")Module[\"postRun\"]=[Module[\"postRun\"]];while(Module[\"postRun\"].length){addOnPostRun(Module[\"postRun\"].shift())}}callRuntimeCallbacks(__ATPOSTRUN__)}function addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function addRunDependency(id){assert(!ENVIRONMENT_IS_PTHREAD,\"addRunDependency cannot be used in a pthread worker\");runDependencies++;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}}function removeRunDependency(id){runDependencies--;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}if(runDependencies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}if(dependenciesFulfilled){var callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}}Module[\"preloadedImages\"]={};Module[\"preloadedAudios\"]={};function abort(what){if(Module[\"onAbort\"]){Module[\"onAbort\"](what)}if(ENVIRONMENT_IS_PTHREAD)console.error(\"Pthread aborting at \"+(new Error).stack);what+=\"\";err(what);ABORT=true;EXITSTATUS=1;what=\"abort(\"+what+\"). Build with -s ASSERTIONS=1 for more info.\";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var dataURIPrefix=\"data:application/octet-stream; base64,\";function isDataURI(filename){return hasPrefix(filename,dataURIPrefix)}var fileURIPrefix=\"file://\";function isFileURI(filename){return hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile=\"tfjs-backend-wasm-threaded-simd.wasm\";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function getBinary(file){try{if(file==wasmBinaryFile&&wasmBinary){return new Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw\"both async and sync fetching of the wasm failed\"}}catch(err){abort(err)}}function getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof fetch===\"function\"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){if(!response[\"ok\"]){throw\"failed to load wasm binary file at '\"+wasmBinaryFile+\"'\"}return response[\"arrayBuffer\"]()}).catch(function(){return getBinary(wasmBinaryFile)})}else{if(readAsync){return new Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new Uint8Array(response))},reject)})}}}return Promise.resolve().then(function(){return getBinary(wasmBinaryFile)})}function createWasm(){var info={\"a\":asmLibraryArg};function receiveInstance(instance,module){var exports=instance.exports;Module[\"asm\"]=exports;wasmTable=Module[\"asm\"][\"I\"];wasmModule=module;if(!ENVIRONMENT_IS_PTHREAD){var numWorkersToLoad=PThread.unusedWorkers.length;PThread.unusedWorkers.forEach(function(w){PThread.loadWasmModuleToWorker(w,function(){if(!--numWorkersToLoad)removeRunDependency(\"wasm-instantiate\")})})}if(!ENVIRONMENT_IS_PTHREAD){addRunDependency(\"wasm-instantiate\")}function receiveInstantiatedSource(output){receiveInstance(output[\"instance\"],output[\"module\"])}function instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return

WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err(\"failed to asynchronously prepare wasm: \"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof WebAssembly.instantiateStreaming===\"function\"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFile)&&typeof fetch===\"function\"){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return result.then(receiveInstantiatedSource,function(reason){err(\"wasm streaming compile failed: \"+reason);err(\"falling back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)})})}else{return instantiateArrayBuffer(receiveInstantiatedSource)}}if(Module[\"instantiateWasm\"]){try{var exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports}catch(e){err(\"Module.instantiateWasm callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}var ASM_CONSTS={10520:function(){throw\"Canceled!\"},10538:function($0,$1){setTimeout(function(){__emscripten_do_dispatch_to_thread($0,$1)},0)}};function initPthreadsJS(){PThread.initRuntime()}function callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof callback==\"function\"){callback(Module);continue}var func=callback.func;if(typeof func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)()}else{wasmTable.get(func)(callback.arg)}}else{func(callback.arg===undefined?null:callback.arg)}}}var ERRNO_CODES={EPERM:63,ENOENT:44,ESRCH:71,EINTR:27,EIO:29,ENXIO:60,E2BIG:1,ENOEXEC:45,EBADF:8,ECHILD:12,EAGAIN:6,EWOULDBLOCK:6,ENOMEM:48,EACCES:2,EFAULT:21,ENOTBLK:105,EBUSY:10,EEXIST:20,EXDEV:75,ENODEV:43,ENOTDIR:54,EISDIR:31,EINVAL:28,ENFILE:41,EMFILE:33,ENOTTY:59,ETXTBSY:74,EFBIG:22,ENOSPC:51,ESPIPE:70,EROFS:69,EMLINK:34,EPIPE:64,EDOM:18,ERANGE:68,ENOMSG:49,EIDRM:24,ECHRNG:106,EL2NSYNC:156,EL3HLT:107,EL3RST:108,ELNRNG:109,EUNATCH:110,ENOCSI:111,EL2HLT:112,EDEADLK:16,ENOLCK:46,EBADE:113,EBADR:114,EXFULL:115,ENOANO:104,EBADRQC:103,EBADSLT:102,EDEADLOCK:16,EBFONT:101,ENOSTR:100,ENODATA:116,ETIME:117,ENOSR:118,ENONET:119,ENOPKG:120,EREMOTE:121,ENOLINK:47,EADV:122,ESRMNT:123,ECOMM:124,EPROTO:65,EMULTIHOP:36,EDOTDOT:125,EBADMSG:9,ENOTUNIQ:126,EBADFD:127,EREMCHG:128,ELIBACC:129,ELIBBAD:130,ELIBSCN:131,ELIBMAX:132,ELIBEXEC:133,ENOSYS:52,ENOTEMPTY:55,ENAMETOOLONG:37,ELOOP:32,EOPNOTSUPP:138,EPFNOSUPPORT:139,ECONNRESET:15,ENOBUFS:42,EAFNOSUPPORT:5,EPROTOTYPE:67,ENOTSOCK:57,ENOPROTOOPT:50,ESHUTDOWN:140,ECONNREFUSED:14,EADDRINUSE:3,ECONNABORTED:13,ENETUNREACH:40,ENETDOWN:38,ETIMEDOUT:73,EHOSTDOWN:142,EHOSTUNREACH:23,EINPROGRESS:26,EALREADY:7,EDESTADDRREQ:17,EMSGSIZE:35,EPROTONOSUPPORT:66,ESOCKTNOSUPPORT:137,EADDRNOTAVAIL:4,ENETRESET:39,EISCONN:30,ENOTCONN:53,ETOOMANYREFS:141,EUSERS:136,EDQUOT:19,ESTALE:72,ENOTSUP:138,ENOMEDIUM:148,EILSEQ:25,EOVERFLOW:61,ECANCELED:11,ENOTRECOVERABLE:56,EOWNERDEAD:62,ESTRPIPE:135};function _emscripten_futex_wake(addr,count){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0||count<0)return-28;if(count==0)return 0;if(count>=2147483647)count=Infinity;var mainThreadWaitAddress=Atomics.load(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2);var mainThreadWoken=0;if(mainThreadWaitAddress==addr){var loadedAddr=Atomics.compareExchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,mainThreadWaitAddress,0);if(loadedAddr==mainThreadWaitAddress){--count;mainThreadWoken=1;if(count<=0)return 1}}var ret=Atomics.notify(GROWABLE_HEAP_I32(),addr>>2,count);if(ret>=0)return ret+mainThreadWoken;throw\"Atomics.notify returned an unexpected value \"+ret}Module[\"_emscripten_futex_wake\"]=_emscripten_futex_wake;function killThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! killThread() can only ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in killThread!\";GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var pthread=PThread.pthreads[pthread_ptr];pthread.worker.terminate();PThread.freeThreadData(pthread);PThread.runningWorkers.splice(PThread.runningWorkers.indexOf(pthread.worker),1);pthread.worker.pthread=undefined}functio

n cancelThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cancelThread() can only ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in cancelThread!\";var pthread=PThread.pthreads[pthread_ptr];pthread.worker.postMessage({\"cmd\":\"cancel\"})}function cleanupThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cleanupThread() can only ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in cleanupThread!\";var pthread=PThread.pthreads[pthread_ptr];if(pthread){GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var worker=pthread.worker;PThread.returnWorkerToPool(worker)}}var PThread={unusedWorkers:[],runningWorkers:[],initMainThreadBlock:function(){var pthreadPoolSize=8;for(var i=0;i<pthreadPoolSize;++i){PThread.allocateUnusedWorker()}},initRuntime:function(){var tb=_malloc(228);for(var i=0;i<228/4;++i)GROWABLE_HEAP_U32()[tb/4+i]=0;GROWABLE_HEAP_I32()[tb+12>>2]=tb;var headPtr=tb+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var tlsMemory=_malloc(512);for(var i=0;i<128;++i)GROWABLE_HEAP_U32()[tlsMemory/4+i]=0;Atomics.store(GROWABLE_HEAP_U32(),tb+100>>2,tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tb+40>>2,tb);__emscripten_thread_init(tb,!ENVIRONMENT_IS_WORKER,1);_emscripten_register_main_browser_thread_id(tb)},initWorker:function(){},pthreads:{},threadExitHandlers:[],setThreadStatus:function(){},runExitHandlers:function(){while(PThread.threadExitHandlers.length>0){PThread.threadExitHandlers.pop()()}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self())___pthread_tsd_run_dtors()},runExitHandlersAndDeinitThread:function(tb,exitCode){Atomics.store(GROWABLE_HEAP_U32(),tb+56>>2,1);Atomics.store(GROWABLE_HEAP_U32(),tb+60>>2,0);PThread.runExitHandlers();Atomics.store(GROWABLE_HEAP_U32(),tb+4>>2,exitCode);Atomics.store(GROWABLE_HEAP_U32(),tb+0>>2,1);_emscripten_futex_wake(tb+0,2147483647);__emscripten_thread_init(0,0,0)},threadExit:function(exitCode){var tb=_pthread_self();if(tb){PThread.runExitHandlersAndDeinitThread(tb,exitCode);if(ENVIRONMENT_IS_PTHREAD){postMessage({\"cmd\":\"exit\"})}}},threadCancel:function(){PThread.runExitHandlersAndDeinitThread(_pthread_self(),-1);postMessage({\"cmd\":\"cancelDone\"})},terminateAllThreads:function(){for(var t in PThread.pthreads){var pthread=PThread.pthreads[t];if(pthread&&pthread.worker){PThread.returnWorkerToPool(pthread.worker)}}PThread.pthreads={};for(var i=0;i<PThread.unusedWorkers.length;++i){var worker=PThread.unusedWorkers[i];worker.terminate()}PThread.unusedWorkers=[];for(var i=0;i<PThread.runningWorkers.length;++i){var worker=PThread.runningWorkers[i];var pthread=worker.pthread;PThread.freeThreadData(pthread);worker.terminate()}PThread.runningWorkers=[]},freeThreadData:function(pthread){if(!pthread)return;if(pthread.threadInfoStruct){var tlsMemory=GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2];GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2]=0;_free(tlsMemory);_free(pthread.threadInfoStruct)}pthread.threadInfoStruct=0;if(pthread.allocatedOwnStack&&pthread.stackBase)_free(pthread.stackBase);pthread.stackBase=0;if(pthread.worker)pthread.worker.pthread=null},returnWorkerToPool:function(worker){PThread.runWithoutMainThreadQueuedCalls(function(){delete PThread.pthreads[worker.pthread.threadInfoStruct];PThread.unusedWorkers.push(worker);PThread.runningWorkers.splice(PThread.runningWorkers.indexOf(worker),1);PThread.freeThreadData(worker.pthread);worker.pthread=undefined})},runWithoutMainThreadQueuedCalls:function(func){GROWABLE_HEAP_I32()[__emscripten_allow_main_runtime_queued_calls>>2]=0;try{func()}finally{GROWABLE_HEAP_I32()[__emscripten_allow_main_runtime_queued_calls>>2]=1}},receiveObjectTransfer:function(data){},loadWasmModuleToWorker:function(worker,onFinishedLoading){worker.onmessage=function(e){var d=e[\"data\"];var cmd=d[\"cmd\"];if(worker.pthread)PThread.currentProxiedOperationCallerThread=worker.pthread.threadInfoStruct;if(d[\"targetThread\"]&&d[\"targetThread\"]!=_pthread_self()){var

thread=PThread.pthreads[d.targetThread];if(thread){thread.worker.postMessage(e.data,d[\"transferList\"])}else{console.error('Internal error! Worker sent a message \"'+cmd+'\" to target pthread '+d[\"targetThread\"]+\", but that thread no longer
exists!\")}PThread.currentProxiedOperationCallerThread=undefined;return}if(cmd===\"processQueuedMainThreadWork\"){_emscripten_main_thread_process_queued_calls()}else
if(cmd===\"spawnThread\"){spawnThread(e.data)}else
if(cmd===\"cleanupThread\"){cleanupThread(d[\"thread\"])}else
if(cmd===\"killThread\"){killThread(d[\"thread\"])}else
if(cmd===\"cancelThread\"){cancelThread(d[\"thread\"])}else
if(cmd===\"loaded\"){worker.loaded=true;if(onFinishedLoading)onFinishedLoading(worker);if(worker.runPthread){worker.runPthread();delete
worker.runPthread}}else if(cmd===\"print\"){out(\"Thread \"+d[\"threadId\"]+\": \"+d[\"text\"])}else
if(cmd===\"printErr\"){err(\"Thread \"+d[\"threadId\"]+\": \"+d[\"text\"])}else if(cmd===\"alert\"){alert(\"Thread \"+d[\"threadId\"]+\": \"+d[\"text\"])}else if(cmd===\"exit\"){var
detached=worker.pthread&&Atomics.load(GROWABLE_HEAP_U32(),worker.pthread.threadInfoStruct+64>>2);if(detached){PThread.returnWorkerToPool(worker)}}else
if(cmd===\"exitProcess\"){try{exit(d[\"returnCode\"])}catch(e){if(e instanceof ExitStatus)return;throw e}}else
if(cmd===\"cancelDone\"){PThread.returnWorkerToPool(worker)}else
if(cmd===\"objectTransfer\"){PThread.receiveObjectTransfer(e.data)}else
if(e.data.target===\"setimmediate\"){worker.postMessage(e.data)}else{err(\"worker sent an unknown command \"+cmd)}PThread.currentProxiedOperationCallerThread=undefined};worker.onerror=function(e){err(\"pthread sent an error! \"+e.filename+\":\"+e.lineno+\":
\"+e.message)};if(ENVIRONMENT_IS_NODE){worker.on(\"message\",function(data){worker.onmessage({data:data})});worker.on(\"error\",function(data){worker.onerror(data)});worker.on(\"exit\",function(data){})}worker.postMessage({\"cmd\":\"load\",\"urlOrBlob\":Module[\"mainScriptUrlOrBlob\"]||_scriptDir,\"wasmMemory\":wasmMemory,\"wasmModule\":wasmModule})},allocateUnusedWorker:function(){var
pthreadMainJs=locateFile(\"tfjs-backend-wasm-threaded-simd.worker.js\");PThread.unusedWorkers.push(new Worker(pthreadMainJs))},getNewWorker:function(){if(PThread.unusedWorkers.length==0){PThread.allocateUnusedWorker();PThread.loadWasmModuleToWorker(PThread.unusedWorkers[0])}if(PThread.unusedWorkers.length>0)return PThread.unusedWorkers.pop();else return null},busySpinWait:function(msecs){var
t=performance.now()+msecs;while(performance.now()<t){}}};function
establishStackSpace(stackTop,stackMax){_emscripten_stack_set_limits(stackTop,stackMax);stackRestore(stackTop)}Module[\"establishStackSpace\"]=establishStackSpace;function getNoExitRuntime(){return
noExitRuntime}Module[\"getNoExitRuntime\"]=getNoExitRuntime;function invokeEntryPoint(ptr,arg){return wasmTable.get(ptr)(arg)}Module[\"invokeEntryPoint\"]=invokeEntryPoint;function
___assert_fail(condition,filename,line,func){abort(\"Assertion failed: \"+UTF8ToString(condition)+\", at: \"+[filename?UTF8ToString(filename):\"unknown filename\",line,func?UTF8ToString(func):\"unknown function\"])}function ___call_main(argc,argv){var returnCode=_main(argc,argv)}var
_emscripten_get_now;if(ENVIRONMENT_IS_NODE){_emscripten_get_now=function(){var
t=process[\"hrtime\"]();return t[0]*1e3+t[1]/1e6}}else
if(ENVIRONMENT_IS_PTHREAD){_emscripten_get_now=function(){return performance.now()-Module[\"__performance_now_clock_drift\"]}}else if(typeof
dateNow!==\"undefined\"){_emscripten_get_now=dateNow}else _emscripten_get_now=function(){return performance.now()};function setErrNo(value){GROWABLE_HEAP_I32()[___errno_location()>>2]=value;return value}function _atexit(func,arg){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(1,1,func,arg)}function
__emscripten_notify_thread_queue(targetThreadId,mainThreadId){if(targetThreadId==mainThreadId){postMessage({\"cmd\":\"processQueuedMainThreadWork\"})}else

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if(ENVIRONMENT_IS_PTHREAD){postMessage({\"targetThread\":targetThreadId,\"cmd\":\"processThreadQueue\"})}else{var pthread=PThread.pthreads[targetThreadId];var worker=pthread&&pthread.worker;if(!worker){return}worker.postMessage({\"cmd\":\"processThreadQueue\"})}return 1}function _abort(){abort()}function _emscripten_asm_const_int(code,sigPtr,argbuf){var args=readAsmConstArgs(sigPtr,argbuf);return ASM_CONSTS[code].apply(null,args)}function _emscripten_conditional_set_current_thread_status(expectedStatus,newStatus){}function _emscripten_futex_wait(addr,val,timeout){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0)return-28;if(!ENVIRONMENT_IS_WEB){var ret=Atomics.wait(GROWABLE_HEAP_I32(),addr>>2,val,timeout);if(ret===\"timed-out\")return-73;if(ret===\"not-equal\")return-6;if(ret===\"ok\")return 0;throw\"Atomics.wait returned an unexpected value \"+ret}else{if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}var tNow=performance.now();var tEnd=tNow+timeout;var lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr);while(1){tNow=performance.now();if(tNow>tEnd){lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,0);return-73}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,0);if(lastAddr==0){break}_emscripten_main_thread_process_queued_calls();if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr)}return 0}}function _emscripten_memcpy_big(dest,src,num){GROWABLE_HEAP_U8().copyWithin(dest,src,src+num)}function _emscripten_num_logical_cores(){if(ENVIRONMENT_IS_NODE)return require(\"os\").cpus().length;return navigator[\"hardwareConcurrency\"]}function _emscripten_proxy_to_main_thread_js(index,sync){var numCallArgs=arguments.length-2;var stack=stackSave();var serializedNumCallArgs=numCallArgs;var args=stackAlloc(serializedNumCallArgs*8);var b=args>>3;for(var i=0;i<numCallArgs;i++){var arg=arguments[2+i];GROWABLE_HEAP_F64()[b+i]=arg}var ret=_emscripten_run_in_main_runtime_thread_js(index,serializedNumCallArgs,args,sync);stackRestore(stack);return ret}var _emscripten_receive_on_main_thread_js_callArgs=[];var readAsmConstArgsArray=[];function readAsmConstArgs(sigPtr,buf){readAsmConstArgsArray.length=0;var ch;buf>>=2;while(ch=GROWABLE_HEAP_U8()[sigPtr++]){var double=ch<105;if(double&&buf&1)buf++;readAsmConstArgsArray.push(double?GROWABLE_HEAP_F64()[buf++>>1]:GROWABLE_HEAP_I32()[buf]);++buf}return readAsmConstArgsArray}function _emscripten_receive_on_main_thread_js(index,numCallArgs,args){_emscripten_receive_on_main_thread_js_callArgs.length=numCallArgs;var b=args>>3;for(var i=0;i<numCallArgs;i++){_emscripten_receive_on_main_thread_js_callArgs[i]=GROWABLE_HEAP_F64()[b+i]}var isEmAsmConst=index<0;var func=!isEmAsmConst?proxiedFunctionTable[index]:ASM_CONSTS[-index-1];return func.apply(null,_emscripten_receive_on_main_thread_js_callArgs)}function _emscripten_get_heap_size(){return GROWABLE_HEAP_U8().length}function emscripten_realloc_buffer(size){try{wasmMemory.grow(size-buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return 1}catch(e){}}function _emscripten_resize_heap(requestedSize){var oldSize=_emscripten_get_heap_size();if(requestedSize<=oldSize){return false}var maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var cutDown=1;cutDown<=4;cutDown*=2){var overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize+100663296);var
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newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var JSEvents={inEventHandler:0,removeAllEventListeners:function(){for(var i=JSEvents.eventHandlers.length-1;i>=0;--i){JSEvents._removeHandler(i)}JSEvents.eventHandlers=[];JSEvents.deferredCalls=[]},registerRemoveEventListeners:function(){if(!JSEvents.removeEventListenersRegistered){__ATEXIT__.push(JSEvents.removeAllEventListeners);JSEvents.removeEventListenersRegistered=true}},deferredCalls:[],deferCall:function(targetFunction,precedence,argsList){function arraysHaveEqualContent(arrA,arrB){if(arrA.length!=arrB.length)return false;for(var i in arrA){if(arrA[i]!=arrB[i])return false}return true}for(var i in JSEvents.deferredCalls){var call=JSEvents.deferredCalls[i];if(call.targetFunction==targetFunction&&arraysHaveEqualContent(call.argsList,argsList)){return}}JSEvents.deferredCalls.push({targetFunction:targetFunction,precedence:precedence,argsList:argsList});JSEvents.deferredCalls.sort(function(x,y){return x.precedence<y.precedence})},removeDeferredCalls:function(targetFunction){for(var i=0;i<JSEvents.deferredCalls.length;++i){if(JSEvents.deferredCalls[i].targetFunction==targetFunction){JSEvents.deferredCalls.splice(i,1);--i}}},canPerformEventHandlerRequests:function(){return JSEvents.inEventHandler&&JSEvents.currentEventHandler.allowsDeferredCalls},runDeferredCalls:function(){if(!JSEvents.canPerformEventHandlerRequests()){return}for(var i=0;i<JSEvents.deferredCalls.length;++i){var call=JSEvents.deferredCalls[i];JSEvents.deferredCalls.splice(i,1);--i;call.targetFunction.apply(null,call.argsList)}},eventHandlers:[],removeAllHandlersOnTarget:function(target,eventTypeString){for(var i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==target&&(!eventTypeString||eventTypeString==JSEvents.eventHandlers[i].eventTypeString)){JSEvents._removeHandler(i--)}}},_removeHandler:function(i){var h=JSEvents.eventHandlers[i];h.target.removeEventListener(h.eventTypeString,h.eventListenerFunc,h.useCapture);JSEvents.eventHandlers.splice(i,1)},registerOrRemoveHandler:function(eventHandler){var jsEventHandler=function jsEventHandler(event){++JSEvents.inEventHandler;JSEvents.currentEventHandler=eventHandler;JSEvents.runDeferredCalls();eventHandler.handlerFunc(event);JSEvents.runDeferredCalls();--JSEvents.inEventHandler};if(eventHandler.callbackfunc){eventHandler.eventListenerFunc=jsEventHandler;eventHandler.target.addEventListener(eventHandler.eventTypeString,jsEventHandler,eventHandler.useCapture);JSEvents.eventHandlers.push(eventHandler);JSEvents.registerRemoveEventListeners()}else{for(var i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==eventHandler.target&&JSEvents.eventHandlers[i].eventTypeString==eventHandler.eventTypeString){JSEvents._removeHandler(i--)}}}},queueEventHandlerOnThread_iiii:function(targetThread,eventHandlerFunc,eventTypeId,eventData,userData){var stackTop=stackSave();var varargs=stackAlloc(12);GROWABLE_HEAP_I32()[varargs>>2]=eventTypeId;GROWABLE_HEAP_I32()[varargs+4>>2]=eventData;GROWABLE_HEAP_I32()[varargs+8>>2]=userData;__emscripten_call_on_thread(0,targetThread,637534208,eventHandlerFunc,eventData,varargs);stackRestore(stackTop)},getTargetThreadForEventCallback:function(targetThread){switch(targetThread){case 1:return 0;case 2:return PThread.currentProxiedOperationCallerThread;default:return targetThread}},getNodeNameForTarget:function(target){if(!target)return\"\";if(target==window)return\"#window\";if(target==screen)return\"#screen\";return target&&target.nodeName?target.nodeName:\"\"},fullscreenEnabled:function(){return document.fullscreenEnabled||document.webkitFullscreenEnabled}};function stringToNewUTF8(jsString){var length=lengthBytesUTF8(jsString)+1;var cString=_malloc(length);stringToUTF8(jsString,cString,length);return cString}function _emscripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height){var stackTop=stackSave();var varargs=stackAlloc(12);var

targetCanvasPtr=0;if(targetCanvas){targetCanvasPtr=stringToNewUTF8(targetCanvas)}GROWABLE_HEAP_I32(
)[varargs>>2]=targetCanvasPtr;GROWABLE_HEAP_I32()[varargs+4>>2]=width;GROWABLE_HEAP_I32()[var
args+8>>2]=height;__emscripten_call_on_thread(0,targetThread,657457152,0,targetCanvasPtr,varargs);stackRestor
e(stackTop)}function
_emscripten_set_offscreencanvas_size_on_target_thread(targetThread,targetCanvas,width,height){targetCanvas=tar
getCanvas?UTF8ToString(targetCanvas):\"\";_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThr
ead,targetCanvas,width,height)}function maybeCStringToJsString(cString){return
cString>2?UTF8ToString(cString):cString}var specialHTMLTargets=[0,typeof
document!==\"undefined\"?document:0,typeof window!==\"undefined\"?window:0];function
findEventTarget(target){target=maybeCStringToJsString(target);var
domElement=specialHTMLTargets[target]||(typeof
document!==\"undefined\"?document.querySelector(target):undefined);return domElement}function
findCanvasEventTarget(target){return findEventTarget(target)}function
_emscripten_set_canvas_element_size_calling_thread(target,width,height){var
canvas=findCanvasEventTarget(target);if(!canvas)return-
4;if(canvas.canvasSharedPtr){GROWABLE_HEAP_I32()[canvas.canvasSharedPtr>>2]=width;GROWABLE_HEA
P_I32()[canvas.canvasSharedPtr+4>>2]=height}if(canvas.offscreenCanvas||!canvas.controlTransferredOffscreen){if
(canvas.offscreenCanvas)canvas=canvas.offscreenCanvas;var
autoResizeViewport=false;if(canvas.GLctxObject&&canvas.GLctxObject.GLctx){var
prevViewport=canvas.GLctxObject.GLctx.getParameter(2978);autoResizeViewport=prevViewport[0]===0&&prev
Viewport[1]===0&&prevViewport[2]===canvas.width&&prevViewport[3]===canvas.height}canvas.width=width;
canvas.height=height;if(autoResizeViewport){canvas.GLctxObject.GLctx.viewport(0,0,width,height)}}else
if(canvas.canvasSharedPtr){var
targetThread=GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+8>>2];_emscripten_set_offscreencanvas_size_o
n_target_thread(targetThread,target,width,height);return 1}else{return-4}return 0}function
_emscripten_set_canvas_element_size_main_thread(target,width,height){if(ENVIRONMENT_IS_PTHREAD)retur
n
_emscripten_proxy_to_main_thread_js(2,1,target,width,height);return
_emscripten_set_canvas_element_size_calling_thread(target,width,height)}function
_emscripten_set_canvas_element_size(target,width,height){var
canvas=findCanvasEventTarget(target);if(canvas){return
_emscripten_set_canvas_element_size_calling_thread(target,width,height)}else{return
_emscripten_set_canvas_element_size_main_thread(target,width,height)}}function
_emscripten_set_current_thread_status(newStatus){}function
_emscripten_set_thread_name(threadId,name){}function __webgl_enable_ANGLE_instanced_arrays(ctx){var
ext=ctx.getExtension(\"ANGLE_instanced_arrays\");if(ext){ctx[\"vertexAttribDivisor\"]=function(index,divisor){ex
t[\"vertexAttribDivisorANGLE\"](index,divisor)};ctx[\"drawArraysInstanced\"]=function(mode,first,count,primcou
nt){ext[\"drawArraysInstancedANGLE\"](mode,first,count,primcount)};ctx[\"drawElementsInstanced\"]=function(
mode,count,type,indices,primcount){ext[\"drawElementsInstancedANGLE\"](mode,count,type,indices,primcount)};
return
1}}function __webgl_enable_OES_vertex_array_object(ctx){var
ext=ctx.getExtension(\"OES_vertex_array_object\");if(ext){ctx[\"createVertexArray\"]=function(){return
ext[\"createVertexArrayOES\"]()};ctx[\"deleteVertexArray\"]=function(vao){ext[\"deleteVertexArrayOES\"](vao)};
ctx[\"bindVertexArray\"]=function(vao){ext[\"bindVertexArrayOES\"](vao)};ctx[\"isVertexArray\"]=function(vao)
{return ext[\"isVertexArrayOES\"](vao)};return 1}}function __webgl_enable_WEBGL_draw_buffers(ctx){var
ext=ctx.getExtension(\"WEBGL_draw_buffers\");if(ext){ctx[\"drawBuffers\"]=function(n,bufs){ext[\"drawBuffers
WEBGL\"](n,bufs)};return 1}}function
__webgl_enable_WEBGL_multi_draw(ctx){return!!(ctx.multiDrawWebgl=ctx.getExtension(\"WEBGL_multi_dra

w\"))}var
GL={counter:1,buffers:[],programs:[],framebuffers:[],renderbuffers:[],textures:[],uniforms:[],shaders:[],vaos:[],cont
exts:{},offscreenCanvases:{},timerQueriesEXT:[],programInfos:{},stringCache:{},unpackAlignment:4,recordError:
function
recordError(errorCode){if(!GL.lastError){GL.lastError=errorCode}},getNewId:function(table){var
ret=GL.counter++;for(var i=table.length;i<ret;i++){table[i]=null}return
ret},getSource:function(shader,count,string,length){var source=\"\";for(var i=0;i<count;++i){var
len=length?GROWABLE_HEAP_I32()[length+i*4>>2]:-
1;source+=UTF8ToString(GROWABLE_HEAP_I32()[string+i*4>>2],len<0?undefined:len)}return
source},createContext:function(canvas,webGLContextAttributes){var
ctx=canvas.getContext(\"webgl\",webGLContextAttributes);if(!ctx)return 0;var
handle=GL.registerContext(ctx,webGLContextAttributes);return
handle},registerContext:function(ctx,webGLContextAttributes){var
handle=_malloc(8);GROWABLE_HEAP_I32()[handle+4>>2]=_pthread_self();var
context={handle:handle,attributes:webGLContextAttributes,version:webGLContextAttributes.majorVersion,GLctx:
ctx};if(ctx.canvas)ctx.canvas.GLctxObject=context;GL.contexts[handle]=context;if(typeof
webGLContextAttributes.enableExtensionsByDefault===\"undefined\"||webGLContextAttributes.enableExtensions
ByDefault){GL.initExtensions(context)}return
handle},makeContextCurrent:function(contextHandle){GL.currentContext=GL.contexts[contextHandle];Module.ctx
=GLctx=GL.currentContext&&GL.currentContext.GLctx;return!(contextHandle&&!GLctx)},getContext:function(c
ontextHandle){return
GL.contexts[contextHandle]},deleteContext:function(contextHandle){if(GL.currentContext===GL.contexts[context
Handle])GL.currentContext=null;if(typeof
JSEvents===\"object\")JSEvents.removeAllHandlersOnTarget(GL.contexts[contextHandle].GLctx.canvas);if(GL.co
ntexts[contextHandle]&&GL.contexts[contextHandle].GLctx.canvas)GL.contexts[contextHandle].GLctx.canvas.GL
ctxObject=undefined;_free(GL.contexts[contextHandle].handle);GL.contexts[contextHandle]=null},initExtensions:f
unction(context){if(!context)context=GL.currentContext;if(context.initExtensionsDone)return;context.initExtension
sDone=true;var
GLctx=context.GLctx;__webgl_enable_ANGLE_instanced_arrays(GLctx);__webgl_enable_OES_vertex_array_obj
ect(GLctx);__webgl_enable_WEBGL_draw_buffers(GLctx);GLctx.disjointTimerQueryExt=GLctx.getExtension(\"
EXT_disjoint_timer_query\");__webgl_enable_WEBGL_multi_draw(GLctx);var
exts=GLctx.getSupportedExtensions()||[];exts.forEach(function(ext){if(ext.indexOf(\"lose_context\")<0&&ext.inde
xOf(\"debug\")<0){GLctx.getExtension(ext)}})},populateUniformTable:function(program){var
p=GL.programs[program];var
ptable=GL.programInfos[program]={uniforms:{},maxUniformLength:0,maxAttributeLength:-
1,maxUniformBlockNameLength:-1};var utable=ptable.uniforms;var
numUniforms=GLctx.getProgramParameter(p,35718);for(var i=0;i<numUniforms;++i){var
u=GLctx.getActiveUniform(p,i);var
name=u.name;ptable.maxUniformLength=Math.max(ptable.maxUniformLength,name.length+1);if(name.slice(-
1)==\"]\"){name=name.slice(0,name.lastIndexOf(\"[\"))}var loc=GLctx.getUniformLocation(p,name);if(loc){var
id=GL.getNewId(GL.uniforms);utable[name]=[u.size,id];GL.uniforms[id]=loc;for(var
j=1;j<u.size;++j){var
n=name+\"[\"+j+\"]\";loc=GLctx.getUniformLocation(p,n);id=GL.getNewId(GL.uniforms);GL.uniforms[id]=loc}}
}};var __emscripten_webgl_power_preferences=[\"default\",\"low-power\",\"high-performance\"];function
_emscripten_webgl_do_create_context(target,attributes){var a=attributes>>2;var
powerPreference=GROWABLE_HEAP_I32()[a+(24>>2)];var
contextAttributes={\"alpha\":!!GROWABLE_HEAP_I32()[a+(0>>2)],\"depth\":!!GROWABLE_HEAP_I32()[a+(4
>>2)],\"stencil\":!!GROWABLE_HEAP_I32()[a+(8>>2)],\"antialias\":!!GROWABLE_HEAP_I32()[a+(12>>2)],\"p

remultipliedAlpha\":!!GROWABLE_HEAP_I32()[a+(16>>2)],\"preserveDrawingBuffer\":!!GROWABLE_HEAP_I32()[a+(20>>2)],\"powerPreference\":__emscripten_webgl_power_preferences[powerPreference],\"failIfMajorPerformanceCaveat\":!!GROWABLE_HEAP_I32()[a+(28>>2)],majorVersion:GROWABLE_HEAP_I32()[a+(32>>2)],minorVersion:GROWABLE_HEAP_I32()[a+(36>>2)],enableExtensionsByDefault:GROWABLE_HEAP_I32()[a+(40>>2)],explicitSwapControl:GROWABLE_HEAP_I32()[a+(44>>2)],proxyContextToMainThread:GROWABLE_HEAP_I32()[a+(48>>2)],renderViaOffscreenBackBuffer:GROWABLE_HEAP_I32()[a+(52>>2)]};var canvas=findCanvasEventTarget(target);if(!canvas){return 0}if(contextAttributes.explicitSwapControl){return 0}var contextHandle=GL.createContext(canvas,contextAttributes);return contextHandle}function _emscripten_webgl_create_context(a0,a1){return _emscripten_webgl_do_create_context(a0,a1)}var SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var ret=GROWABLE_HEAP_I32()[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function _fd_close(fd){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(3,1,fd);return 0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(4,1,fd,offset_low,offset_high,whence,newOffset)}function _fd_write(fd,iov,iovcnt,pnum){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(5,1,fd,iov,iovcnt,pnum);var num=0;for(var i=0;i<iovcnt;i++){var ptr=GROWABLE_HEAP_I32()[iov+i*8>>2];var len=GROWABLE_HEAP_I32()[iov+(i*8+4)>>2];for(var j=0;j<len;j++){SYSCALLS.printChar(fd,GROWABLE_HEAP_U8()[ptr+j])}num+=len}GROWABLE_HEAP_I32()[pnum>>2]=num;return 0}function _pthread_cleanup_pop(execute){var routine=PThread.threadExitHandlers.pop();if(execute)routine()}function _pthread_cleanup_push(routine,arg){PThread.threadExitHandlers.push(function(){wasmTable.get(routine)(arg)})}function spawnThread(threadParams){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! spawnThread() can only ever be called from main application thread!\";var worker=PThread.getNewWorker();if(worker.pthread!==undefined)throw\"Internal error!\";if(!threadParams.pthread_ptr)throw\"Internal error, no pthread ptr!\";PThread.runningWorkers.push(worker);var tlsMemory=_malloc(128*4);for(var i=0;i<128;++i){GROWABLE_HEAP_I32()[tlsMemory+i*4>>2]=0}var stackHigh=threadParams.stackBase+threadParams.stackSize;var pthread=PThread.pthreads[threadParams.pthread_ptr]={worker:worker,stackBase:threadParams.stackBase,stackSize:threadParams.stackSize,allocatedOwnStack:threadParams.allocatedOwnStack,threadInfoStruct:threadParams.pthread_ptr};var tis=pthread.threadInfoStruct>>2;Atomics.store(GROWABLE_HEAP_U32(),tis+(64>>2),threadParams.detached);Atomics.store(GROWABLE_HEAP_U32(),tis+(100>>2),tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tis+(40>>2),pthread.threadInfoStruct);Atomics.store(GROWABLE_HEAP_U32(),tis+(80>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(76>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),tis+(104>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+8>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+12>>2),threadParams.detached);var global_libc=_emscripten_get_global_libc();var global_locale=global_libc+40;Atomics.store(GROWABLE_HEAP_U32(),tis+(172>>2),global_locale);worker.pthread=pthread;var msg={\"cmd\":\"run\",\"start_routine\":threadParams.startRoutine,\"arg\":threadParams.arg,\"threadInfoStruct\":threadParams.pthread_ptr,\"stackBase\":threadParams.stackBase,\"stackSize\":threadParams.stackSize};worker.runPthread=function(){msg.time=performance.now();worker.postMessage(msg,threadParams.transferList)};if(worker.loaded){worker.runPthread();delete worker.runPthread}}function _pthread_create(pthread_ptr,attr,start_routine,arg){if(typeof SharedArrayBuffer===\"undefined\"){err(\"Current

environment does not support SharedArrayBuffer, pthreads are not available!\");return 6}if(!pthread_ptr){err(\"pthread_create called with a null thread pointer!\");return 28}var transferList=[];var error=0;if(ENVIRONMENT_IS_PTHREAD&&(transferList.length===0||error)){return _emscripten_sync_run_in_main_thread_4(687865856,pthread_ptr,attr,start_routine,arg)}if(error)return error;var stackSize=0;var stackBase=0;var detached=0;if(attr&&attr!=-1){stackSize=GROWABLE_HEAP_I32()[attr>>2];stackSize+=81920;stackBase=GROWABLE_HEAP_I32()[attr+8>>2];detached=GROWABLE_HEAP_I32()[attr+12>>2]!==0}else{stackSize=2097152}var allocatedOwnStack=stackBase==0;if(allocatedOwnStack){stackBase=_memalign(16,stackSize)}else{stackBase-=stackSize;assert(stackBase>0)}var threadInfoStruct=_malloc(228);for(var i=0;i<228>>2;++i)GROWABLE_HEAP_U32()[(threadInfoStruct>>2)+i]=0;GROWABLE_HEAP_I32()[pthread_ptr>>2]=threadInfoStruct;GROWABLE_HEAP_I32()[threadInfoStruct+12>>2]=threadInfoStruct;var headPtr=threadInfoStruct+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var threadParams={stackBase:stackBase,stackSize:stackSize,allocatedOwnStack:allocatedOwnStack,detached:detached,startRoutine:start_routine,pthread_ptr:threadInfoStruct,arg:arg,transferList:transferList};if(ENVIRONMENT_IS_PTHREAD){threadParams.cmd=\"spawnThread\";postMessage(threadParams,transferList)}else{spawnThread(threadParams)}return 0}function __pthread_testcancel_js(){if(!ENVIRONMENT_IS_PTHREAD)return;var tb=_pthread_self();if(!tb)return;var cancelDisabled=Atomics.load(GROWABLE_HEAP_U32(),tb+56>>2);if(cancelDisabled)return;var canceled=Atomics.load(GROWABLE_HEAP_U32(),tb+0>>2);if(canceled==2)throw\"Canceled!\"}function _emscripten_check_blocking_allowed(){if(ENVIRONMENT_IS_NODE)return;if(ENVIRONMENT_IS_WORKER)return;warnOnce(\"Blocking on the main thread is very dangerous, see https://emscripten.org/docs/porting/pthreads.html#blocking-on-the-main-browser-thread\")}function __emscripten_do_pthread_join(thread,status,block){if(!thread){err(\"pthread_join attempted on a null thread pointer!\");return ERRNO_CODES.ESRCH}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self()==thread){err(\"PThread \"+thread+\" is attempting to join to itself!\");return ERRNO_CODES.EDEADLK}else if(!ENVIRONMENT_IS_PTHREAD&&_emscripten_main_browser_thread_id()==thread){err(\"Main thread \"+thread+\" is attempting to join to itself!\");return ERRNO_CODES.EDEADLK}var self=GROWABLE_HEAP_I32()[thread+12>>2];if(self!==thread){err(\"pthread_join attempted on thread \"+thread+\", which does not point to a valid thread, or does not exist anymore!\");return ERRNO_CODES.ESRCH}var detached=Atomics.load(GROWABLE_HEAP_U32(),thread+64>>2);if(detached){err(\"Attempted to join thread \"+thread+\", which was already detached!\");return ERRNO_CODES.EINVAL}if(block){_emscripten_check_blocking_allowed()}for(;;){var threadStatus=Atomics.load(GROWABLE_HEAP_U32(),thread+0>>2);if(threadStatus==1){var threadExitCode=Atomics.load(GROWABLE_HEAP_U32(),thread+4>>2);if(status)GROWABLE_HEAP_I32()[status>>2]=threadExitCode;Atomics.store(GROWABLE_HEAP_U32(),thread+64>>2,1);if(!ENVIRONMENT_IS_PTHREAD)cleanupThread(thread);else postMessage({\"cmd\":\"cleanupThread\",\"thread\":thread});return 0}if(!block){return ERRNO_CODES.EBUSY}__pthread_testcancel_js();if(!ENVIRONMENT_IS_PTHREAD)_emscripten_main_thread_process_queued_calls();_emscripten_futex_wait(thread+0,threadStatus,ENVIRONMENT_IS_PTHREAD?100:1)}}function _pthread_join(thread,status){return __emscripten_do_pthread_join(thread,status,true)}function _sysconf(name){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(6,1,name);switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case

159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-1}if(!ENVIRONMENT_IS_PTHREAD)PThread.initMainThreadBlock();var GLctx;var proxiedFunctionTable=[null,_atexit,_emscripten_set_canvas_element_size_main_thread,_fd_close,_fd_seek,_fd_write,_sysconf];var asmLibraryArg={\"e\":___assert_fail,\"r\":___call_main,\"x\":__emscripten_notify_thread_queue,\"b\":_abort,\"y\":_emscripten_asm_const_int,\"j\":_emscripten_conditional_set_current_thread_status,\"d\":_emscripten_futex_wait,\"c\":_emscripten_futex_wake,\"f\":_emscripten_get_now,\"p\":_emscripten_memcpy_big,\"A\":_emscripten_num_logical_cores,\"u\":_emscripten_receive_on_main_thread_js,\"q\":_emscripten_resize_heap,\"v\":_emscripten_set_canvas_element_size,\"i\":_emscripten_set_current_thread_status,\"s\":_emscripten_set_thread_name,\"w\":_emscripten_webgl_create_context,\"l\":_fd_close,\"n\":_fd_seek,\"g\":_fd_write,\"o\":initPthreadsJS,\"a\":wasmMemory||Module[\"wasmMemory\"],\"z\":_pthread_cleanup_pop,\"k\":_pthread_cleanup_push,\"h\":_pthread_create,\"m\":_pthread_join,\"t\":_sysconf};var asm=createWasm();var ___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=function(){return(___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=Module[\"asm\"][\"B\"]).apply(null,arguments)};var _init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"C\"]).apply(null,arguments)};var _init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Module[\"_init_with_threads_count\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var _get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads_count\"]=Module[\"asm\"][\"E\"]).apply(null,arguments)};var _register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=Module[\"asm\"][\"F\"]).apply(null,arguments)};var _dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"asm\"][\"G\"]).apply(null,arguments)};var _dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"H\"]).apply(null,arguments)};var _Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"J\"]).apply(null,arguments)};var _Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"K\"]).apply(null,arguments)};var _AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"L\"]).apply(null,arguments)};var _All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"M\"]).apply(null,arguments)};var _Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"N\"]).apply(null,arguments)};var _ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"O\"]).ap

ply(null,arguments)};var
_AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"P\"]).a
pply(null,arguments)};var
_BatchMatMul=Module[\"_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\"_BatchMatMul\"]=Modu
le[\"asm\"][\"Q\"]).apply(null,arguments)};var
_Ceil=Module[\"_Ceil\"]=function(){return(_Ceil=Module[\"_Ceil\"]=Module[\"asm\"][\"R\"]).apply(null,argument
s)};var
_ClipByValue=Module[\"_ClipByValue\"]=function(){return(_ClipByValue=Module[\"_ClipByValue\"]=Module[\
"asm\"][\"S\"]).apply(null,arguments)};var
_Conv2D=Module[\"_Conv2D\"]=function(){return(_Conv2D=Module[\"_Conv2D\"]=Module[\"asm\"][\"T\"]).app
ly(null,arguments)};var
_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=function(){return(_Conv2DBackpropInput=Modul
e[\"_Conv2DBackpropInput\"]=Module[\"asm\"][\"U\"]).apply(null,arguments)};var
_Cos=Module[\"_Cos\"]=function(){return(_Cos=Module[\"_Cos\"]=Module[\"asm\"][\"V\"]).apply(null,arguments
)};var
_Cosh=Module[\"_Cosh\"]=function(){return(_Cosh=Module[\"_Cosh\"]=Module[\"asm\"][\"W\"]).apply(null,argu
ments)};var
_CropAndResize=Module[\"_CropAndResize\"]=function(){return(_CropAndResize=Module[\"_CropAndResize\"]
=Module[\"asm\"][\"X\"]).apply(null,arguments)};var
_Cumsum=Module[\"_Cumsum\"]=function(){return(_Cumsum=Module[\"_Cumsum\"]=Module[\"asm\"][\"Y\"]).a
pply(null,arguments)};var
_DepthToSpace=Module[\"_DepthToSpace\"]=function(){return(_DepthToSpace=Module[\"_DepthToSpace\"]=M
odule[\"asm\"][\"Z\"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=function(){return(_DepthwiseConv2dNative=M
odule[\"_DepthwiseConv2dNative\"]=Module[\"asm\"][\"_\"]).apply(null,arguments)};var
_Elu=Module[\"_Elu\"]=function(){return(_Elu=Module[\"_Elu\"]=Module[\"asm\"][\"$\"]).apply(null,arguments)}
;var
_Equal=Module[\"_Equal\"]=function(){return(_Equal=Module[\"_Equal\"]=Module[\"asm\"][\"aa\"]).apply(null,ar
guments)};var
_Exp=Module[\"_Exp\"]=function(){return(_Exp=Module[\"_Exp\"]=Module[\"asm\"][\"ba\"]).apply(null,argument
s)};var
_FlipLeftRight=Module[\"_FlipLeftRight\"]=function(){return(_FlipLeftRight=Module[\"_FlipLeftRight\"]=Modul
e[\"asm\"][\"ca\"]).apply(null,arguments)};var
_Floor=Module[\"_Floor\"]=function(){return(_Floor=Module[\"_Floor\"]=Module[\"asm\"][\"da\"]).apply(null,arg
uments)};var
_FloorDiv=Module[\"_FloorDiv\"]=function(){return(_FloorDiv=Module[\"_FloorDiv\"]=Module[\"asm\"][\"ea\"]).
apply(null,arguments)};var
_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=function(){return(_FusedBatchNorm=Module[\"_FusedBatchN
orm\"]=Module[\"asm\"][\"fa\"]).apply(null,arguments)};var
_FusedConv2D=Module[\"_FusedConv2D\"]=function(){return(_FusedConv2D=Module[\"_FusedConv2D\"]=Mod
ule[\"asm\"][\"ga\"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=function(){return(_FusedDepthwiseConv2D=M
odule[\"_FusedDepthwiseConv2D\"]=Module[\"asm\"][\"ha\"]).apply(null,arguments)};var
_Gather=Module[\"_Gather\"]=function(){return(_Gather=Module[\"_Gather\"]=Module[\"asm\"][\"ia\"]).apply(nul
l,arguments)};var
_GatherNd=Module[\"_GatherNd\"]=function(){return(_GatherNd=Module[\"_GatherNd\"]=Module[\"asm\"][\"ja\"
]).apply(null,arguments)};var
_Greater=Module[\"_Greater\"]=function(){return(_Greater=Module[\"_Greater\"]=Module[\"asm\"][\"ka\"]).apply(

null,arguments)};var
_GreaterEqual=Module[\"_GreaterEqual\"]=function(){return(_GreaterEqual=Module[\"_GreaterEqual\"]=Module[\"asm\"][\"la\"]).apply(null,arguments)};var
_LeakyRelu=Module[\"_LeakyRelu\"]=function(){return(_LeakyRelu=Module[\"_LeakyRelu\"]=Module[\"asm\"][\"ma\"]).apply(null,arguments)};var
_Less=Module[\"_Less\"]=function(){return(_Less=Module[\"_Less\"]=Module[\"asm\"][\"na\"]).apply(null,arguments)};var
_LessEqual=Module[\"_LessEqual\"]=function(){return(_LessEqual=Module[\"_LessEqual\"]=Module[\"asm\"][\"oa\"]).apply(null,arguments)};var
_Log=Module[\"_Log\"]=function(){return(_Log=Module[\"_Log\"]=Module[\"asm\"][\"pa\"]).apply(null,arguments)};var
_LogicalAnd=Module[\"_LogicalAnd\"]=function(){return(_LogicalAnd=Module[\"_LogicalAnd\"]=Module[\"asm\"][\"qa\"]).apply(null,arguments)};var
_Max=Module[\"_Max\"]=function(){return(_Max=Module[\"_Max\"]=Module[\"asm\"][\"ra\"]).apply(null,arguments)};var
_MaxPool=Module[\"_MaxPool\"]=function(){return(_MaxPool=Module[\"_MaxPool\"]=Module[\"asm\"][\"sa\"]).apply(null,arguments)};var
_Maximum=Module[\"_Maximum\"]=function(){return(_Maximum=Module[\"_Maximum\"]=Module[\"asm\"][\"ta\"]).apply(null,arguments)};var
_Mean=Module[\"_Mean\"]=function(){return(_Mean=Module[\"_Mean\"]=Module[\"asm\"][\"ua\"]).apply(null,arguments)};var
_Min=Module[\"_Min\"]=function(){return(_Min=Module[\"_Min\"]=Module[\"asm\"][\"va\"]).apply(null,arguments)};var
_Minimum=Module[\"_Minimum\"]=function(){return(_Minimum=Module[\"_Minimum\"]=Module[\"asm\"][\"wa\"]).apply(null,arguments)};var
_MirrorPad=Module[\"_MirrorPad\"]=function(){return(_MirrorPad=Module[\"_MirrorPad\"]=Module[\"asm\"][\"xa\"]).apply(null,arguments)};var
_Multiply=Module[\"_Multiply\"]=function(){return(_Multiply=Module[\"_Multiply\"]=Module[\"asm\"][\"ya\"]).apply(null,arguments)};var
_Neg=Module[\"_Neg\"]=function(){return(_Neg=Module[\"_Neg\"]=Module[\"asm\"][\"za\"]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module[\"_NonMaxSuppressionV3\"]=function(){return(_NonMaxSuppressionV3=Module[\"_NonMaxSuppressionV3\"]=Module[\"asm\"][\"Aa\"]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module[\"_NonMaxSuppressionV4\"]=function(){return(_NonMaxSuppressionV4=Module[\"_NonMaxSuppressionV4\"]=Module[\"asm\"][\"Ba\"]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module[\"_NonMaxSuppressionV5\"]=function(){return(_NonMaxSuppressionV5=Module[\"_NonMaxSuppressionV5\"]=Module[\"asm\"][\"Ca\"]).apply(null,arguments)};var
_NotEqual=Module[\"_NotEqual\"]=function(){return(_NotEqual=Module[\"_NotEqual\"]=Module[\"asm\"][\"Da\"]).apply(null,arguments)};var
_OneHot=Module[\"_OneHot\"]=function(){return(_OneHot=Module[\"_OneHot\"]=Module[\"asm\"][\"Ea\"]).apply(null,arguments)};var
_PadV2=Module[\"_PadV2\"]=function(){return(_PadV2=Module[\"_PadV2\"]=Module[\"asm\"][\"Fa\"]).apply(null,arguments)};var
_Pow=Module[\"_Pow\"]=function(){return(_Pow=Module[\"_Pow\"]=Module[\"asm\"][\"Ga\"]).apply(null,arguments)};var
_Prelu=Module[\"_Prelu\"]=function(){return(_Prelu=Module[\"_Prelu\"]=Module[\"asm\"][\"Ha\"]).apply(null,arguments)};var

_Prod=Module[\"_Prod\"]=function(){return(_Prod=Module[\"_Prod\"]=Module[\"asm\"][\"Ia\"]).apply(null,arguments)};var
_RealDiv=Module[\"_RealDiv\"]=function(){return(_RealDiv=Module[\"_RealDiv\"]=Module[\"asm\"][\"Ja\"]).apply(null,arguments)};var
_Relu=Module[\"_Relu\"]=function(){return(_Relu=Module[\"_Relu\"]=Module[\"asm\"][\"Ka\"]).apply(null,arguments)};var
_Relu6=Module[\"_Relu6\"]=function(){return(_Relu6=Module[\"_Relu6\"]=Module[\"asm\"][\"La\"]).apply(null,arguments)};var
_ResizeBilinear=Module[\"_ResizeBilinear\"]=function(){return(_ResizeBilinear=Module[\"_ResizeBilinear\"]=Module[\"asm\"][\"Ma\"]).apply(null,arguments)};var
_Reverse=Module[\"_Reverse\"]=function(){return(_Reverse=Module[\"_Reverse\"]=Module[\"asm\"][\"Na\"]).apply(null,arguments)};var
_RotateWithOffset=Module[\"_RotateWithOffset\"]=function(){return(_RotateWithOffset=Module[\"_RotateWithOffset\"]=Module[\"asm\"][\"Oa\"]).apply(null,arguments)};var
_Round=Module[\"_Round\"]=function(){return(_Round=Module[\"_Round\"]=Module[\"asm\"][\"Pa\"]).apply(null,arguments)};var
_Rsqrt=Module[\"_Rsqrt\"]=function(){return(_Rsqrt=Module[\"_Rsqrt\"]=Module[\"asm\"][\"Qa\"]).apply(null,arguments)};var
_ScatterNd=Module[\"_ScatterNd\"]=function(){return(_ScatterNd=Module[\"_ScatterNd\"]=Module[\"asm\"][\"Ra\"]).apply(null,arguments)};var
_SelectV2=Module[\"_SelectV2\"]=function(){return(_SelectV2=Module[\"_SelectV2\"]=Module[\"asm\"][\"Sa\"]).apply(null,arguments)};var
_Sigmoid=Module[\"_Sigmoid\"]=function(){return(_Sigmoid=Module[\"_Sigmoid\"]=Module[\"asm\"][\"Ta\"]).apply(null,arguments)};var
_Sin=Module[\"_Sin\"]=function(){return(_Sin=Module[\"_Sin\"]=Module[\"asm\"][\"Ua\"]).apply(null,arguments)};var
_Softmax=Module[\"_Softmax\"]=function(){return(_Softmax=Module[\"_Softmax\"]=Module[\"asm\"][\"Va\"]).apply(null,arguments)};var
_Sqrt=Module[\"_Sqrt\"]=function(){return(_Sqrt=Module[\"_Sqrt\"]=Module[\"asm\"][\"Wa\"]).apply(null,arguments)};var
_Square=Module[\"_Square\"]=function(){return(_Square=Module[\"_Square\"]=Module[\"asm\"][\"Xa\"]).apply(null,arguments)};var
_SquaredDifference=Module[\"_SquaredDifference\"]=function(){return(_SquaredDifference=Module[\"_SquaredDifference\"]=Module[\"asm\"][\"Ya\"]).apply(null,arguments)};var
_Step=Module[\"_Step\"]=function(){return(_Step=Module[\"_Step\"]=Module[\"asm\"][\"Za\"]).apply(null,arguments)};var
_StridedSlice=Module[\"_StridedSlice\"]=function(){return(_StridedSlice=Module[\"_StridedSlice\"]=Module[\"asm\"][\"_a\"]).apply(null,arguments)};var
_Sub=Module[\"_Sub\"]=function(){return(_Sub=Module[\"_Sub\"]=Module[\"asm\"][\"$a\"]).apply(null,arguments)};var
_Sum=Module[\"_Sum\"]=function(){return(_Sum=Module[\"_Sum\"]=Module[\"asm\"][\"ab\"]).apply(null,arguments)};var
_Tan=Module[\"_Tan\"]=function(){return(_Tan=Module[\"_Tan\"]=Module[\"asm\"][\"bb\"]).apply(null,arguments)};var
_Tanh=Module[\"_Tanh\"]=function(){return(_Tanh=Module[\"_Tanh\"]=Module[\"asm\"][\"cb\"]).apply(null,arguments)};var
_Tile=Module[\"_Tile\"]=function(){return(_Tile=Module[\"_Tile\"]=Module[\"asm\"][\"db\"]).apply(null,arguments)};var

_TopK=Module[\"_TopK\"]=function(){return(_TopK=Module[\"_TopK\"]=Module[\"asm\"][\"eb\"]).apply(null,arguments)};var
_Transform=Module[\"_Transform\"]=function(){return(_Transform=Module[\"_Transform\"]=Module[\"asm\"][\"fb\"]).apply(null,arguments)};var
_Transpose=Module[\"_Transpose\"]=function(){return(_Transpose=Module[\"_Transpose\"]=Module[\"asm\"][\"gb\"]).apply(null,arguments)};var
__FusedMatMul=Module[\"__FusedMatMul\"]=function(){return(__FusedMatMul=Module[\"__FusedMatMul\"]=Module[\"asm\"][\"hb\"]).apply(null,arguments)};var
_malloc=Module[\"_malloc\"]=function(){return(_malloc=Module[\"_malloc\"]=Module[\"asm\"][\"ib\"]).apply(null,arguments)};var
_free=Module[\"_free\"]=function(){return(_free=Module[\"_free\"]=Module[\"asm\"][\"jb\"]).apply(null,arguments)};var
___errno_location=Module[\"___errno_location\"]=function(){return(___errno_location=Module[\"___errno_location\"]=Module[\"asm\"][\"kb\"]).apply(null,arguments)};var
_emscripten_get_global_libc=Module[\"_emscripten_get_global_libc\"]=function(){return(_emscripten_get_global_libc=Module[\"_emscripten_get_global_libc\"]=Module[\"asm\"][\"lb\"]).apply(null,arguments)};var
_pthread_self=Module[\"_pthread_self\"]=function(){return(_pthread_self=Module[\"_pthread_self\"]=Module[\"asm\"][\"mb\"]).apply(null,arguments)};var
___pthread_tsd_run_dtors=Module[\"___pthread_tsd_run_dtors\"]=function(){return(___pthread_tsd_run_dtors=Module[\"___pthread_tsd_run_dtors\"]=Module[\"asm\"][\"nb\"]).apply(null,arguments)};var
_emscripten_main_thread_process_queued_calls=Module[\"_emscripten_main_thread_process_queued_calls\"]=function(){return(_emscripten_main_thread_process_queued_calls=Module[\"_emscripten_main_thread_process_queued_calls\"]=Module[\"asm\"][\"ob\"]).apply(null,arguments)};var
_emscripten_current_thread_process_queued_calls=Module[\"_emscripten_current_thread_process_queued_calls\"]=function(){return(_emscripten_current_thread_process_queued_calls=Module[\"_emscripten_current_thread_process_queued_calls\"]=Module[\"asm\"][\"pb\"]).apply(null,arguments)};var
_emscripten_register_main_browser_thread_id=Module[\"_emscripten_register_main_browser_thread_id\"]=function(){return(_emscripten_register_main_browser_thread_id=Module[\"_emscripten_register_main_browser_thread_id\"]=Module[\"asm\"][\"qb\"]).apply(null,arguments)};var
_emscripten_main_browser_thread_id=Module[\"_emscripten_main_browser_thread_id\"]=function(){return(_emscripten_main_browser_thread_id=Module[\"_emscripten_main_browser_thread_id\"]=Module[\"asm\"][\"rb\"]).apply(null,arguments)};var
__emscripten_do_dispatch_to_thread=Module[\"__emscripten_do_dispatch_to_thread\"]=function(){return(__emscripten_do_dispatch_to_thread=Module[\"__emscripten_do_dispatch_to_thread\"]=Module[\"asm\"][\"sb\"]).apply(null,arguments)};var
_emscripten_sync_run_in_main_thread_4=Module[\"_emscripten_sync_run_in_main_thread_4\"]=function(){return(_emscripten_sync_run_in_main_thread_4=Module[\"_emscripten_sync_run_in_main_thread_4\"]=Module[\"asm\"][\"tb\"]).apply(null,arguments)};var
_emscripten_run_in_main_runtime_thread_js=Module[\"_emscripten_run_in_main_runtime_thread_js\"]=function(){return(_emscripten_run_in_main_runtime_thread_js=Module[\"_emscripten_run_in_main_runtime_thread_js\"]=Module[\"asm\"][\"ub\"]).apply(null,arguments)};var
__emscripten_call_on_thread=Module[\"__emscripten_call_on_thread\"]=function(){return(__emscripten_call_on_thread=Module[\"__emscripten_call_on_thread\"]=Module[\"asm\"][\"vb\"]).apply(null,arguments)};var
_emscripten_tls_init=Module[\"_emscripten_tls_init\"]=function(){return(_emscripten_tls_init=Module[\"_emscripten_tls_init\"]=Module[\"asm\"][\"wb\"]).apply(null,arguments)};var
__emscripten_thread_init=Module[\"__emscripten_thread_init\"]=function(){return(__emscripten_thread_init=Module[\"__emscripten_thread_init\"]=Module[\"asm\"][\"xb\"]).apply(null,arguments)};var
stackSave=Module[\"stackSave\"]=function(){return(stackSave=Module[\"stackSave\"]=Module[\"asm\"][\"yb\"]).a

pply(null,arguments)};var
stackRestore=Module[\"stackRestore\"]=function(){return(stackRestore=Module[\"stackRestore\"]=Module[\"asm\"][\"zb\"]).apply(null,arguments)};var
stackAlloc=Module[\"stackAlloc\"]=function(){return(stackAlloc=Module[\"stackAlloc\"]=Module[\"asm\"][\"Ab\"]).apply(null,arguments)};var
_emscripten_stack_set_limits=Module[\"_emscripten_stack_set_limits\"]=function(){return(_emscripten_stack_set_limits=Module[\"_emscripten_stack_set_limits\"]=Module[\"asm\"][\"Bb\"]).apply(null,arguments)};var
_memalign=Module[\"_memalign\"]=function(){return(_memalign=Module[\"_memalign\"]=Module[\"asm\"][\"Cb\"]).apply(null,arguments)};var
__emscripten_allow_main_runtime_queued_calls=Module[\"__emscripten_allow_main_runtime_queued_calls\"]=10512;var
__emscripten_main_thread_futex=Module[\"__emscripten_main_thread_futex\"]=12148;Module[\"cwrap\"]=cwrap;Module[\"PThread\"]=PThread;Module[\"PThread\"]=PThread;Module[\"wasmMemory\"]=wasmMemory;Module[\"ExitStatus\"]=ExitStatus;var
calledRun;function ExitStatus(status){this.name=\"ExitStatus\";this.message=\"Program terminated with exit(\"+status+\")\";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}if(ENVIRONMENT_IS_PTHREAD){readyPromiseResolve(Module);initRuntime();postMessage({\"cmd\":\"loaded\"});return}preRun();if(runDependencies>0){return}function
doRun(){if(calledRun)return;calledRun=true;Module[\"calledRun\"]=true;if(ABORT)return;initRuntime();preMain();readyPromiseResolve(Module);if(Module[\"onRuntimeInitialized\"])Module[\"onRuntimeInitialized\"]();postRun()}if(Module[\"setStatus\"]){Module[\"setStatus\"](\"Running...\");setTimeout(function(){setTimeout(function(){Module[\"setStatus\"](\"\")},1);doRun()},1)}else{doRun()}}Module[\"run\"]=run;function
exit(status,implicit){if(implicit&&noExitRuntime&&status===0){return}if(!implicit){if(ENVIRONMENT_IS_PTHREAD){postMessage({\"cmd\":\"exitProcess\",\"returnCode\":status});throw
new
ExitStatus(status)}else{}}if(noExitRuntime){}else{PThread.terminateAllThreads();EXITSTATUS=status;exitRuntime();if(Module[\"onExit\"])Module[\"onExit\"](status);ABORT=true}quit_(status,new
ExitStatus(status))}if(Module[\"preInit\"]){if(typeof
Module[\"preInit\"]==\"function\")Module[\"preInit\"]=[Module[\"preInit\"]];while(Module[\"preInit\"].length>0){Module[\"preInit\"].pop()()}}if(ENVIRONMENT_IS_PTHREAD){noExitRuntime=false;PThread.initWorker()}run();\n\n\n return WasmBackendModuleThreadedSimd.ready\n}\n);\n})();\nif (typeof exports === 'object' && typeof module === 'object')\n module.exports = WasmBackendModuleThreadedSimd;\nelse if (typeof define === 'function' && define['amd'])\n define([], function() { return WasmBackendModuleThreadedSimd; });\nelse if (typeof exports === 'object')\n exports[\"WasmBackendModuleThreadedSimd\"]
= WasmBackendModuleThreadedSimd;\n","export const wasmWorkerContents = 'var Module={};function
threadPrintErr(){var text=Array.prototype.slice.call(arguments).join(\" \");console.error(text)}function
threadAlert(){var text=Array.prototype.slice.call(arguments).join(\"
\");postMessage({cmd:\"alert\",text:text,threadId:Module[\"_pthread_self\"]()})}var
err=threadPrintErr;this.alert=threadAlert;Module[\"instantiateWasm\"]=function(info,receiveInstance){var
instance=new
WebAssembly.Instance(Module[\"wasmModule\"],info);Module[\"wasmModule\"]=null;receiveInstance(instance);return instance.exports};function
moduleLoaded(){}this.onmessage=function(e){try{if(e.data.cmd===\"load\"){Module[\"wasmModule\"]=e.data.wasmModule;Module[\"wasmMemory\"]=e.data.wasmMemory;Module[\"buffer\"]=Module[\"wasmMemory\"].buffer;Module[\"ENVIRONMENT_IS_PTHREAD\"]=true;if(typeof
e.data.urlOrBlob===\"string\"){importScripts(e.data.urlOrBlob)}else{var

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objectUrl=URL.createObjectURL(e.data.urlOrBlob);importScripts(objectUrl);URL.revokeObjectURL(objectUrl)}
WasmBackendModuleThreadedSimd(Module).then(function(instance){Module=instance;moduleLoaded()})}else
 if(e.data.cmd===\"objectTransfer\"){Module[\"PThread\"].receiveObjectTransfer(e.data)}else
if(e.data.cmd===\"run\"){Module[\"__performance_now_clock_drift\"]=performance.now()-
e.data.time;Module[\"__emscripten_thread_init\"](e.data.threadInfoStruct,0,0);var max=e.data.stackBase;var
top=e.data.stackBase+e.data.stackSize;Module[\"establishStackSpace\"](top,max);Module[\"_emscripten_tls_init\"](
);Module[\"PThread\"].receiveObjectTransfer(e.data);Module[\"PThread\"].setThreadStatus(Module[\"_pthread_self
\"](),1);try{var
result=Module[\"invokeEntryPoint\"](e.data.start_routine,e.data.arg);if(!Module[\"getNoExitRuntime\"]())Module[\
"PThread\"].threadExit(result)}catch(ex){if(ex===\"Canceled!\"){Module[\"PThread\"].threadCancel()}else
if(ex!=\"unwind\"){if(ex instanceof
Module[\"ExitStatus\"]){if(Module[\"getNoExitRuntime\"]()){}else{Module[\"PThread\"].threadExit(ex.status)}}el
se{Module[\"PThread\"].threadExit(-2);throw
 ex}}}}else
if(e.data.cmd===\"cancel\"){if(Module[\"_pthread_self\"]()){Module[\"PThread\"].threadCancel()}}else
if(e.data.target===\"setimmediate\"){}else
if(e.data.cmd===\"processThreadQueue\"){if(Module[\"_pthread_self\"]()){Module[\"_emscripten_current_thread_
process_queued_calls\"]()}}else{err(\"worker.js received unknown command
\"+e.data.cmd);err(e.data)}}catch(ex){err(\"worker.js onmessage() captured an uncaught exception:
\"+ex);if(ex&&ex.stack)err(ex.stack);throw ex}};if(typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof process.versions.node===\"string\"){self={location:{href:__filename}};var
onmessage=this.onmessage;var
nodeWorkerThreads=require(\"worker_threads\");global.Worker=nodeWorkerThreads.Worker;var
parentPort=nodeWorkerThreads.parentPort;parentPort.on(\"message\",function(data){onmessage({data:data})});var
nodeFS=require(\"fs\");var nodeRead=function(filename){return
 nodeFS.readFileSync(filename,\"utf8\")};function
globalEval(x){global.require=require;global.Module=Module;eval.call(null,x)}importScripts=function(f){globalEva
l(nodeRead(f))};postMessage=function(msg){parentPort.postMessage(msg)};if(typeof
performance===\"undefined\"){performance={now:function(){return Date.now()}}}';","\nvar
WasmBackendModule = (function() {\n  var _scriptDir = typeof document !== 'undefined' &&
document.currentScript ? document.currentScript.src : undefined;\n  if (typeof __filename !== 'undefined')
_scriptDir = _scriptDir || __filename;\n  return (\nfunction(WasmBackendModule) {\n  WasmBackendModule =
WasmBackendModule || {};\n\nvar Module=typeof
WasmBackendModule!==\"undefined\"?WasmBackendModule:{};var
readyPromiseResolve,readyPromiseReject;Module[\"ready\"]=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var
 arguments_=[];var thisProgram=\"./this.program\";var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window===\"object\";ENVIRONMENT_IS_WORKER=typeof
importScripts===\"function\";ENVIRONMENT_IS_NODE=typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof
process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var scriptDirectory=\"\";function
locateFile(path){if(Module[\"locateFile\"]){return Module[\"locateFile\"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
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nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\"path\").dirname(scriptDirectory)+\"/\"}else{scriptDirectory=__dirname+\"/\"}read_=function shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=nodePath[\"normalize\"](filename);return nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\")};readBinary=function readBinary(filename){var ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return ret};if(process[\"argv\"].length>1){thisProgram=process[\"argv\"][1].replace(/\\\\/g,\"/\")}arguments_=process[\"argv\"].slice(2);process[\"on\"](\"uncaughtException\",function(ex){if(!(ex instanceof ExitStatus)){throw ex}});process[\"on\"](\"unhandledRejection\",abort);quit_=function(status){process[\"exit\"](status)};Module[\"inspect\"]=function(){return\"[Emscripten Module object]\"}}else if(ENVIRONMENT_IS_SHELL){if(typeof read!=\"undefined\"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var data;if(typeof readbuffer===\"function\"){return new Uint8Array(readbuffer(f))}data=read(f,\"binary\");assert(typeof data===\"object\");return data};if(typeof scriptArgs!=\"undefined\"){arguments_=scriptArgs}else if(typeof arguments!=\"undefined\"){arguments_=arguments}if(typeof quit===\"function\"){quit_=function(status){quit(status)}}if(typeof print!==\"undefined\"){if(typeof console===\"undefined\")console={};console.log=print;console.warn=console.error=typeof printErr!==\"undefined\"?printErr:print}}else if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDirectory=self.location.href}else if(typeof document!==\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(_scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf(\"blob:\")!==0){scriptDirectory=scriptDirectory.substr(0,scriptDirectory.lastIndexOf(\"/\")+1)}else{scriptDirectory=\"\"}{read_=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.send(null);return xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.responseType=\"arraybuffer\";xhr.send(null);return new Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,true);xhr.responseType=\"arraybuffer\";xhr.onload=function(){if(xhr.status==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror()};xhr.onerror=onerror;xhr.send(null)}}setWindowTitle=function(title){document.title=title}}else{}var out=Module[\"print\"]||console.log.bind(console);var err=Module[\"printErr\"]||console.warn.bind(console);for(key in moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverrides=null;if(Module[\"arguments\"])arguments_=Module[\"arguments\"];if(Module[\"thisProgram\"])thisProgram=Module[\"thisProgram\"];if(Module[\"quit\"])quit_=Module[\"quit\"];var wasmBinary;if(Module[\"wasmBinary\"])wasmBinary=Module[\"wasmBinary\"];var noExitRuntime=Module[\"noExitRuntime\"]||true;if(typeof WebAssembly!==\"object\"){abort(\"no native wasm support detected\")}var wasmMemory;var ABORT=false;var EXITSTATUS;function assert(condition,text){if(!condition){abort(\"Assertion failed: \"+text)}}function getCFunc(ident){var func=Module[\"_\"+ident];assert(func,\"Cannot call unknown function \"+ident+\", make sure it is exported\");return func}function ccall(ident,returnType,argTypes,args,opts){var toC={\"string\":function(str){var ret=0;if(str!==null&&str!==undefined&&str!==0){var len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\"array\":function(arr){var ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function convertReturnValue(ret){if(returnType===\"string\")return UTF8ToString(ret);if(returnType===\"boolean\")return Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var i=0;i<args.length;i++){var converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i

]=args[i]}}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var numericArgs=argTypes.every(function(type){return type===\"number\"});var numericRet=returnType!==\"string\";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return function(){return ccall(ident,returnType,argTypes,arguments,opts)}}var UTF8Decoder=typeof TextDecoder!==\"undefined\"?new TextDecoder(\"utf8\"):undefined;function UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var endPtr=idx;while(heap[endPtr]&&!(endPtr>=endIdx))++endPtr;if(endPtr-idx>16&&heap.subarray&&UTF8Decoder){return UTF8Decoder.decode(heap.subarray(idx,endPtr))}else{var str=\"\";while(idx<endPtr){var u0=heap[idx++];if(!(u0&128)){str+=String.fromCharCode(u0);continue}var u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[idx++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}}return str}function UTF8ToString(ptr,maxBytesToRead){return ptr?UTF8ArrayToString(HEAPU8,ptr,maxBytesToRead):\"\"}function stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var u=str.charCodeAt(i);if(u>=55296&&u<=57343){var u1=str.charCodeAt(++i);u=65536+((u&1023)<<10)|u1&1023}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function stringToUTF8(str,outPtr,maxBytesToWrite){return stringToUTF8Array(str,HEAPU8,outPtr,maxBytesToWrite)}function writeArrayToMemory(array,buffer){HEAP8.set(array,buffer)}function alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function updateGlobalBufferAndViews(buf){buffer=buf;Module[\"HEAP8\"]=HEAP8=new Int8Array(buf);Module[\"HEAP16\"]=HEAP16=new Int16Array(buf);Module[\"HEAP32\"]=HEAP32=new Int32Array(buf);Module[\"HEAPU8\"]=HEAPU8=new Uint8Array(buf);Module[\"HEAPU16\"]=HEAPU16=new Uint16Array(buf);Module[\"HEAPU32\"]=HEAPU32=new Uint32Array(buf);Module[\"HEAPF32\"]=HEAPF32=new Float32Array(buf);Module[\"HEAPF64\"]=HEAPF64=new Float64Array(buf)}var INITIAL_MEMORY=Module[\"INITIAL_MEMORY\"]||16777216;var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;__ATINIT__.push({func:function(){___wasm_call_ctors()}});function preRun(){if(Module[\"preRun\"]){if(typeof Module[\"preRun\"]==\"function\")Module[\"preRun\"]=[Module[\"preRun\"]];while(Module[\"preRun\"].length){addOnPreRun(Module[\"preRun\"].shift())}}callRuntimeCallbacks(__ATPRERUN__)}function initRuntime(){runtimeInitialized=true;callRuntimeCallbacks(__ATINIT__)}function preMain(){callRuntimeCallbacks(__ATMAIN__)}function postRun(){if(Module[\"postRun\"]){if(typeof Module[\"postRun\"]==\"function\")Module[\"postRun\"]=[Module[\"postRun\"]];while(Module[\"postRun\"].length){addOnPostRun(Module[\"postRun\"].shift())}}callRuntimeCallbacks(__ATPOSTRUN__)}function addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function addRunDependency(id){runDependencies++;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDep

endencies\"](runDependencies)}}function removeRunDependency(id){runDependencies--
;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}if(runDependencies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}}Module[\"preloadedImages\"]={};Module[\"preloadedAudios\"]={};function
abort(what){if(Module[\"onAbort\"]){Module[\"onAbort\"](what)}what+=\"\";err(what);ABORT=true;EXITSTATUS=1;what=\"abort(\"+what+\"). Build with -s ASSERTIONS=1 for more info.\";var e=new
WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix=\"data:application/octet-stream; base64,\";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix=\"file://\";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile=\"tfjs-backend-
wasm.wasm\";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file==wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw\"both async and sync fetching of the wasm failed\"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch===\"function\"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){if(!response[\"ok\"]){throw\"failed to load wasm binary file at
\'\"+wasmBinaryFile+\"\'\"}return response[\"arrayBuffer\"]()}).catch(function(){return
getBinary(wasmBinaryFile)})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response))},reject)})}}}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={\"a\":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module[\"asm\"]=exports;wasmMemory=Module[\"asm\"][\"j\"];updateGlobalBufferAndViews(wasmMemory.buffer);wasmTable=Module[\"asm\"][\"r\"];removeRunDependency(\"wasm-instantiate\")}addRunDependency(\"wasm-instantiate\");function
receiveInstantiatedSource(output){receiveInstance(output[\"instance\"])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err(\"failed to asynchronously prepare wasm: \"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===\"function\"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFile)&&typeof fetch===\"function\"){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err(\"wasm streaming compile failed: \"+reason);err(\"falling back to ArrayBuffer
instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)})})}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}}if(Module[\"instantiateWasm\"]){try{var
exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports}catch(e){err(\"Module.instantiateWasm callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback==\"function\"){callback(Module);continue}var func=callback.func;if(typeof
func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)()}else{wasmTable.get(func)(callback.arg)}}else{func(callback.arg===undefined?null:callback.arg)}}}function _abort(){abort()}function
_emscripten_memcpy_big(dest,src,num){HEAPU8.copyWithin(dest,src,src+num)}function
_emscripten_get_heap_size(){return HEAPU8.length}function

emscripten_realloc_buffer(size){try{wasmMemory.grow(size-buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return 1}catch(e){}}function _emscripten_resize_heap(requestedSize){var oldSize=_emscripten_get_heap_size();var maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var cutDown=1;cutDown<=4;cutDown*=2){var overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize+100663296);var newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var ret=HEAP32[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function _fd_close(fd){return 0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){}function _fd_write(fd,iov,iovcnt,pnum){var num=0;for(var i=0;i<iovcnt;i++){var ptr=HEAP32[iov+i*8>>2];var len=HEAP32[iov+(i*8+4)>>2];for(var j=0;j<len;j++){SYSCALLS.printChar(fd,HEAPU8[ptr+j])}num+=len}HEAP32[pnum>>2]=num;return 0}function _pthread_create(){return 6}function _pthread_join(){return 28}function setErrNo(value){HEAP32[___errno_location()>>2]=value;return value}function _sysconf(name){switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-1}var asmLibraryArg={\"a\":_abort,\"d\":_emscripten_memcpy_big,\"e\":_emscripten_resize_heap,\"f\":_fd_close,\"c\":_fd_seek,\"b\":_fd_write,\"h\":_pthread_create,\"g\":_pthread_join,\"i\":_sysconf};var asm=createWasm();var ___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=function(){return(___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=Module[\"asm\"][\"k\"]).apply(null,arguments)};var _init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"l\"]).apply(null,arguments)};var _init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Module[\"_init_with_threads_count\"]=Module[\"asm\"][\"m\"]).apply(null,arguments)};var _get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads_count\"]=Module[\"asm\"][\"n\"]).apply(null,arguments)};var _register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=Module[\"asm\"][\"o\"]).apply(null,arguments)};var

_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"asm\"][\"p\"]).apply(null,arguments)};var
_dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"q\"]).apply(null,arguments)};var
_Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"s\"]).apply(null,arguments)};var
_Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"t\"]).apply(null,arguments)};var
_AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"u\"]).apply(null,arguments)};var
_All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"v\"]).apply(null,arguments)};var
_Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"w\"]).apply(null,arguments)};var
_ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"x\"]).apply(null,arguments)};var
_AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"y\"]).apply(null,arguments)};var
_BatchMatMul=Module[\"_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\"_BatchMatMul\"]=Module[\"asm\"][\"z\"]).apply(null,arguments)};var
_Ceil=Module[\"_Ceil\"]=function(){return(_Ceil=Module[\"_Ceil\"]=Module[\"asm\"][\"A\"]).apply(null,arguments)};var
_ClipByValue=Module[\"_ClipByValue\"]=function(){return(_ClipByValue=Module[\"_ClipByValue\"]=Module[\"asm\"][\"B\"]).apply(null,arguments)};var
_Conv2D=Module[\"_Conv2D\"]=function(){return(_Conv2D=Module[\"_Conv2D\"]=Module[\"asm\"][\"C\"]).apply(null,arguments)};var
_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=function(){return(_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var
_Cos=Module[\"_Cos\"]=function(){return(_Cos=Module[\"_Cos\"]=Module[\"asm\"][\"E\"]).apply(null,arguments)};var
_Cosh=Module[\"_Cosh\"]=function(){return(_Cosh=Module[\"_Cosh\"]=Module[\"asm\"][\"F\"]).apply(null,arguments)};var
_CropAndResize=Module[\"_CropAndResize\"]=function(){return(_CropAndResize=Module[\"_CropAndResize\"]=Module[\"asm\"][\"G\"]).apply(null,arguments)};var
_Cumsum=Module[\"_Cumsum\"]=function(){return(_Cumsum=Module[\"_Cumsum\"]=Module[\"asm\"][\"H\"]).apply(null,arguments)};var
_DepthToSpace=Module[\"_DepthToSpace\"]=function(){return(_DepthToSpace=Module[\"_DepthToSpace\"]=Module[\"asm\"][\"I\"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=function(){return(_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=Module[\"asm\"][\"J\"]).apply(null,arguments)};var
_Elu=Module[\"_Elu\"]=function(){return(_Elu=Module[\"_Elu\"]=Module[\"asm\"][\"K\"]).apply(null,arguments)};var
_Equal=Module[\"_Equal\"]=function(){return(_Equal=Module[\"_Equal\"]=Module[\"asm\"][\"L\"]).apply(null,arguments)};var
_Exp=Module[\"_Exp\"]=function(){return(_Exp=Module[\"_Exp\"]=Module[\"asm\"][\"M\"]).apply(null,arguments)};var
_FlipLeftRight=Module[\"_FlipLeftRight\"]=function(){return(_FlipLeftRight=Module[\"_FlipLeftRight\"]=Module[\"asm\"][\"N\"]).apply(null,arguments)};var

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_Floor=Module[\"_Floor\"]=function(){return(_Floor=Module[\"_Floor\"]=Module[\"asm\"][\"O\"]).apply(null,arguments)};var
_FloorDiv=Module[\"_FloorDiv\"]=function(){return(_FloorDiv=Module[\"_FloorDiv\"]=Module[\"asm\"][\"P\"]).apply(null,arguments)};var
_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=function(){return(_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=Module[\"asm\"][\"Q\"]).apply(null,arguments)};var
_FusedConv2D=Module[\"_FusedConv2D\"]=function(){return(_FusedConv2D=Module[\"_FusedConv2D\"]=Module[\"asm\"][\"R\"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=function(){return(_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=Module[\"asm\"][\"S\"]).apply(null,arguments)};var
_Gather=Module[\"_Gather\"]=function(){return(_Gather=Module[\"_Gather\"]=Module[\"asm\"][\"T\"]).apply(null,arguments)};var
_GatherNd=Module[\"_GatherNd\"]=function(){return(_GatherNd=Module[\"_GatherNd\"]=Module[\"asm\"][\"U\"]).apply(null,arguments)};var
_Greater=Module[\"_Greater\"]=function(){return(_Greater=Module[\"_Greater\"]=Module[\"asm\"][\"V\"]).apply(null,arguments)};var
_GreaterEqual=Module[\"_GreaterEqual\"]=function(){return(_GreaterEqual=Module[\"_GreaterEqual\"]=Module[\"asm\"][\"W\"]).apply(null,arguments)};var
_LeakyRelu=Module[\"_LeakyRelu\"]=function(){return(_LeakyRelu=Module[\"_LeakyRelu\"]=Module[\"asm\"][\"X\"]).apply(null,arguments)};var
_Less=Module[\"_Less\"]=function(){return(_Less=Module[\"_Less\"]=Module[\"asm\"][\"Y\"]).apply(null,arguments)};var
_LessEqual=Module[\"_LessEqual\"]=function(){return(_LessEqual=Module[\"_LessEqual\"]=Module[\"asm\"][\"Z\"]).apply(null,arguments)};var
_Log=Module[\"_Log\"]=function(){return(_Log=Module[\"_Log\"]=Module[\"asm\"][\"_\"]).apply(null,arguments)};var
_LogicalAnd=Module[\"_LogicalAnd\"]=function(){return(_LogicalAnd=Module[\"_LogicalAnd\"]=Module[\"asm\"][\"$\"]).apply(null,arguments)};var
_Max=Module[\"_Max\"]=function(){return(_Max=Module[\"_Max\"]=Module[\"asm\"][\"aa\"]).apply(null,arguments)};var
_MaxPool=Module[\"_MaxPool\"]=function(){return(_MaxPool=Module[\"_MaxPool\"]=Module[\"asm\"][\"ba\"]).apply(null,arguments)};var
_Maximum=Module[\"_Maximum\"]=function(){return(_Maximum=Module[\"_Maximum\"]=Module[\"asm\"][\"ca\"]).apply(null,arguments)};var
_Mean=Module[\"_Mean\"]=function(){return(_Mean=Module[\"_Mean\"]=Module[\"asm\"][\"da\"]).apply(null,arguments)};var
_Min=Module[\"_Min\"]=function(){return(_Min=Module[\"_Min\"]=Module[\"asm\"][\"ea\"]).apply(null,arguments)};var
_Minimum=Module[\"_Minimum\"]=function(){return(_Minimum=Module[\"_Minimum\"]=Module[\"asm\"][\"fa\"]).apply(null,arguments)};var
_MirrorPad=Module[\"_MirrorPad\"]=function(){return(_MirrorPad=Module[\"_MirrorPad\"]=Module[\"asm\"][\"ga\"]).apply(null,arguments)};var
_Multiply=Module[\"_Multiply\"]=function(){return(_Multiply=Module[\"_Multiply\"]=Module[\"asm\"][\"ha\"]).apply(null,arguments)};var
_Neg=Module[\"_Neg\"]=function(){return(_Neg=Module[\"_Neg\"]=Module[\"asm\"][\"ia\"]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module[\"_NonMaxSuppressionV3\"]=function(){return(_NonMaxSuppressionV3=Module[\"_NonMaxSuppressionV3\"]=Module[\"asm\"][\"ja\"]).apply(null,arguments)};var
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_NonMaxSuppressionV4=Module[\"_NonMaxSuppressionV4\"]=function(){return(_NonMaxSuppressionV4=Module[\"_NonMaxSuppressionV4\"]=Module[\"asm\"][\"ka\"]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module[\"_NonMaxSuppressionV5\"]=function(){return(_NonMaxSuppressionV5=Module[\"_NonMaxSuppressionV5\"]=Module[\"asm\"][\"la\"]).apply(null,arguments)};var
_NotEqual=Module[\"_NotEqual\"]=function(){return(_NotEqual=Module[\"_NotEqual\"]=Module[\"asm\"][\"ma\"]).apply(null,arguments)};var
_OneHot=Module[\"_OneHot\"]=function(){return(_OneHot=Module[\"_OneHot\"]=Module[\"asm\"][\"na\"]).apply(null,arguments)};var
_PadV2=Module[\"_PadV2\"]=function(){return(_PadV2=Module[\"_PadV2\"]=Module[\"asm\"][\"oa\"]).apply(null,arguments)};var
_Pow=Module[\"_Pow\"]=function(){return(_Pow=Module[\"_Pow\"]=Module[\"asm\"][\"pa\"]).apply(null,arguments)};var
_Prelu=Module[\"_Prelu\"]=function(){return(_Prelu=Module[\"_Prelu\"]=Module[\"asm\"][\"qa\"]).apply(null,arguments)};var
_Prod=Module[\"_Prod\"]=function(){return(_Prod=Module[\"_Prod\"]=Module[\"asm\"][\"ra\"]).apply(null,arguments)};var
_RealDiv=Module[\"_RealDiv\"]=function(){return(_RealDiv=Module[\"_RealDiv\"]=Module[\"asm\"][\"sa\"]).apply(null,arguments)};var
_Relu=Module[\"_Relu\"]=function(){return(_Relu=Module[\"_Relu\"]=Module[\"asm\"][\"ta\"]).apply(null,arguments)};var
_Relu6=Module[\"_Relu6\"]=function(){return(_Relu6=Module[\"_Relu6\"]=Module[\"asm\"][\"ua\"]).apply(null,arguments)};var
_ResizeBilinear=Module[\"_ResizeBilinear\"]=function(){return(_ResizeBilinear=Module[\"_ResizeBilinear\"]=Module[\"asm\"][\"va\"]).apply(null,arguments)};var
_Reverse=Module[\"_Reverse\"]=function(){return(_Reverse=Module[\"_Reverse\"]=Module[\"asm\"][\"wa\"]).apply(null,arguments)};var
_RotateWithOffset=Module[\"_RotateWithOffset\"]=function(){return(_RotateWithOffset=Module[\"_RotateWithOffset\"]=Module[\"asm\"][\"xa\"]).apply(null,arguments)};var
_Round=Module[\"_Round\"]=function(){return(_Round=Module[\"_Round\"]=Module[\"asm\"][\"ya\"]).apply(null,arguments)};var
_Rsqrt=Module[\"_Rsqrt\"]=function(){return(_Rsqrt=Module[\"_Rsqrt\"]=Module[\"asm\"][\"za\"]).apply(null,arguments)};var
_ScatterNd=Module[\"_ScatterNd\"]=function(){return(_ScatterNd=Module[\"_ScatterNd\"]=Module[\"asm\"][\"Aa\"]).apply(null,arguments)};var
_SelectV2=Module[\"_SelectV2\"]=function(){return(_SelectV2=Module[\"_SelectV2\"]=Module[\"asm\"][\"Ba\"]).apply(null,arguments)};var
_Sigmoid=Module[\"_Sigmoid\"]=function(){return(_Sigmoid=Module[\"_Sigmoid\"]=Module[\"asm\"][\"Ca\"]).apply(null,arguments)};var
_Sin=Module[\"_Sin\"]=function(){return(_Sin=Module[\"_Sin\"]=Module[\"asm\"][\"Da\"]).apply(null,arguments)};var
_Softmax=Module[\"_Softmax\"]=function(){return(_Softmax=Module[\"_Softmax\"]=Module[\"asm\"][\"Ea\"]).apply(null,arguments)};var
_Sqrt=Module[\"_Sqrt\"]=function(){return(_Sqrt=Module[\"_Sqrt\"]=Module[\"asm\"][\"Fa\"]).apply(null,arguments)};var
_Square=Module[\"_Square\"]=function(){return(_Square=Module[\"_Square\"]=Module[\"asm\"][\"Ga\"]).apply(null,arguments)};var
_SquaredDifference=Module[\"_SquaredDifference\"]=function(){return(_SquaredDifference=Module[\"_SquaredDifference\"]=Module[\"asm\"][\"Ha\"]).apply(null,arguments)};var

_Step=Module[\"_Step\"]=function(){return(_Step=Module[\"_Step\"]=Module[\"asm\"][\"Ia\"]).apply(null,argume
nts)};var
_StridedSlice=Module[\"_StridedSlice\"]=function(){return(_StridedSlice=Module[\"_StridedSlice\"]=Module[\"as
m\"][\"Ja\"]).apply(null,arguments)};var
_Sub=Module[\"_Sub\"]=function(){return(_Sub=Module[\"_Sub\"]=Module[\"asm\"][\"Ka\"]).apply(null,argument
s)};var
_Sum=Module[\"_Sum\"]=function(){return(_Sum=Module[\"_Sum\"]=Module[\"asm\"][\"La\"]).apply(null,argum
ents)};var
_Tan=Module[\"_Tan\"]=function(){return(_Tan=Module[\"_Tan\"]=Module[\"asm\"][\"Ma\"]).apply(null,argumen
ts)};var
_Tanh=Module[\"_Tanh\"]=function(){return(_Tanh=Module[\"_Tanh\"]=Module[\"asm\"][\"Na\"]).apply(null,argu
ments)};var
_Tile=Module[\"_Tile\"]=function(){return(_Tile=Module[\"_Tile\"]=Module[\"asm\"][\"Oa\"]).apply(null,argumen
ts)};var
_TopK=Module[\"_TopK\"]=function(){return(_TopK=Module[\"_TopK\"]=Module[\"asm\"][\"Pa\"]).apply(null,ar
guments)};var
_Transform=Module[\"_Transform\"]=function(){return(_Transform=Module[\"_Transform\"]=Module[\"asm\"][\"
Qa\"]).apply(null,arguments)};var
_Transpose=Module[\"_Transpose\"]=function(){return(_Transpose=Module[\"_Transpose\"]=Module[\"asm\"][\"R
a\"]).apply(null,arguments)};var
__FusedMatMul=Module[\"__FusedMatMul\"]=function(){return(__FusedMatMul=Module[\"__FusedMatMul\"]=
Module[\"asm\"][\"Sa\"]).apply(null,arguments)};var
_malloc=Module[\"_malloc\"]=function(){return(_malloc=Module[\"_malloc\"]=Module[\"asm\"][\"Ta\"]).apply(nu
ll,arguments)};var
_free=Module[\"_free\"]=function(){return(_free=Module[\"_free\"]=Module[\"asm\"][\"Ua\"]).apply(null,argument
s)};var
___errno_location=Module[\"___errno_location\"]=function(){return(___errno_location=Module[\"___errno_locati
on\"]=Module[\"asm\"][\"Va\"]).apply(null,arguments)};var
stackSave=Module[\"stackSave\"]=function(){return(stackSave=Module[\"stackSave\"]=Module[\"asm\"][\"Wa\"]).
apply(null,arguments)};var
stackRestore=Module[\"stackRestore\"]=function(){return(stackRestore=Module[\"stackRestore\"]=Module[\"asm\"
][\"Xa\"]).apply(null,arguments)};var
stackAlloc=Module[\"stackAlloc\"]=function(){return(stackAlloc=Module[\"stackAlloc\"]=Module[\"asm\"][\"Ya\"
]).apply(null,arguments)};Module[\"cwrap\"]=cwrap;var calledRun;function
ExitStatus(status){this.name=\"ExitStatus\";this.message=\"Program terminated with
exit(\"+status+\")\";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}preRun();if(runDependencies>0){return}function
doRun(){if(calledRun)return;calledRun=true;Module[\"calledRun\"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module[\"onRuntimeInitialized\"])Module[\"onRuntimeInitialized\"]();postRun(
)}if(Module[\"setStatus\"]){Module[\"setStatus\"](\"Running...\");setTimeout(function(){setTimeout(function(){Mo
dule[\"setStatus\"](\"\")},1);doRun()},1)}else{doRun()}}Module[\"run\"]=run;if(Module[\"preInit\"]){if(typeof
Module[\"preInit\"]==\"function\")Module[\"preInit\"]=[Module[\"preInit\"]];while(Module[\"preInit\"].length>0){
Module[\"preInit\"].pop()()}}run();\n\n\n\n return WasmBackendModule.ready\n}\n);\n})();\nif (typeof exports ===
'object' && typeof module === 'object')\n module.exports = WasmBackendModule;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModule; });\nelse if (typeof exports ===
'object')\n exports[\"WasmBackendModule\"] = WasmBackendModule;\n","/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you

may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\nimport './flags_wasm';\n\nimport {backend_util, BackendTimingInfo, DataStorage, DataType, deprecationWarn, engine, env, KernelBackend, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasmModule, WasmFactoryConfig} from '../wasm-out/tfjs-backend-wasm';\nimport {BackendWasmThreadedSimdModule} from '../wasm-out/tfjs-backend-wasm-threaded-simd';\nimport wasmFactoryThreadedSimd from '../wasm-out/tfjs-backend-wasm-threaded-simd.js';\n// @ts-ignore\nimport {wasmWorkerContents} from '../wasm-out/tfjs-backend-wasm-threaded-simd.worker.js';\nimport wasmFactory from '../wasm-out/tfjs-backend-wasm.js';\n\ninterface TensorData {\n id: number;\n memoryOffset: number;\n shape: number[];\n dtype: DataType;\n refCount: number;\n /** Only used for string tensors, storing encoded bytes. */\n stringBytes?: Uint8Array[];\n}\n\nexport type DataId = object; // object instead of {} to force non-primitive.\n\nexport class BackendWasm extends KernelBackend {\n // 0 is reserved for null data ids.\n private dataIdNextNumber = 1;\n dataIdMap: DataStorage<TensorData>;\n\n constructor(public wasm: BackendWasmModule|BackendWasmThreadedSimdModule) {\n super();\n this.wasm.tfjs.initWithThreadsCount(threadsCount);\n actualThreadsCount = this.wasm.tfjs.getThreadsCount();\n this.dataIdMap = new DataStorage(this, engine());\n }\n\n write(values: backend_util.BackendValues, shape: number[], dtype: DataType):\n DataId {\n const dataId = {id: this.dataIdNextNumber++};\n this.move(dataId, values, shape, dtype, 1);\n return dataId;\n }\n\n numDataIds(): number {\n return this.dataIdMap.numDataIds();\n }\n\n async time(f: () => void): Promise<BackendTimingInfo> {\n const start = util.now();\n f();\n const kernelMs = util.now() - start;\n return {kernelMs};\n }\n\n move(\n dataId: DataId, values: backend_util.BackendValues, shape: number[],\n dtype: DataType, refCount: number): void {\n const id = this.dataIdNextNumber++;\n if (dtype === 'string') {\n const stringBytes = values as Uint8Array[];\n this.dataIdMap.set(\n dataId,\n {id, stringBytes, shape, dtype, memoryOffset: null, refCount});\n return;\n }\n\n const size = util.sizeFromShape(shape);\n const numBytes = size * util.bytesPerElement(dtype);\n const memoryOffset = this.wasm._malloc(numBytes);\n\n this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount});\n\n this.wasm.tfjs.registerTensor(id, size, memoryOffset);\n\n if (values != null) {\n this.wasm.HEAPU8.set(\n new Uint8Array(\n (values as backend_util.TypedArray).buffer,\n (values as backend_util.TypedArray).byteOffset, numBytes),\n memoryOffset);\n }\n }\n\n async read(dataId: DataId): Promise<backend_util.BackendValues> {\n return this.readSync(dataId);\n }\n\n readSync(dataId: DataId): backend_util.BackendValues {\n const {memoryOffset, dtype, shape, stringBytes} =\n this.dataIdMap.get(dataId);\n if (dtype === 'string') {\n return stringBytes;\n }\n const bytes = this.wasm.HEAPU8.slice(\n memoryOffset,\n memoryOffset + util.sizeFromShape(shape) * util.bytesPerElement(dtype));\n return typedArrayFromBuffer(bytes.buffer, dtype);\n }\n\n /**\n * Dispose the memory if the dataId has 0 refCount. Return true if the memory\n * is released, false otherwise.\n * @param dataId\n * @oaram force Optional, remove the data regardless of refCount\n */\n disposeData(dataId: DataId, force = false): boolean {\n if (this.dataIdMap.has(dataId)) {\n const data = this.dataIdMap.get(dataId);\n data.refCount--;\n if (!force && data.refCount > 0) {\n return false;\n }\n\n this.wasm._free(data.memoryOffset);\n this.wasm.tfjs.disposeData(data.id);\n this.dataIdMap.delete(dataId);\n }\n return true;\n }\n\n /** Return refCount of a `TensorData`. */\n refCount(dataId: DataId): number {\n if (this.dataIdMap.has(dataId)) {\n const tensorData = this.dataIdMap.get(dataId);\n return tensorData.refCount;\n }\n return 0;\n }\n\n incRef(dataId: DataId) {\n const data = this.dataIdMap.get(dataId);\n if (data != null) {\n data.refCount++;\n }\n }\n\n floatPrecision(): 32 {\n

```
return 32;\n  }\n\n  // Returns the memory offset of a tensor. Useful for debugging and unit\n  // testing.\n
getMemoryOffset(dataId: DataId): number {\n    return this.dataIdMap.get(dataId).memoryOffset;\n  }\n\n
dispose() {\n    this.wasm.tfjs.dispose();\n    if ('PThread' in this.wasm) {\n
this.wasm.PThread.terminateAllThreads();\n    }\n    this.wasm = null;\n  }\n\n  memory() {\n    return {unreliable:
false};\n  }\n\n  /**\n   * Make a tensor info for the output of an op. If `memoryOffset` is not\n   * present, this
method allocates memory on the WASM heap. If `memoryOffset`\n   * is present, the memory was allocated
elsewhere (in c++) and we just record\n   * the pointer where that memory lives.\n   */\n  makeOutput(shape:
 number[], dtype: DataType, memoryOffset?: number):\n      TensorInfo {\n    let dataId: {};\n    if (memoryOffset
== null) {\n      dataId = this.write(null /* values */, shape, dtype);\n    } else {\n      const id =
this.dataIdNextNumber++;\n      dataId = {id};\n      this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype,
refCount: 1});\n      const size = util.sizeFromShape(shape);\n      this.wasm.tfjs.registerTensor(id, size,
memoryOffset);\n    }\n    return {dataId, shape, dtype};\n  }\n\n  typedArrayFromHeap({shape, dtype, dataId}:
TensorInfo):\n      backend_util.TypedArray {\n    const buffer = this.wasm.HEAPU8.buffer;\n    const
{memoryOffset} = this.dataIdMap.get(dataId);\n    const size = util.sizeFromShape(shape);\n    switch (dtype) {\n
case 'float32':\n        return new Float32Array(buffer, memoryOffset, size);\n      case 'int32':\n        return new
Int32Array(buffer, memoryOffset, size);\n      case 'bool':\n        return new Uint8Array(buffer, memoryOffset,
 size);\n      default:\n        throw new Error(`Unknown dtype ${dtype}`);\n    }\n  }\n}\n\nfunction
createInstantiateWasmFunc(path: string) {\n  // this will be replace by rollup plugin patchWechatWebAssembly in\n
// minprogram's output.\n  // tslint:disable-next-line:no-any\n  return (imports: any, callback: any) => {\n
util.fetch(path, {credentials: 'same-origin'}).then((response) => {\n      if (!response['ok']) {\n
imports.env.a(`failed to load wasm binary file at '${path}'`);\n      }\n      response.arrayBuffer().then(binary => {\n
   WebAssembly.instantiate(binary, imports).then(output => {\n          callback(output.instance, output.module);\n
});\n      });\n    });\n    return {};\n  };\n}\n\n/**\n * Returns the path of the WASM binary.\n * @param
simdSupported whether SIMD is supported\n * @param threadsSupported whether multithreading is supported\n *
@param wasmModuleFolder the directory containing the WASM binaries.\n */\nfunction getPathToWasmBinary(\n
   simdSupported: boolean, threadsSupported: boolean,\n    wasmModuleFolder: string) {\n  if (wasmPath != null)
{\n    // If wasmPath is defined, the user has supplied a full path to\n    // the vanilla .wasm binary.\n    return
wasmPath;\n  }\n\n  let path: WasmBinaryName = 'tfjs-backend-wasm.wasm';\n  if (simdSupported &&
threadsSupported) {\n    path = 'tfjs-backend-wasm-threaded-simd.wasm';\n  } else if (simdSupported) {\n    path =
'tfjs-backend-wasm-simd.wasm';\n  }\n\n  if (wasmFileMap != null) {\n    if (wasmFileMap[path] != null) {\n
return wasmFileMap[path];\n    }\n  }\n\n  return wasmModuleFolder + path;\n}\n\n/**\n * Initializes the wasm
module and creates the js <--> wasm bridge.\n *\n * NOTE: We wrap the wasm module in a object with property
'wasm' instead of\n * returning Promise<BackendWasmModule> to avoid freezing Chrome (last tested\n * in
Chrome 76).\n */\nexport async function init(): Promise<{wasm: BackendWasmModule}> {\n  const
[simdSupported,
 threadsSupported] = await Promise.all([\n    env().getAsync('WASM_HAS_SIMD_SUPPORT'),\n
env().getAsync('WASM_HAS_MULTITHREAD_SUPPORT')\n  ]);\n\n  return new Promise((resolve, reject) =>
{\n    const factoryConfig: WasmFactoryConfig = {};\n\n    /**\n     * This function overrides the Emscripten
module locateFile utility.\n     * @param path The relative path to the file that needs to be loaded.\n     * @param
prefix The path to the main JavaScript file's directory.\n     */\n    factoryConfig.locateFile = (path, prefix) => {\n
if (path.endsWith('.worker.js')) {\n        const response = wasmWorkerContents;\n        const blob = new
Blob([response], {type: 'application/javascript'});\n        return URL.createObjectURL(blob);\n      }\n\n      if
(path.endsWith('.wasm')) {\n        return getPathToWasmBinary(\n            simdSupported as boolean,
threadsSupported as boolean,\n            wasmPathPrefix != null ? wasmPathPrefix : prefix);\n      }\n      return prefix
+ path;\n
    };\n\n    // Use the instantiateWasm override when system fetch is not available.\n    // Reference:\n    //
https://github.com/emscripten-
core/emscripten/blob/2bca083cbbd5a4133db61fbd74d04f7feecfa907/tests/manual_wasm_instantiate.html#L170\n
```

```
if (customFetch) {\n  factoryConfig.instantiateWasm =\n  createInstantiateWasmFunc(getPathToWasmBinary(\n  simdSupported as boolean, threadsSupported as boolean,\n  wasmPathPrefix != null ? wasmPathPrefix : ''));\n  }\n\n  let initialized = false;\n  factoryConfig.onAbort = () => {\n  if (initialized) {\n  // Emscripten already called console.warn so no need to double log.\n  return;\n  }\n  if (initAborted) {\n  // Emscripten calls `onAbort` twice, resulting in double error\n  // messages.\n  return;\n  }\n  initAborted = true;\n  const rejectMsg =\n  'Make sure the server can serve the `.wasm` file relative to the ' +\n  'bundled
 js file. For more details see https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers';\n  reject({message: rejectMsg});\n  };\n\n  let wasm: Promise<BackendWasmModule>;\n  // If `wasmPath` has been defined we must initialize the vanilla module.\n  if (threadsSupported && simdSupported && wasmPath == null) {\n  factoryConfig.mainScriptUrlOrBlob = new Blob(\n  [`var WasmBackendModuleThreadedSimd = ` +\n  wasmFactoryThreadedSimd.toString()],\n  {type: 'text/javascript'});\n  wasm = wasmFactoryThreadedSimd(factoryConfig);\n  } else {\n  // The wasmFactory works for both vanilla and SIMD binaries.\n  wasm = wasmFactory(factoryConfig);\n  }\n\n  // The WASM module has been successfully created by the factory.\n  // Any error will be caught by the onAbort callback defined above.\n  wasm.then((module) => {\n  initialized = true;\n  initAborted = false;\n\n  const voidReturnType: string
 = null;\n  // Using the tfjs namespace to avoid conflict with emscripten's API.\n  module.tfjs = {\n  init: module.cwrap('init', null, []),\n  initWithThreadsCount:\n  module.cwrap('init_with_threads_count', null, ['number']),\n  getThreadsCount: module.cwrap('get_threads_count', 'number', []),\n  registerTensor: module.cwrap(\n  'register_tensor', null,\n  [\n  'number',  // id\n  'number',  // size\n  'number',  // memoryOffset\n  ]),\n  disposeData: module.cwrap('dispose_data', voidReturnType, ['number']),\n  dispose: module.cwrap('dispose', voidReturnType, []),\n  };\n\n  resolve({wasm: module});\n  });\n  });\n}\n\nfunction typedArrayFromBuffer(\n  buffer: ArrayBuffer, dtype: DataType): backend_util.TypedArray {\n  switch (dtype) {\n  case 'float32':\n  return new Float32Array(buffer);\n  case 'int32':\n  return new Int32Array(buffer);\n
  case 'bool':\n  return new Uint8Array(buffer);\n  default:\n  throw new Error(`Unknown dtype ${dtype}`);\n }\n}\n\nconst wasmBinaryNames = [\n  'tfjs-backend-wasm.wasm', 'tfjs-backend-wasm-simd.wasm',\n  'tfjs-backend-wasm-threaded-simd.wasm'\n] as const ;\ntype WasmBinaryName = typeof wasmBinaryNames[number];\n\nlet wasmPath: string = null;\nlet wasmPathPrefix: string = null;\nlet wasmFileMap: {[key in WasmBinaryName]?: string} = {};\nlet initAborted = false;\nlet customFetch = false;\n\n/**\n * @deprecated Use `setWasmPaths` instead.\n * Sets the path to the `.wasm` file which will be fetched when the wasm\n * backend is initialized. See\n * https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n * for more details.\n * @param path wasm file path or url\n * @param usePlatformFetch optional boolean to use platform fetch to download\n *  the wasm file, default to false.\n *\n * @doc {heading: 'Environment', namespace: 'wasm'}\n */\nexport
 function setWasmPath(path: string, usePlatformFetch = false): void {\n  deprecationWarn(\n  'setWasmPath has been deprecated in favor of setWasmPaths and' +\n  ' will be removed in a future release.');\n  if (initAborted) {\n  throw new Error(\n  'The WASM backend was already initialized. Make sure you call ' +\n  '`setWasmPath()` before you call `tf.setBackend()` or `tf.ready()`');\n  }\n  wasmPath = path;\n  customFetch = usePlatformFetch;\n}\n\n/**\n * Configures the locations of the WASM binaries.\n *\n * ```js\n * setWasmPaths({\n *  'tfjs-backend-wasm.wasm': 'renamed.wasm',\n *  'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n *  'tfjs-backend-wasm-threaded-simd.wasm': 'renamed-threaded-simd.wasm'\n * });\n * tf.setBackend('wasm');\n * ```\n *\n * @param prefixOrFileMap This can be either a string or object:\n *  - (string) The path to the directory where the WASM binaries are located.\n *  Note that this prefix will be used to load each binary
 (vanilla,\n *  SIMD-enabled, threading-enabled, etc.).\n *  - (object) Mapping from names of WASM binaries to custom\n *  full paths specifying the locations of those binaries. This is useful if\n *  your WASM binaries are not all located in the same directory, or if your\n *  WASM binaries have been renamed.\n * @param
```

usePlatformFetch optional boolean to use platform fetch to download\n *   the wasm file, default to false.\n *\n * @doc {heading: 'Environment', namespace: 'wasm'}\n */\nexport function setWasmPaths(\n   prefixOrFileMap: string|{[key in WasmBinaryName]?: string},\n   usePlatformFetch = false): void {\n if (initAborted) {\n   throw new Error(\n   'The WASM backend was already initialized. Make sure you call ' +\n   '`setWasmPaths()` before you call `tf.setBackend()` or ' +\n   '`tf.ready()`');\n }\n\n if (typeof prefixOrFileMap === 'string') {\n   wasmPathPrefix = prefixOrFileMap;\n } else {\n   wasmFileMap = prefixOrFileMap;\n   const missingPaths =\n   wasmBinaryNames.filter(name => wasmFileMap[name] == null);\n   if (missingPaths.length > 0) {\n   throw new Error(\n   `There were no entries found for the following binaries: ` +\n   `${missingPaths.join(',')}. Please either call setWasmPaths with a ` +\n   `map providing a path for each binary, or with a string indicating ` +\n   `the directory where all the binaries can be found.`);\n   }\n }\n\n customFetch = usePlatformFetch;\n}\n\n/** Used in unit tests. */\nexport function resetWasmPath(): void {\n wasmPath = null;\n wasmPathPrefix = null;\n wasmFileMap = {};\n customFetch = false;\n initAborted = false;\n}\n\nlet threadsCount = -1;\nlet actualThreadsCount = -1;\n\n/**\n * Sets the number of threads that will be used by XNNPACK to create\n * threadpool (default to the number of logical CPU cores).\n *\n * This must be called before calling `tf.setBackend('wasm')`.\n */\nexport function setThreadsCount(numThreads: number) {\n threadsCount = numThreads;\n}\n\n/**\n * Gets the actual threads count that is used by XNNPACK.\n *\n * It is set after the backend is intialized.\n */\nexport function getThreadsCount(): number {\n if (actualThreadsCount === -1) {\n   throw new Error(`WASM backend not initialized.`);\n }\n return actualThreadsCount;\n}\n","/** @license See the LICENSE file. */\n\n// This code is auto-generated, do not modify this file!\nconst version = '3.11.0';\nexport {version};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport './flags_wasm';\n\nimport {registerBackend} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm, init} from './backend_wasm';\n\nexport {BackendWasm, getThreadsCount, setThreadsCount, setWasmPath, setWasmPaths} from './backend_wasm';\nexport {version as version_wasm} from './version';\n\nconst WASM_PRIORITY = 2;\nregisterBackend('wasm', async () => {\n const {wasm} = await init();\n return new BackendWasm(wasm);\n}, WASM_PRIORITY);\n"],"names":["setup","wasmFunc","sliceImplCPU","concatImplCPU","supportsFullBroadcast","setupFunc","kernelFunc","rangeImplCPU","require$$0","require$$1","require$$2","global","require$$3","require$$4","wasmFactoryThreadedSimd","wasmFactory"],"mappings":";;;;;;;;;;;;;;;;;;;;;;AAAA;;;;;;;;;;;;;;;AAiBA;AACA,IAAY,QAAMX;AAND,WAAY,QAAQ;AAClB,6CAAW,CAAA;AACX,yCAAS,CAAA;AACT,uCAAQ,CAAA;AACR,2CAAU,CAAA;AACV,iDAAa,CAAA;AACb,2CAAU,CAAA;AACV,yCAAS,CAAA;AACT

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,"../src/kernels/Mean.ts","../src/kernels/Min.ts","../src/kernels/MirrorPad.ts","../src/kernels/Minimum.ts","../src/kernels/NonMaxSuppressionV3.ts","../src/kernels/Multiply.ts","../src/kernels/Neg.ts","../src/kernels/NonMaxSuppression_util.ts","../src/kernels/NonMaxSuppressionV4.ts","../src/kernels/NonMaxSuppressionV5.ts","../src/kernels/OneHot.ts","../src/kernels/NotEqual.ts","../src/kernels/OnesLike.ts","../src/kernels/Pack.ts","../src/kernels/PadV2.ts","../src/kernels/Prelu.ts","../src/kernels/Pow.ts","../src/kernels/Prod.ts","../src/kernels/ResizeBilinear.ts","../src/kernels/Range.ts","../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Range_impl.js","../src/kernels/RealDiv.ts","../src/kernels/Relu.ts","../src/kernels/Relu6.ts","../src/kernels/Reverse.ts","../src/kernels/RotateWithOffset.ts","../src/kernels/ScatterNd.ts","../src/kernels/Round.ts","../src/kernels/Rsqrt.ts","../src/kernels/Select.ts","../src/kernels/Sigmoid.ts","../src/kernels/Softmax.ts","../src/kernels/Sin.ts","../src/kernels/SpaceToBatchND.ts","../src/kernels/SplitV.ts","../src/kernels/Step.ts","../src/kernels/Sqrt.ts","../src/kernels/Square.ts","../src/kernels/SquaredDifference.ts","../src/kernels/StridedSlice.ts","../src/kernels/Sum.ts","../src/kernels/Sub.ts","../src/kernels/Tile.ts","../src/kernels/Tan.ts","../src/kernels/Tanh.ts","../src/kernels/TopK.ts","../src/kernels/Transform.ts","../src/kernels/Unpack.ts","../src/register_all_kernels.ts","../src/kernels/ZerosLike.ts","../src/flags_wasm.ts","../wasm-out/tfjs-backend-wasm-threaded-simd.js","../wasm-out/tfjs-backend-wasm.js","../src/backend_wasm.ts","../wasm-out/tfjs-backend-wasm-threaded-simd.worker.js","../src/base.ts","../src/version.ts"],"sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\n// This enum must align with the enum defined in cc/backend.h.\nexport enum CppDType {\n float32 = 0,\n int32 = 1,\n bool = 2,\n string = 3,\n complex64 = 4\n}\n\n// Must match enum in cc/fusable_activations.h.\nexport enum FusableActivation {\n linear = 0,\n relu = 1,\n relu6 = 2,\n prelu = 3,\n leakyrelu = 4,\n sigmoid = 5,\n elu = 6\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n *
 distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {_FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet wasmFusedMatMul:\n   (aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n   transposeB: boolean, activation: number, biasId: number,\n   preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedMatMul = backend.wasm.cwrap(_FusedMatMul, null /* void */, [\n   'number',
  // a_id\n   'array', // a_shape\n   'number', // a_shape.length\n   'number', // b_id\n   'array', // b_shape\n 'number', // b_shape.length\n   'number', // transpose_a\n   'number', // transpose_b\n   'number', // activation\n 'number', // biasId\n   'number', // preluActivationWeightsId\n   'number', // leakyreluAlpha\n   'number' // out_id\n]);\n}\n\nfunction fusedBatchMatMul(args: {\n inputs: _FusedMatMulInputs,\n backend: BackendWasm,\n attrs: _FusedMatMulAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {a, b, bias, preluActivationWeights} = inputs;\n\n if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n   throw new Error(\n

`_FusedMatMul for non non-float32 tensors not yet supported.`);\n }\n\n const {transposeA, transposeB, activation, leakyreluAlpha} = attrs;\n const aId = backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n\n let biasId = 0;\n if (bias != null) {\n   const biasData = backend.dataIdMap.get(bias.dataId);\n   if (biasData.shape.length !== 1) {\n   throw new Error(\n   `_FusedMatMul only supports rank-1 bias but got ` +\n   `rank ${biasData.shape.length}.`);\n   }\n   biasId = biasData.id;\n }\n const preluActivationWeightsId = preluActivationWeights == null ?\n   0 :\n   backend.dataIdMap.get(preluActivationWeights.dataId).id;\n const fusedActivation =\n   FusableActivation[activation as {} as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n   throw new Error(\n   `${activation} activation not yet supported for FusedConv2D ` +\n   `in the wasm backend.`);\n }\n\n const leftDim = transposeA ? a.shape[2] : a.shape[1];\n const rightDim = transposeB ? b.shape[1] : b.shape[2];\n const batchDim = a.shape[0];\n\n const out = backend.makeOutput([batchDim, leftDim, rightDim], a.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n\n wasmFusedMatMul(\n   aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n   transposeA, transposeB, fusedActivation, biasId, preluActivationWeightsId,\n   leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedMatMulConfig: KernelConfig = {\n kernelName: _FusedMatMul,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchMatMul as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {DataType, KernelConfig, TensorInfo, UnaryInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nexport function createUnaryKernelConfig(\n   kernelName: string, outType?: DataType): KernelConfig {\n let wasmFunc: (xId: number, dtype: number, outId: number) => void;\n\n function setupFunc(backend: BackendWasm): void {\n   wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n   'number', // x_id\n   'number', // dtype\n   'number', // out_id\n   ]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: UnaryInputs}):\n   TensorInfo {\n   const {backend, inputs: {x}} = args;\n   const xId = backend.dataIdMap.get(x.dataId).id;\n   const out = backend.makeOutput(x.shape, outType || x.dtype);\n   const outId = backend.dataIdMap.get(out.dataId).id;\n\n   // Short-circuit zero-sized tensors.\n   if (util.sizeFromShape(out.shape) === 0) {\n   return out;\n   }\n\n   wasmFunc(xId, CppDType[x.dtype], outId);\n   return out;\n }\n\n return {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n
 * limitations under the License.\n *
==\n */\nimport {Abs, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the

License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nexport function createBinaryKernelConfig(\n kernelName: string, supportsFullBroadcast: boolean,\n dtype?: DataType): KernelConfig {\n let wasmFunc:\n (aId: number, aShape: Uint8Array, aShapeLen: number, bId: number,\n bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) =>\n void;\n\n function setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n 'number', // a_id,\n 'array', // a_shape\n 'number', // a_shape.length\n 'number', // b_id\n 'array', // b_shape\n 'number', // b_shape.length\n 'number', // dtype\n 'number' // out_id\n]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: BinaryInputs}):\n TensorInfo {\n const {backend, inputs} = args;\n const {a, b} = inputs;\n const aId = backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n\n const outputType = dtype != null ? dtype : a.dtype;\n const newShape = backend_util.assertAndGetBroadcastShape(a.shape, b.shape);\n const out = backend.makeOutput(newShape, outputType);\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(newShape) === 0) {\n return out;\n }\n\n const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const kernelFunc = () => wasmFunc(\n aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n CppDType[a.dtype], outId);\n\n // Currently only some float operations support full broadcast.\n if (supportsFullBroadcast && a.dtype === 'float32')
{\n kernelFunc();\n return out;\n }\n\n const aBroadcastDims = backend_util.getBroadcastDims(a.shape, newShape);\n const bBroadcastDims = backend_util.getBroadcastDims(b.shape, newShape);\n const loopsOverAllOfA = aBroadcastDims.every((v, i) => v === i);\n const loopsOverAllOfB = bBroadcastDims.every((v, i) => v === i);\n if (loopsOverAllOfA && loopsOverAllOfB) {\n kernelFunc();\n return out;\n } else {\n throw new Error(\n `Broadcasting along outer dims is not yet ` +\n `supported for ${a.dtype} ${kernelName}.`);\n }\n }\n\n return {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {Add, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const addConfig: KernelConfig =\n createBinaryKernelConfig(Add, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
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law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {AddN, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport

{BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmFunc:\n (inputIds: Uint8Array, inputIdsLen: number, dtype: number, outId: number) =>\n void;\n\nfunction setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(AddN, null /* void */, [\n 'array', // input_ids\n 'number', // input_ids.length\n 'number', // dtype\n 'number', // out_id\n]);\n}\n\nfunction addn(args: {inputs: TensorInfo[], backend: BackendWasm}) {\n const {inputs,
backend} = args;\n const out = backend.makeOutput(inputs[0].shape, inputs[0].dtype);\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n const inputIds = inputs.map(x => backend.dataIdMap.get(x.dataId).id);\n const inputIdsBytes = new Uint8Array(new Int32Array(inputIds).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(inputIdsBytes, inputIds.length, CppDType[out.dtype], outId);\n\n return out;\n}\n\nexport const addNConfig: KernelConfig = {\n kernelName: AddN,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: addn as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed
to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function identity(args: {inputs: IdentityInputs, backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const inVals = backend.typedArrayFromHeap(x);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const identityConfig: KernelConfig = {\n kernelName: Identity,\n backendName: 'wasm',\n
kernelFunc: identity as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {identity} from './Identity';\nimport {CppDType}
from './types';\n\nlet wasmTranspose: (\n xId: number, xShape: Uint8Array, xShapeLength: number, dtype: CppDType,\n outId: number, perm: Uint8Array, permLength: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTranspose = backend.wasm.cwrap(Transpose, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // dtype\n 'number', // outId\n 'array', // perm\n 'number', // perm.length\n]);\n}\n\nexport function transpose(\n args:\n {inputs: TransposeInputs, backend: BackendWasm, attrs: TransposeAttrs}):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n // Reduce any dimensions with size one. Lower-rank transpose kernel performs\n // better due to simpler memory access pattern.\n const [reducedShape, perm] = removeOneSizeDims(inputs.x.shape, attrs.perm);\n\n let permIsNoOp = true;\n for (let i = 0; i < perm.length; i++) {\n if (perm[i] !== i) {\n permIsNoOp
= false;\n }\n }\n const outShape = computeOutShape(inputs.x.shape, attrs.perm);\n const x = {\n dataId: inputs.x.dataId,\n shape: reducedShape,\n dtype: inputs.x.dtype\n };\n\n if (permIsNoOp) {\n const cloned = identity({inputs, backend});\n cloned.shape = outShape;\n return cloned;\n }\n\n const out =

backend.makeOutput(outShape, x.dtype);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n const permBytes = new Uint8Array(new Int32Array(perm).buffer);\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n wasmTranspose(\n   xId, xShapeBytes, x.shape.length, CppDType[x.dtype], outId, permBytes,\n   perm.length);\n return out;\n}\n\nfunction computeOutShape(inShape: number[], perm: number[]): number[] {\n const outShape = new Array(inShape.length);\n for (let i = 0; i < outShape.length; i++) {\n   outShape[i] = inShape[perm[i]];\n }\n return outShape;\n}\n\nfunction
 removeOneSizeDims(\n   shape: number[], perm: number[]): [number[], number[]] {\n const newShape: number[] = [];\n const newPerm: number[] = [];\n for (let i = 0; i < shape.length; ++i) {\n   if (shape[i] !== 1) {\n newShape.push(shape[i]);\n   }\n   if (shape[perm[i]] !== 1) {\n   newPerm.push(perm[i]);\n   }\n }\n for (let i = 0; i < newPerm.length; ++i) {\n   let minValIdx = -1;\n   for (let j = 0; j < newPerm.length; ++j) {\n   if (newPerm[j] >= i &&\n   (minValIdx === -1 || newPerm[minValIdx] > newPerm[j])) {\n   minValIdx = j;\n }\n   }\n   newPerm[minValIdx] = i;\n }\n return [newShape, newPerm];\n}\n\nexport const transposeConfig: KernelConfig = {\n kernelName: Transpose,\n backendName: 'wasm',\n kernelFunc: transpose as {} as KernelFunc,\n setupFunc: setup,\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
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==\n
*/\n\nimport {All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmAll: (xId: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmAll = backend.wasm.cwrap(All, null /*void*/, ['number, number, number']);\n}\n\nfunction
 all(args: {backend: BackendWasm, inputs: AllInputs, attrs: AllAttrs}):\n   TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   input = transposed;\n   inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('all', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n wasmAll(inputId,
 reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n return out;\n}\n\nexport const allConfig: KernelConfig = {\n kernelName: All,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: all as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express

or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {backend_util, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {transpose} from './Transpose';\n\n/**\n * Compute permutation axes and do a transpose if necessary.\n *\n * Used by reduction ops.\n * @param x input TensorInfo\n * @param axis reduction axes\n * @param backend wasm backend instance\n */\nexport function permuteAxesAndTranspose(\n x: TensorInfo, axis: number|number[], backend: BackendWasm): {\n transposed: TensorInfo|null,\n axes: number[],\n originalAxes: number[],\n inputWasTransposed: boolean\n} {\n const xShape = x.shape;\n const xRank = x.shape.length;\n\n const originalAxes = util.parseAxisParam(axis, xShape);\n let axes = originalAxes;\n const permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n let xTransposed = null;\n let inputWasTransposed = false;\n if (permutedAxes != null) {\n const newShape: number[] = new Array(xRank);\n for (let i = 0; i < newShape.length; i++) {\n newShape[i] = xShape[permutedAxes[i]];\n }\n\n axes = backend_util.getInnerMostAxes(axes.length, xRank);\n xTransposed =\n transpose({inputs: {x}, attrs: {perm: permutedAxes}, backend});\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const transposedId = backend.dataIdMap.get(xTransposed.dataId).id;\n if (transposedId !== xId) {\n inputWasTransposed = true;\n }\n }\n\n return {transposed: xTransposed, originalAxes, axes, inputWasTransposed};\n}\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmAny: (xId: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmAny = backend.wasm.cwrap(Any, null /*void*/, ['number, number, number']);\n}\n\nfunction any(args: {backend: BackendWasm, inputs: AnyInputs, attrs: AnyAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n input = transposed;\n inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('any', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmAny(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return out;\n}\n\nexport const anyConfig: KernelConfig = {\n kernelName: Any,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: any as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the

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 * ==\n */\n\nimport {ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmFunc: (\n   xId: number, dtype: number, outerSize: number, innerSize: number,\n   outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n   'number', // x_id\n   'number', // dtype\n   'number', // outer_size\n   'number', // inner_size\n   'number'   // out_id\n]);\n}\n\nfunction argmax(\n   args: {inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs}) {\n const {backend, inputs, attrs} = args;\n const {axis} = attrs as {} as ArgMaxAttrs;\n const {x} = inputs as {} as ArgMaxInputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId
 = xId;\n let input = x;\n\n const {transposed, axes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n   const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   if (transposedId !== xId) {\n   // transpose was not a no-op. We will need to dispose of this\n   // once we are done.\n   input = transposed;\n   inputId = transposedId;\n   }\n }\n\n const outShape = input.shape.slice(0, -1);\n const out = backend.makeOutput(outShape, 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const outerSize = util.sizeFromShape(out.shape);\n const innerSize = input.shape[axes[0]];\n wasmFunc(inputId, CppDType[input.dtype], outerSize, innerSize, outId);\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n return out;\n}\n\nexport const argMaxConfig: KernelConfig = {\n kernelName: ArgMax,\n backendName: 'wasm',\n
  kernelFunc: argmax as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 * ==\n */\n\nimport {AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmAvgPool: (\n   xId:
  number, batchSize: number, inputHeight: number, inputWidth: number,\n   filterHeight: number, filterWidth: number, padTop: number, padRight: number,\n   padBottom: number, padLeft: number, strideHeight: number,\n stride Width: number, channels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmAvgPool = backend.wasm.cwrap(AvgPool, null /* void */, [\n   'number', // xId\n   'number', // batchSize\n   'number', // inputHeight\n   'number', // inputWidth\n   'number', // filterHeight\n   'number', // filterWidth\n   'number', // padTop\n   'number', // padRight\n   'number', // padBottom\n   'number', // padLeft\n   'number', // strideHeight\n   'number', // strideWidth\n   'number', // channels\n   'number', // outId\n]);\n}\n\nfunction avgPool(\n   args: {inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs}) {\n const {inputs, attrs, backend} = args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n
  const {filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo =
      backend_util.computePool2DInfo(\n   x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n

const padLeft = convInfo.padInfo.left;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const channels = convInfo.inChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n   throw new Error(\n   `wasm backend does not support dataFormat:` +\n   `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n   throw new Error(\n   `was backend only supports average pooling with dilation = [1, 1], ` +\n   `got [${convInfo.dilationHeight}, ${convInfo.dilationWidth}].`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmAvgPool(\n   xId, x.shape[0], x.shape[1], x.shape[2], filterHeight, filterWidth,\n   padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels,\n   outId);\n return out;\n}\n\nexport const avgPoolConfig: KernelConfig = {\n kernelName: AvgPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: avgPool as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function reshape(\n   args: {inputs: ReshapeInputs, attrs: ReshapeAttrs, backend: BackendWasm}) {\n const {inputs, attrs} = args;\n const {x} = inputs;\n const {shape} = attrs;\n\n const xSize = util.sizeFromShape(x.shape);\n const $shape = util.inferFromImplicitShape(shape, xSize);\n\n util.assert(\n   xSize === util.sizeFromShape($shape),\n   () => `new shape: ${$shape}, old shape: ${x.shape}. New shape and old ` +\n   `shape must have the same number of elements.`);\n\n // Backend needs to track refCount for the dataId for reshape op\n args.backend.incRef(x.dataId);\n return {dataId: x.dataId, shape: $shape, dtype: x.dtype};\n}\n\nexport const reshapeConfig: KernelConfig = {\n kernelName: Reshape,\n backendName: 'wasm',\n kernelFunc: reshape as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from './Reshape';\n\nlet wasmBatchMatMul: (\n   aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n   bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n   transposeB: boolean, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul, null /* void */, [\n   'number', // a_id\n   'array',   // a_shape\n   'number', // a_shape.length\n   'number', // b_id\n   'array',   // b_shape\n   'number', // b_shape.length\n   'number', // transpose_a\n   'number', // transpose_b\n   'number'   // out_id\n]);\n}\n\nfunction batchMatMul(args: {\n inputs: BatchMatMulInputs,\n backend: BackendWasm,\n attrs: BatchMatMulAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {a, b} = inputs;\n const

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{transposeA, transposeB} = attrs;\n\n  if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n    throw new Error(\n`BatchMatMul for non non-float32 tensors not yet supported.`);\n  }\n\n  const aRank = a.shape.length;\n  const bRank = b.shape.length;\n\n  const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];\n  const innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];\n\n  const outerShapeA = transposeA ? a.shape[aRank - 1] : a.shape[aRank - 2];\n  const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank - 1];\n\n  const outerDimsA = a.shape.slice(0, -2);\n  const outerDimsB = b.shape.slice(0, -2);\n\n  const batchDimA = util.sizeFromShape(outerDimsA);\n  const batchDimB = util.sizeFromShape(outerDimsB);\n\n  const batchDimsCompatible =\n      batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;\n\n  util.assert(\n      aRank >= 2 && bRank >= 2 && batchDimsCompatible,\n      () => `Error in matMul: the input batch dimensions
 must either be the ` +\n          `same or at least one input batch dimension must be 1. Got input ` +\n          `batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);\n\n  const outShapeOuterDims =\n      batchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);\n  const outShape =
outShapeOuterDims.concat([outerShapeA, outerShapeB]);\n\n  util.assert(\n      innerShapeA === innerShapeB,\n      () => `Error in matMul: inner shapes (${innerShapeA}) and (` +\n          `${innerShapeB}) of Tensors with shapes ${a.shape} and ` +\n          `${b.shape} and transposeA=${transposeA}` +\n          ` and transposeB=${transposeB} must match.`);\n\n  const a3dShape = transposeA ? [batchDimA, innerShapeA, outerShapeA] :\n[batchDimA, outerShapeA, innerShapeA];\n  const b3dShape = transposeB ? [batchDimB, outerShapeB, innerShapeB] :\n                                [batchDimB, innerShapeB, outerShapeB];\n\n  // The rest of the implementation is
 designed to operate on rank-3 tensors\n  const a3d = reshape({inputs: {x: a}, backend, attrs: {shape: a3dShape}});\n  const b3d = reshape({inputs: {x: b}, backend, attrs: {shape: b3dShape}});\n\n  const a3dId =
backend.dataIdMap.get(a3d.dataId).id;\n  const b3dId = backend.dataIdMap.get(b3d.dataId).id;\n\n  const leftDim = transposeA ? a3d.shape[2] : a3d.shape[1];\n  const rightDim = transposeB ? b3d.shape[1] : b3d.shape[2];\n  const batchDim = Math.max(batchDimA, batchDimB);\n\n  const out = backend.makeOutput([batchDim, leftDim, rightDim], a3d.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  const aShapeBytes = new Uint8Array(new Int32Array(a3d.shape).buffer);\n  const bShapeBytes = new Uint8Array(new Int32Array(b3d.shape).buffer);\n\n  wasmBatchMatMul(\n      a3dId, aShapeBytes, a3d.shape.length, b3dId, bShapeBytes,\n      b3d.shape.length, transposeA, transposeB, outId);\n\n  backend.disposeData(a3d.dataId);\n  backend.disposeData(b3d.dataId);\n\n  out.shape = outShape;\n
 return out;\n}\n\nexport const batchMatMulConfig: KernelConfig = {\n  kernelName: BatchMatMul,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: batchMatMul as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\nimport { backend_util, buffer, Slice, slice_util, util } from '@tensorflow/tfjs-core';\nimport
 { assertNotComplex } from '../cpu_util';\nexport function sliceImpl(vals, begin, size, shape, dtype) {\n  const isContinous = slice_util.isSliceContinous(shape, begin, size);\n  const length = util.sizeFromShape(size);\n  const xStrides = util.computeStrides(shape);\n  if (isContinous) {\n    const flatOffset =
slice_util.computeFlatOffset(begin, xStrides);\n    if (dtype === 'string') {\n      return vals.slice(flatOffset, flatOffset + length);\n    }\n    return vals.subarray(flatOffset, flatOffset + length);\n  }\n  const decodedData = dtype === 'string' ?\n      backend_util.fromUint8ToStringArray(vals) :\n      vals;\n  const inBuf = buffer(shape, dtype, decodedData);\n  const outBuf = buffer(size, dtype);\n  for (let i = 0; i < outBuf.size; ++i) {\n    const outLoc = outBuf.indexToLoc(i);\n    const inLoc = outLoc.map((idx, j) => idx + begin[j]);\n
```

outBuf.set(inBuf.get(...inLoc), ...outLoc);\n
}\n if (dtype === 'string') {\n return backend_util.fromStringArrayToUint8(outBuf.values);\n }\n return outBuf.values;\n}\nexport function slice(args) {\n const { inputs, backend, attrs } = args;\n const { x } = inputs;\n const { begin, size } = attrs;\n assertNotComplex(x, 'slice');\n const [$begin, $size] = slice_util.parseSliceParams(x, begin, size);\n slice_util.assertParamsValid(x, $begin, $size);\n const vals = backend.data.get(x.dataId).values;\n const outVals = sliceImpl(vals, $begin, $size, x.shape, x.dtype);\n return backend.makeTensorInfo($size, x.dtype, outVals);\n}\nexport const sliceConfig = {\n kernelName: Slice,\n backendName: 'cpu',\n kernelFunc: slice\n};\n//#
sourceMappingURL=data:application/json; base64,eyJ2ZXJzaW9uIjozLCJmaWxlIjoiU2xpY2UuanMiLCJzb3VyY2
VSb290IjoiIiwic291cmNlcyI6WyIuLi8uLi8uLi8uLi8uLi8uLi90ZmpzLWJhY2tlbmQtY3B1L3NyYy9rZXJuZWxzL
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BQU8sRUFBQyxZQUFZLEVBQWlCLE1BQU0sdUJBQXVCLENBQUM7QUFFOUQsT0FBTyxFQUFDLGlCQUFpQixFQ
FFLFVBQVUsRUFBQyxNQUFNLHVCQUF1QixDQUFDO0FBRWpELE9BQU8sRUFBQyxjQUFjLEVBQUMsTUFBTSxvQ
mFja2VuZC1jcHUnO2ltcG9ydCB7c2xpY2VJbXBsfSBmcm9tICcuLi9iYWNrZW5kX3V0aWwnO2ltcG9ydCB7YX
NzZXJ0Tm90Q29tcGxleCwgZnJvbVN0cmluZ0FycmF5VG9VaW50OCwgc2xpY2VfdXRpbCwgdXRpbH0gZnJvbSA
nQGxpdGVyYWxseS9jb3JlJztcbmltcG9ydCB7U2xpY2VBdHRyc30gZnJvbSAnLi4vYmFja2VuZF90eXBlcyc7
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30gPSBhcmdzO1xuIGNvbnN0IHt4fSA9IGlucHV0cztcbiBjb25zdCB7YmVnaW4sIHNpemV9ID0gYXR0cztcbiBh
c3NlcnROb3RDb21wbGV4KHgsICdzbGljZScpO1xuIGNvbnN0IFskYmVnaW4sICRzaXplXSA9IHNsaWNlX3V0aWw
ucGFyc2VTbGljZVBhcmFtcyh4LCBiZWdpbiwgc2l6ZSk7XG4gc2xpY2VfdXRpbC5hc3NlcnRQYXJhbXNWYWxp
ZCh4LCAkYmVnaW4sICRzaXplKTtcbiBjb25zdCB2YWxzID0gYmFja2VuZC5kYXRhLmdldCh4LmRhdGFJZCkudmF
sdWVzO1xuIGNvbnN0IG91dFZhbHMgPSBzbGljZUltcGwodmFscywgJGJlZ2luLCAkc2l6ZSwgeC5zaGFwZSwgeC
5kdHlwZSk7XG4gcmV0dXJuIGJhY2tlbmQubWFrZVRlbnNvckluZm8oJHNpemUsIHguZHR5cGUsIG91dFZhbHM
pO1xufVxuZXhwb3J0IGNvbnN0IHNsaWNlQ29uZmlnID0ge1xuIGtlcm5lbE5hbWU6IFNsaWNlLFxuIGJhY2tlbm
RfbmFtZTogJ2NwdScsXG4ga2VybmVsRnVuYzogc2xpY2VcbiB9O1xuXG4vLyMgc291cmNlTWFwcGluZ1VSTD1
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FuTXlJc0luTnZkWDVqWlNJNld5SnpiM1Z5WTJWeklsMHNJbTV2WkdWeUlqcGJJbk5zYVdObExuUnpJbDBzSW5
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VU4c1JVRkJjRUlzU1VGQlNTeEZRVUZGTEVWQlEzUXNSVUZCUlN4RlFVRkRMRTlCUVU4c1JVRkJjRUlzU1VGQl
NTeEZRVUZGTEVWQlEzUXNSVUZCUlN4RlFVRkRMRTlCUVU4c1JVRkJjRUlzU1VGQlNTeEZRVUZGTEVWQlEzUXN
SVUZCUlN4RlFVRkRMRTlCUVU4c1JVRkJjRUlzU1VGQlNTeEZRVUZGTEVWQlEzUXNSVUZCUlN4RlFVRkRMRTlC
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WQlEzUXNSVUZCUlN4RlFVRkR

VBQUUsS0FBSztJQUNsQixVQUFVLEVBQUUsS0FBeUI7Q0FDdEMsQ0FBQyIsInNvdXJjZXNDb250ZW50Ijpb
Ii8qKlxuICogQGxpY2Vuc2VcbiAqIENvcHlyaWdodCAyMDIwIEdvb2dsZSBMTEMuIEFsbCBSaWdodHMgUm
VzZXJ2ZWQuXG4gKiBMaWNlbnNlZCB1bmRlciB0aGUgQXBhY2hlIExpY2Vuc2UsIFZlcnNpb24gMi4wICh0a
GUgXCJMaWNlbnNlXCIpO1xuICogeW91IG1heSBub3QgdXNlIHRoaXMgZmlsZSBleGNlcHQgaW4gY29tcGxp
YW5jZSB3aXRoIHRoZSBMaWNlbnNlLlxuICogWW91IG1heSBvYnRhaW4gYSBjb3B5IG9mIHRoZSBMaWNlb
nNlIGF0XG4gKlxuICogaHR0cDovL3d3dy5hcGFjaGUub3JnL2xpY2Vuc2VzL0xJQ0VOU0UtMi4wXG4gKlxu
ICogVW5sZXNzIHJlcXVpcmVkIGJ5IGFwcGxpY2FibGUgb3IgYWdyZWVkIHB0byBpbiB3cml0aW5nLCBzb2
Z0d2FyZVxuICogZGlzdHJpYnV0ZWQgdW5kZXIgdGhlIExpY2Vuc2UgaXMgZGlzdHJpYnV0ZWQgb24gYW4g
XCJBUyBJU1wiIEJBU0lTLFxuICogV0lUSE9VVCBXQVJSQU5USUVTIE9SIENPTkRJVElPTlMgT0YgQU5ZI
EtJTkQsIGVpdGhlciBleHByZXNzIG9yIGltcGxpZWQuXG4gKiBiBTZWUgdGhlIExpY2Vuc2UgZm9yIHRoZSBzc
GVjaWZpYyBsYW5ndWFnZSBnb3Zlcm5pbmcgcGVybWlzc2lvbnMgYW5kXG4gKiBiBsaW1pdGF0aW9ucyB1bm
RlciB0aGUgTGljZW5zZS5cbiAqLyAgICAgICAgIC

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All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========================================================================\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Slice, slice_util, SliceAttrs, SliceInputs, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {sliceImplCPU} from '../kernel_utils/shared';\n\nexport function slice(\n    args: {inputs: SliceInputs, attrs: SliceAttrs, backend: BackendWasm}) {\n  const {inputs: {x}, attrs: {begin, size}, backend} = args;\n\n  const [begin_, size_] = slice_util.parseSliceParams(x, begin, size);\n\n  const isContinous = slice_util.isSliceContinous(x.shape, begin_, size_);\n  const xVals = backend.readSync(x.dataId);\n  const out = backend.makeOutput(size_, x.dtype);\n  const xStrides = util.computeStrides(x.shape);\n  const outData = backend.dataIdMap.get(out.dataId);\n\n  if (isContinous) {\n    const flatOffset = slice_util.computeFlatOffset(begin_, xStrides);\n\n    if (x.dtype === 'string') {\n      outData.stringBytes =\n          (xVals as Uint8Array[])\n              .slice(flatOffset, flatOffset + util.sizeFromShape(size_));\n    } else {\n      const outVals = backend.typedArrayFromHeap(out);\n      outVals.set(\n          (xVals as TypedArray)\n              .subarray(flatOffset, flatOffset + util.sizeFromShape(size_)));\n    }\n\n    return out;\n  }\n\n  if (x.dtype === 'string') {\n    const res = sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype);\n    outData.stringBytes = res as Uint8Array[];\n    return out;\n  }\n\n  const outVals = backend.typedArrayFromHeap(out);\n  const rank = x.shape.length;\n  if (rank === 2) {\n    slice2d(\n        xVals as TypedArray, xStrides[0], outVals, begin_ as [number, number],\n        size_ as [number, number]);\n  } else if (rank === 3) {\n    slice3d(\n        xVals as TypedArray, xStrides[0], xStrides[1], outVals,\n        begin_ as [number, number, number], size_ as [number, number, number]);\n  } else if (rank === 4) {\n    slice4d(\n        xVals as TypedArray, xStrides[0], xStrides[1], xStrides[2], outVals,\n        begin_ as [number, number, number, number],\n        size_ as [number, number, number, number]);\n  } else {\n    const res =\n        sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype) as TypedArray;\n    outVals.set(res);\n  }\n\n  return out;\n}\n\nfunction slice2d(\n    xVals: backend_util.TypedArray, xStride: number,\n    outVals: backend_util.TypedArray, begin: [number, number],\n    size: [number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const endI = beginI + size[0];\n  for (let i = beginI; i < endI; i++) {\n    const xOffset = i * xStride + beginJ;\n    outVals.set(xVals.subarray(xOffset, xOffset + size[1]), outOffset);\n    outOffset += size[1];\n  }\n}\n\nfunction slice3d(\n    xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n    outVals: backend_util.TypedArray, begin: [number, number, number],\n    size: [number, number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const beginK = begin[2];\n  const endI = beginI + size[0];\n  const endJ = beginJ + size[1];\n  for (let i = beginI; i < endI; i++) {\n    for (let j = beginJ; j < endJ; j++) {\n      const xOffset = i * xStride1 + j * xStride2 + beginK;\n      outVals.set(xVals.subarray(xOffset, xOffset + size[2]), outOffset);\n      outOffset += size[2];\n    }\n  }\n}\n\nfunction slice4d(\n    xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n    xStride3: number, outVals: backend_util.TypedArray,\n    begin: [number, number, number, number],\n    size: [number, number, number, number]): void {\n  let outOffset = 0;\n  const beginI = begin[0];\n  const beginJ = begin[1];\n  const beginK = begin[2];\n  const endI = beginI + size[0];\n  const endJ = beginJ + size[1];\n  const endK = beginK + size[2];\n  const beginL = begin[3];\n\n  for (let i = beginI; i < endI; i++) {\n    for (let j = beginJ; j < endJ; j++) {\n      for (let k = beginK; k < endK; k++) {\n        const xOffset = i * xStride1 + j * xStride2 + k * xStride3 + beginL;\n        outVals.set(xVals.subarray(xOffset, xOffset + size[3]), outOffset);\n        outOffset += size[3];\n      }\n    }\n  }\n}\n\nexport const sliceConfig: KernelConfig = {\n  kernelName: Slice,\n  backendName: 'wasm',\n  kernelFunc: slice as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. 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==========\n
*/\n\nimport {backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig,
KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport
{reshape} from './Reshape';\nimport {slice} from './Slice';\nimport {transpose} from './Transpose';\n\nfunction
batchToSpaceND(args: {\n inputs: BatchToSpaceNDInputs,\n backend: BackendWasm,\n attrs:
BatchToSpaceNDAttrs\n}) {\n const {inputs,
backend, attrs} = args;\n const {x} = inputs;\n const {blockShape, crops} = attrs;\n\n const prod =
blockShape.reduce((a, b) => a * b);\n\n const reshaped = backend_util.getReshaped(x.shape, blockShape, prod);\n
const permuted = backend_util.getPermuted(reshaped.length, blockShape.length);\n const reshapedPermuted =\n
backend_util.getReshapedPermuted(x.shape, blockShape, prod);\n const sliceBeginCoords =\n
backend_util.getSliceBeginCoords(crops, blockShape.length);\n const sliceSize =\n
backend_util.getSliceSize(reshapedPermuted, crops, blockShape.length);\n\n const xReshaped = reshape({inputs:
{x}, backend, attrs: {shape: reshaped}});\n const xTransposed =\n   transpose({inputs: {x: xReshaped}, backend,
attrs: {perm: permuted}});\n const xTransposedReshaped = reshape(\n   {inputs: {x: xTransposed}, backend,
attrs: {shape: reshapedPermuted}});\n const result = slice({\n   inputs: {x: xTransposedReshaped},\n   backend,\n
attrs: {begin: sliceBeginCoords,
size: sliceSize}\n });\n\n backend.disposeData(xReshaped.dataId);\n backend.disposeData(xTransposed.dataId);\n
backend.disposeData(xReshaped.dataId);\n\n return result;\n}\n\nexport const batchToSpaceNDConfig:
KernelConfig = {\n kernelName: BatchToSpaceND,\n backendName: 'wasm',\n kernelFunc: batchToSpaceND as
{} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
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License.\n *
==========\n
*/\n\nimport {Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport
{TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function
cast(\n   args: {inputs: CastInputs, attrs: CastAttrs, backend: BackendWasm}):\n   TensorInfo {\n const {inputs:
{x}, attrs: {dtype}, backend} = args;\n const out = backend.makeOutput(x.shape, dtype);\n const inVals =
backend.typedArrayFromHeap(x);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n
return out;\n}\n\nexport const castConfig: KernelConfig = {\n kernelName: Cast,\n backendName: 'wasm',\n
kernelFunc: cast as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights
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==========\n
*/\n\nimport {ClipByValue, ClipByValueAttrs, ClipByValueInputs, KernelConfig, KernelFunc} from

'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmClip: (xId: number, min: number, max: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmClip = backend.wasm.cwrap(ClipByValue, null /* void */, [\n 'number', // x_id\n 'number', // min\n 'number', // max\n 'number' // out_id\n]);\n}\n\nfunction clip(args: {\n inputs: ClipByValueInputs,\n backend: BackendWasm,\n attrs: ClipByValueAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {clipValueMin, clipValueMax} = attrs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmClip(xId, clipValueMin, clipValueMax, outId);\n return out;\n}\n\nexport const clipByValueConfig: KernelConfig = {\n kernelName: ClipByValue,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: clip as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==*/\nimport {KernelConfig, Ceil} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND,\n * either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==*/\n\nimport {backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {concatImplCPU} from '../kernel_utils/shared';\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\n\nexport function concat(\n args: {inputs: ConcatInputs, backend: BackendWasm, attrs: ConcatAttrs}) {\n const {inputs, backend} = args;\n\n const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];\n\n let outShape = backend_util.computeOutShape(inputs.map(t => t.shape), axis);\n\n // Keep only non-empty tensors (ignore tensors with 0 in their shape).\n const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);\n if ($inputs.length === 1)\n {\n return identity({inputs: {x: $inputs[0]}, backend});\n }\n\n const out = backend.makeOutput(outShape, inputs[0].dtype);\n\n if (util.sizeFromShape(outShape) === 0) {\n return out;\n }\n\n const shapes = $inputs.map(t => t.shape);\n backend_util.assertParamsConsistent(shapes, axis);\n\n if ($inputs[0].dtype === 'string') {\n // Any concat of n-dimensional tensors across any axis can be reduced to\n // a concatenation of two-dimensional tensors across the axis 1 by first\n // partitioning the axes of the original tensors into those less than the\n // axis to be concatenated and the rest. Then reshape the tensors\n // into a two-dimensional tensor by collapsing these two sets of axes and\n // concatenate the resulting matrices across the axis 1, finally reshaping\n // the result to have the proper shape.\n const inputs2D = $inputs.map(t => {\n const innerSize = util.sizeFromShape(t.shape.slice(axis));\n const shape = [-1, innerSize];\n return reshape({inputs: {x: t}, backend, attrs: {shape}});\n });\n\n const inputsValShapes = inputs2D.map(t => {\n return {vals: backend.readSync(t.dataId), shape: t.shape};\n });\n\n // Concats 2d tensors along axis=1.\n outShape =\n backend_util.computeOutShape(inputs2D.map(t => t.shape), 1 /* axis */);\n const simplyConcat = inputs2D[0].shape[0] === 1;\n const outVals = concatImplCPU(\n

inputsValShapes, outShape, inputs[0].dtype,\n simplyConcat) as string[];\n\n const finalOutShape =\n backend_util.computeOutShape($inputs.map(t => t.shape), axis);\n\n out.shape = finalOutShape;\n const outData = backend.dataIdMap.get(out.dataId);\n outData.stringBytes = backend_util.fromStringArrayToUint8(outVals);\n\n inputs2D.forEach(t => backend.disposeData(t.dataId));\n\n return out;\n }\n\n const batchDim = util.sizeFromShape($inputs[0].shape.slice(0, axis));\n let sumInnerDims = 0;\n
const innerDims = $inputs.map(input => {\n const innerDim = util.sizeFromShape(input.shape.slice(axis));\n sumInnerDims += innerDim;\n return innerDim;\n });\n const inVals = $inputs.map(input => backend.typedArrayFromHeap(input));\n const outVals = backend.typedArrayFromHeap(out);\n for (let b = 0; b < batchDim; b++) {\n let outOffset = b * sumInnerDims;\n for (let i = 0; i < inVals.length; i++) {\n const innerDim = innerDims[i];\n const inOffset = b * innerDim;\n const vals = inVals[i].subarray(inOffset, inOffset + innerDim);\n outVals.set(vals, outOffset);\n outOffset += innerDim;\n }\n }\n return out;\n}\n\nexport const concatConfig: KernelConfig = {\n kernelName: Concat,\n backendName: 'wasm',\n kernelFunc: concat as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance
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==\n */\nimport { backend_util, util } from '@tensorflow/tfjs-core';\nexport function concatImpl(inputs, outShape, dtype, simplyConcat) {\n const outVals = util.getArrayFromDType(dtype, util.sizeFromShape(outShape));\n if (simplyConcat && dtype !== 'string') {\n // Use built-in TypedArray.set() method for speed.\n let offset = 0;\n inputs.forEach(input => {\n const size = util.sizeFromShape(input.shape);\n outVals.set(input.vals,
offset);\n offset += size;\n });\n }\n else {\n let colOffset = 0;\n inputs.forEach(input => {\n const decodedData = dtype === 'string' ?\n backend_util.fromUint8ToStringArray(input.vals) :\n input.vals;\n let tIdx = 0;\n for (let row = 0; row < input.shape[0]; ++row) {\n const resIdx = row * outShape[1] + colOffset;\n for (let col = 0; col < input.shape[1]; ++col) {\n outVals[resIdx + col] = decodedData[tIdx++];\n }\n }\n colOffset += input.shape[1];\n });\n }\n return outVals;\n}\n//# sourceMappingURL=data:application/json; base64,eyJ2ZXJzaW9uIjozLCJmaWxlIjoiQ29uY2F0X2ltcGwuanMiLCJzb3VyY2VSb290IjoiIiwic291cmNlcyI6WyIuLi8uLi8uLi8uLi8uLi8uLi90ZmpzLWJhY2tlbmQtY3B1L3NyYy9rZXJuZWxzL0NvbmNhdF9pbXBsLnRzIl0sIm5hbWVzIjpbXSwibWFwcGluZ3MiOiJBQUFBOzs7Ozs7Ozs7Ozs7R0FlRlRztBQUVILE9BQU8sRUFBRSxZQUFZLEVBQUUsSUFBSSxFQUFFLE1BQU0sdUJBQXVCLENBQUM7QUFFM0QsTUFBTSxVQUFVLFVBQVUsQ0FBQyxNQUFNLEVBQUUsUUFBUSxFQUFFLEtBQUssRUFBRSxZQUFZLEVBQUU7SUFDaEUsTUFBTSxPQUFPLEdBQUcsSUFBSSxDQUFDLGdCQUFnQixDQUFDLEtBQUssRUFBRSxJQUFJLENBQUMsYUFBYSxDQUFDLFFBQVEsQ0FBQyxDQUFDLENBQUM7SUFDMUUsSUFBSSxZQUFZLElBQUksS0FBSyxLQUFLLFFBQVEsRUFBRTtRQUN0QyxnREFBZ0Q7UUFDaEQsSUFBSSxNQUFNLEdBQUcsQ0FBQyxDQUFDO1FBQ2YsTUFBTSxDQUFDLE9BQU8sQ0FBQyxLQUFLLENBQUMsRUFBRTtZQUNyQixNQUFNLElBQUksR0FBRyxJQUFJLENBQUMsYUFBYSxDQUFDLEtBQUssQ0FBQyxLQUFLLENBQUMsQ0FBQztZQUM3QyxPQUFPLENBQUMsR0FBRyxDQUFDLEtBQUssQ0FBQyxJQUFJLEVBQUUsTUFBTSxDQUFDLENBQUM7WUFDaEMsTUFBTSxJQUFJLElBQUksQ0FBQztRQUNqQixDQUFDLENBQUMsQ0FBQztLQUNKO1NBQU07UUFDTCxJQUFJLFNBQVMsR0FBRyxDQUFDLENBQUM7UUFDbEIsTUFBTSxDQUFDLE9BQU8sQ0FBQyxLQUFLLENBQUMsRUFBRTtZQUNyQixNQUFNLFdBQVcsR0FBRyxLQUFLLEtBQUssUUFBUSxDQUFDLENBQUM7Z0JBQ3RDLFlBQVksQ0FBQyxvQkFBb0IsQ0FBQyxLQUFLLENBQUMsSUFBSSxDQUFDLENBQUMsQ0FBQztnQkFDL0MsS0FBSyxDQUFDLElBQUksQ0FBQztZQUNiLElBQUksSUFBSSxHQUFHLENBQUMsQ0FBQztZQUNiLEtBQUssSUFBSSxHQUFHLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxLQUFLLENBQUMsS0FBSyxDQUFDLENBQUMsQ0FBQyxFQUFFLEVBQUUsR0FBRyxFQUFFO2dCQUNqRCxNQUFNLE1BQU0sR0FBRyxHQUFHLEdBQUcsUUFBUSxDQUFDLENBQUMsQ0FBQyxHQUFHLFNBQVMsQ0FBQztnQkFDN0MsS0FBSyxJQUFJLEdBQUcsR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEtBQUssQ0FBQyxLQUFLLENBQUMsQ0FBQyxDQUFDLEVBQUUsRUFBRSxHQUFHLEVBQUU7b0JBQ2pELE9BQU8sQ0FBQyxNQUFNLEdBQUcsR0FBRyxDQUFDLEdBQUcsV0FBVyxDQUFDLElBQUksRUFBRSxDQUFDLENBQUM7aUJBQzdDO2dCQUNELFNBQVMsSUFBSSxLQUFLLENBQUMsS0FBSyxDQUFDLENBQUMsQ0FBQyxDQUFDO2FBQzdCO1FBQ0gsQ0FBQyxDQUFDLENBQUM7S0FDSjtJQUNELE9BQU8sT0FBTyxDQUFDO0FBQ2pCLENBQUM=

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UFDO29NQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDO29NQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQzt3TUFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQzt3TUFFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7NE1BQzNCLElBQUksR0FBRyxDQUFDLENBQUM7NE1BRVQsS0FBSyxJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO2dOQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDO2dOQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQztvTkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQztvTkFFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7d05BQzNCLElBQUksR0FBRyxDQUFDLENBQUM7d05BRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDOzROQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDOzROQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQztnT0FDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQztnT0FFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7b09BQzNCLElBQUksR0FBRyxDQUFDLENBQUM7b09BRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO3dPQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDO3dPQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQzs0T0FDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQzs0T0FFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7Z1BBQzNCLElBQUksR0FBRyxDQUFDLENBQUM7Z1BBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO29QQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDO29QQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQzt3UEFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQzt3UEFFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7NFBBQzNCLElBQUksR0FBRyxDQUFDLENBQUM7NFBBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO2dRQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDO2dRQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQztvUUFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQztvUUFFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7d1FBQzNCLElBQUksR0FBRyxDQUFDLENBQUM7d1FBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDOzRRQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDOzRRQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQztnUkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQztnUkFFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7b1JBQzNCLElBQUksR0FBRyxDQUFDLENBQUM7b1JBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO3dSQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDO3dSQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQzs0UkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQzs0UkFFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7Z1NBQzNCLElBQUksR0FBRyxDQUFDLENBQUM7Z1NBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO29TQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDO29TQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQzt3U0FDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQzt3U0FFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7NFNBQzNCLElBQUksR0FBRyxDQUFDLENBQUM7NFNBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO2dUQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDO2dUQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQztvVEFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQztvVEFFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7d1RBQzNCLElBQUksR0FBRyxDQUFDLENBQUM7d1RBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDOzRUQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDOzRUQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQztnVUFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQztnVUFFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7b1VBQzNCLElBQUksR0FBRyxDQUFDLENBQUM7b1VBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO3dVQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDO3dVQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQzs0VUFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQzs0VUFFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7Z1ZBQzNCLElBQUksR0FBRyxDQUFDLENBQUM7Z1ZBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO29WQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDO29WQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQzt3VkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQzt3VkFFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7NFZBQzNCLElBQUksR0FBRyxDQUFDLENBQUM7NFZBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO2dXQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDO2dXQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQztvV0FDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQztvV0FFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7d1dBQzNCLElBQUksR0FBRyxDQUFDLENBQUM7d1dBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDOzRXQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDOzRXQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQztnWEFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQztnWEFFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7b1hBQzNCLElBQUksR0FBRyxDQUFDLENBQUM7b1hBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO3dYQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDO3dYQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQzs0WEFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQzs0WEFFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7Z1lBQzNCLElBQUksR0FBRyxDQUFDLENBQUM7Z1lBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO29ZQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDO29ZQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQzt3WUFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQzt3WUFFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7NFlBQzNCLElBQUksR0FBRyxDQUFDLENBQUM7NFlBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO2daQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDO2daQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQztvWkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQztvWkFFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7d1pBQzNCLElBQUksR0FBRyxDQUFDLENBQUM7d1pBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDOzRaQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDOzRaQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQztnYkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQztnYkFFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7b2JBQzNCLElBQUksR0FBRyxDQUFDLENBQUM7b2JBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO3diQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDO3diQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQzs0YkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQzs0YkFFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7Z2NBQzNCLElBQUksR0FBRyxDQUFDLENBQUM7Z2NBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO29jQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDO29jQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQzt3Y0FDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQzt3Y0FFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7NGNBQzNCLElBQUksR0FBRyxDQUFDLENBQUM7NGNBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO2dkQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDO2dkQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQztvZEFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQztvZEFFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7d2RBQzNCLElBQUksR0FBRyxDQUFDLENBQUM7d2RBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDOzRkQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDOzRkQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQztnZUFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQztnZUFFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7b2VBQzNCLElBQUksR0FBRyxDQUFDLENBQUM7b2VBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO3dlQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDO3dlQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQzs0ZUFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQzs0ZUFFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7Z2ZBQzNCLElBQUksR0FBRyxDQUFDLENBQUM7Z2ZBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO29mQUMzQixJQUFJLEdBQUcsQ0FBQyxDQUFDO29mQUVULEtBQUssSUFBSSxHQUFHLENBQUMsRUFBRSxHQUFHLEdBQUcsRUFBRSxHQUFHLEVBQUUsQ0FBQzt3ZkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQzt3ZkFFVCxLQUFLLElBQUksR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEVBQUUsR0FBRyxFQUFFLENBQUM7NGZBQzNCLElBQUksR0FBRyxDQUFDLENBQUM7NGZBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO2dnQkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQztnZ0JBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO29nQkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQztvZ0JBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO3dnQkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQzt3Z0JBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDOzRnQkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQzs0Z0JBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO2doQkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQztnaEJBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO29oQkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQztvaEJBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO3doQkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQzt3aEJBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDOzRoQkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQzs0aEJBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO2dpQkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQztnaUJBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO29pQkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQztvaUJBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO3dpQkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQzt3aUJBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDOzRpQkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQzs0aUJBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO2dqQkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQztnakJBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO29qQkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQztvakJBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO3dqQkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQzt3akJBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDOzRqQkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQzs0akJBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO2drQkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQztna0JBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO29rQkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQztva0JBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO3drQkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQzt3a0JBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDOzRrQkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQzs0a0JBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFLEdBQUcsRUFBRSxDQUFDO2dsQkFDM0IsSUFBSSxHQUFHLENBQUMsQ0FBQztnbEJBRVQsS0FBSyBJQUFJLEdBQUcsQ0FBQyxFQUFFLEdBQUcsR0FBRyxFQUFFL

```
==========================================================================\n
*/\n\nimport {backend_util,
 Conv2D, Conv2DAttrs, Conv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmConv2d: (\n    xId: number, batchSize:
number, inputHeight: number, inputWidth: number,\n    filterId: number, filterHeight: number, filterWidth: number,
padTop: number,\n    padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n
dilationHeight: number, dilationWidth: number, strideHeight: number,\n    strideWidth: number, inputChannels:
number, outputChannels: number,\n    outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmConv2d = backend.wasm.cwrap(Conv2D, null /* void */, [\n    'number',  // xId\n    'number',  // batchSize\n
'number',  // inputHeight\n    'number',  // inputWidth\n    'number',  // filterId\n    'number',  // filterHeight\n
'number',  // filterWidth\n    'number',  // padTop\n    'number',  // padRight\n    'number',  // padBottom\n    'number',
// padLeft\n
    'number',  // isSamePad\n    'number',  // dilationHeight\n    'number',  // dilationWidth\n    'number',  //
strideHeight\n    'number',  // strideWidth\n    'number',  // inputChannels\n    'number',  // outputChannels\n
'number',  // outId\n  ]);\n}\n\nfunction conv2d(\n    args: {inputs: Conv2DInputs, backend: BackendWasm, attrs:
Conv2DAttrs}) {\n  const {inputs, attrs, backend} = args;\n\n  const {x, filter} = inputs;\n  const xId =
backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n  const {strides,
dilations, pad, dimRoundingMode, dataFormat} = attrs;\n  const $dataFormat =
backend_util.convertConv2DDataFormat(dataFormat);\n  const convInfo = backend_util.computeConv2DInfo(\n
(x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n      pad, dimRoundingMode, false,
$dataFormat);\n\n  const filterHeight = convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const
padTop = convInfo.padInfo.top;\n
  const padRight = convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft =
convInfo.padInfo.left;\n  const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth =
convInfo.dilationWidth;\n  const strideHeight = convInfo.strideHeight;\n  const strideWidth =
convInfo.strideWidth;\n  const inputChannels = convInfo.inChannels;\n  const outputChannels =
convInfo.outChannels;\n  const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n  if
(convInfo.dataFormat !== 'channelsLast') {\n    throw new Error(\n        `wasm backend Conv2D does not support
dataFormat:'` +\n        `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n  }\n\n  const out =
backend.makeOutput(convInfo.outShape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmConv2d(\n      xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n      filterWidth, padTop,
padRight, padBottom, padLeft, isSamePad,\n      dilationHeight, dilationWidth,
 strideHeight, strideWidth, inputChannels,\n      outputChannels, outId);\n  return out;\n}\n\nexport const
conv2DConfig: KernelConfig = {\n  kernelName: Conv2D,\n  backendName: 'wasm',\n  setupFunc: setup,\n
kernelFunc: conv2d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport
 {backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs, KernelConfig,
KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'../backend_wasm';\n\nlet wasmConv2DBackpropInput: (\n    dyId: number, filterId: number, batchSize: number,
filterHeight: number,\n    filterWidth: number, inHeight: number, inWidth: number, inChannels: number,\n
outHeight: number, outWidth: number, outChannels: number,\n    strideHeight: number, strideWidth: number,
```

topPad: number, leftPad: number,\n fltS0: number, fltS1: number, fltS2: number, xBatchStride: number,\n xRowStride: number, xColStride: number, xChannelStride: number,\n yBatchStride: number, yRowStride: number, yColStride: number,\n yChannelStride: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmConv2DBackpropInput = backend.wasm.cwrap(Conv2DBackpropInput, null, [\n 'number', // dyId\n 'number', // filterId\n 'number',
  // batchSize\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // inHeight\n 'number', // inWidth\n 'number', // inChannels\n 'number', // outHeight\n 'number', // outWidth\n 'number', // outChannels\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // topPad\n 'number', // leftPad\n 'number', // fltS0\n 'number', // fltS1\n 'number', // fltS2\n 'number', // xBatchStride\n 'number', // xRowStride\n 'number', // xColStride\n 'number', // xChannelStride\n 'number', // yBatchStride\n 'number', // yRowStride\n 'number', // yColStride\n 'number', // yChannelStride\n 'number', // outId\n]);\n}\n\nfunction conv2DBackpropInput(args: {\n backend: BackendWasm,\n inputs: Conv2DBackpropInputInputs,\n attrs: Conv2DBackpropInputAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {dy, filter} = inputs;\n const {strides, pad, dataFormat, dimRoundingMode,
  inputShape} = attrs;\n\n const dilations = 1;\n\n const $dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n inputShape, filter.shape as [number, number, number, number], strides,\n dilations, pad, dimRoundingMode, false /* depthwise */, $dataFormat);\n const {\n batchSize,\n filterHeight,\n filterWidth,\n inChannels,\n inHeight,\n inWidth,\n outChannels,\n outHeight,\n outWidth,\n strideHeight,\n strideWidth\n } = convInfo;\n\n const topPad = filterHeight - 1 - convInfo.padInfo.top;\n const leftPad = filterWidth - 1 - convInfo.padInfo.left;\n\n const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n const dxStrides = util.computeStrides(convInfo.inShape);\n const dyStrides = util.computeStrides(dy.shape);\n const [fltS0, fltS1, fltS2] = util.computeStrides(filter.shape);\n const xBatchStride = dxStrides[0];\n const xRowStride = isChannelsLast ?
  dxStrides[1] : dxStrides[2];\n const xColStride = isChannelsLast ? dxStrides[2] : 1;\n const xChannelStride = isChannelsLast ? 1 : dxStrides[1];\n const yBatchStride = dyStrides[0];\n const yRowStride = isChannelsLast ? dyStrides[1] : dyStrides[2];\n const yColStride = isChannelsLast ? dyStrides[2] : 1;\n const yChannelStride = isChannelsLast ? 1 : dyStrides[1];\n\n const out = backend.makeOutput(convInfo.inShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const dyId = backend.dataIdMap.get(dy.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n wasmConv2DBackpropInput(\n dyId, filterId, batchSize,
  filterHeight, filterWidth, inHeight, inWidth,\n inChannels, outHeight, outWidth, outChannels, strideHeight,
  strideWidth,\n topPad, leftPad, fltS0, fltS1, fltS2, xBatchStride, xRowStride,\n xColStride, xChannelStride,
  yBatchStride, yRowStride, yColStride,\n yChannelStride, outId);\n return out;\n}\n\nexport
  const conv2DBackpropInputConfig: KernelConfig = {\n kernelName: Conv2DBackpropInput,\n backendName:
  'wasm',\n setupFunc: setup,\n kernelFunc: conv2DBackpropInput as {} as KernelFunc\n};\n","/**\n * @license\n *
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  \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
  License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
  agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
  WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
  the specific language governing permissions and\n * limitations under the License.\n *
  ==\n
  */\n\nimport {CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc,
  TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast}
  from './Cast';\n\n// Must match enum in CropAndResize.cc\nenum InterpolationMethod {\n bilinear = 0,\n nearest
  = 1\n}\n\nlet wasmCropAndResize: (\n imagesId: number, boxesId: number, boxIndId: number, numBoxes:
  number,\n imagesShape: Uint8Array, cropHeight: number, cropWidth: number,\n method: number,
  extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n

wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n 'number', // imagesId\n 'number', // boxesId\n 'number', // boxIndId\n 'number', // numBoxes\n 'array', // images shape\n 'number', // cropHeight\n 'number', // cropWidth\n 'number', // method\n 'number', // extrapolation value\n 'number' // out id\n]);\n}\n\nfunction cropAndResize(args: {\n backend: BackendWasm,\n inputs: CropAndResizeInputs,\n attrs: CropAndResizeAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {method, extrapolationValue, cropSize} = attrs;\n const {image, boxes, boxInd} = inputs;\n\n const numBoxes = boxes.shape[0];\n\n const [cropHeight, cropWidth] = cropSize as [number, number];\n const outShape = [numBoxes, cropHeight, cropWidth, image.shape[3]];\n\n let imagesData = backend.dataIdMap.get(image.dataId);\n let castedData;\n if (image.dtype !== 'float32') {\n castedData = cast({backend, inputs: {x: image}, attrs: {dtype: 'float32'}});\n imagesData = backend.dataIdMap.get(castedData.dataId);\n }\n\n const imagesId = imagesData.id;\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const boxIndId = backend.dataIdMap.get(boxInd.dataId).id;\n\n const out = backend.makeOutput(outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n\n wasmCropAndResize(\n imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n cropWidth,\n InterpolationMethod[method as {} as keyof typeof InterpolationMethod],\n extrapolationValue, outId);\n\n if (castedData != null) {\n backend.disposeData(castedData.dataId);\n }\n\n return out;\n}\n\nexport const cropAndResizeConfig: KernelConfig = {\n kernelName: CropAndResize,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: cropAndResize as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either
express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {Cos, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const cosConfig: KernelConfig = createUnaryKernelConfig(Cos);\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions
and\n * limitations under the License.\n *
==\n
*/\nimport {Cosh, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, Cumsum, CumsumAttrs, CumsumInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from

'./types';\n\nimport {transpose} from './Transpose';\n\nlet wasmCumsum: (xId: number, exclusive: number, reverse: number,\n finalDim: number, outId: number, dtype: CppDType) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmCumsum = backend.wasm.cwrap(Cumsum, null /* void */, [\n 'number', // x_id\n 'number', // exclusive\n 'number', // reverse\n 'number', // final_dim\n 'number', // out_id\n 'number' // dtype\n]);\n}\n\nexport function cumsum(\n args: {inputs: CumsumInputs, backend: BackendWasm, attrs: CumsumAttrs}):\nTensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {axis, exclusive, reverse} = attrs;\n const xRank = x.shape.length;\n\n util.assert(x.dtype === 'float32' || x.dtype === 'int32',\n () => `cumsum does not support ${x.dtype} tensors in the WASM backend`);\n // permute required axis to inner most axis\n const permutation = backend_util.getAxesPermutation([axis], xRank);\n let permutedX = x;\n if (permutation !== null) {\n permutedX = transpose({inputs: {x}, attrs: {perm: permutation}, backend});\n }\n const permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];\n backend_util.assertAxesAreInnerMostDims('cumsum', [permutedAxis], xRank);\n\n const permutedOut = backend.makeOutput(permutedX.shape, permutedX.dtype);\n const finalDim = permutedX.shape[permutedAxis];\n const permutedXId = backend.dataIdMap.get(permutedX.dataId).id;\n const permutedOutId = backend.dataIdMap.get(permutedOut.dataId).id;\n wasmCumsum(permutedXId, exclusive ? 1 : 0, reverse ? 1 : 0, finalDim,\n permutedOutId, CppDType[x.dtype]);\n\n // transpose data back if permuted\n let out = permutedOut;\n if (permutation !== null) {\n const undoPermutation = backend_util.getUndoAxesPermutation(permutation);\n out = transpose(\n {inputs: {x: permutedOut}, attrs: {perm: undoPermutation}, backend});\n backend.disposeData(permutedX.dataId);\n backend.disposeData(permutedOut.dataId);\n }\n return out;\n}\n\nexport const cumsumConfig: KernelConfig = {\n kernelName: Cumsum,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: cumsum as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthToSpace: (\n xId: number, blockSize: number, channelsLast: number, xStrides: Uint8Array,\n xStridesLength: number, outputShape: Uint8Array, outputStrides: Uint8Array,\n outSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmDepthToSpace = backend.wasm.cwrap(DepthToSpace, null /*void*/, [\n 'number', // xId\n 'number', // blockSize\n 'number', // channelsLast\n 'array', // xStrides\n 'number', // xStridesLength\n 'array', // outputShape\n 'array', // outputStrides\n 'number', // outSize\n 'number', // outId\n]);\n}\n\nexport function depthToSpace(args: {\n backend: BackendWasm,\n inputs: DepthToSpaceInputs,\n attrs: DepthToSpaceAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x} = inputs;\n const {blockSize, dataFormat} = attrs;\n\n const batchSize = x.shape[0];\n const inputHeight = (dataFormat === 'NHWC') ? x.shape[1] : x.shape[2];\n const inputWidth = (dataFormat === 'NHWC') ? x.shape[2] : x.shape[3];\n const inputDepth = (dataFormat === 'NHWC') ? x.shape[3] : x.shape[1];\n\n const outputHeight = inputHeight * blockSize;\n const outputWidth = inputWidth * blockSize;\n const outputDepth = inputDepth / (blockSize * blockSize);\n\n const outputShape = (dataFormat === 'NHWC') ?\n [batchSize, outputHeight, outputWidth, outputDepth] :\n [batchSize, outputDepth, outputHeight, outputWidth];\n\n const out = backend.makeOutput(outputShape, 'float32');\n\n const xData = backend.dataIdMap.get(x.dataId);\n const xId = xData.id;\n const xStridesBytes

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=\n      new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n\n  const outputShapeBytes = new Uint8Array(new Int32Array(outputShape).buffer);\n  const outStridesBytes =\n      new Uint8Array(new Int32Array(util.computeStrides(outputShape)).buffer);\n\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const channelsLast = dataFormat === 'NHWC' ? 1 : 0;\n  wasmDepthToSpace(\n      xId, blockSize, channelsLast, xStridesBytes, x.shape.length - 1,\n      outputShapeBytes, outStridesBytes, outputShape.length, outId);\n\n  return out;\n}\n\nexport const depthToSpaceConfig: KernelConfig = {\n  kernelName: DepthToSpace,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: depthToSpace as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n
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==========================================================================\n
*/\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs, DepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthwiseConv2d: (\n    xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n    filterId: number, filterHeight: number, filterWidth: number, padTop: number,\n    padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n    dilationHeight: number, dilationWidth: number,
 strideHeight: number,\n    strideWidth: number, inputChannels: number, outputChannels: number,\n    outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmDepthwiseConv2d =\n      backend.wasm.cwrap(DepthwiseConv2dNative, null /* void */, [\n        'number',  // xId\n        'number',  // batchSize\n        'number',  // inputHeight\n        'number',  // inputWidth\n        'number',  // filterId\n        'number',  // filterHeight\n        'number',  // filterWidth\n        'number',  // padTop\n        'number',  // padRight\n        'number',  // padBottom\n        'number',  // padLeft\n        'number',  // isSamePad\n        'number',  // dilationHeight\n        'number',  // dilationWidth\n        'number',  // strideHeight\n        'number',  // strideWidth\n        'number',  // inputChannels\n        'number',  // outputChannels\n        'number',  // outId\n      ]);\n}\n\nfunction depthwiseConv2d(args: {\n  inputs: DepthwiseConv2dNativeInputs,\n
 backend: BackendWasm,\n  attrs: DepthwiseConv2dNativeAttrs\n}) {\n  const {inputs, attrs, backend} = args;\n\n  const {x, filter} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n  const {strides, dilations, pad, dimRoundingMode} = attrs;\n\n  const $dilations = dilations == null ? [1, 1] : dilations;\n\n  const convInfo = backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as Tensor4D).shape, strides,\n      ($dilations as number | [number, number]), pad, dimRoundingMode,\n      true /* depthwise */);\n\n  const filterHeight = convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const padRight = convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft = convInfo.padInfo.left;\n  const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth = convInfo.dilationWidth;\n  const strideHeight = convInfo.strideHeight;\n
  const strideWidth = convInfo.strideWidth;\n  const inputChannels = convInfo.inChannels;\n  const outputChannels = convInfo.outChannels;\n  const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n  if (convInfo.dataFormat !== 'channelsLast') {\n    throw new Error(\n        `wasm backend DepthwiseConv2dNative does not support dataFormat:'` +\n        `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n  }\n\n  const out = backend.makeOutput(convInfo.outShape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  wasmDepthwiseConv2d(\n      xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n      filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n      dilationHeight, dilationWidth, strideHeight, strideWidth, inputChannels,\n      outputChannels, outId);\n  return out;\n}\n\nexport const depthwiseConv2dNativeConfig:
```

KernelConfig = {\n kernelName: DepthwiseConv2dNative,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: depthwiseConv2d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\nimport {Elu, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const eluConfig: KernelConfig = createUnaryKernelConfig(Elu);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\nimport {Equal, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const equalConfig: KernelConfig =\n createBinaryKernelConfig(Equal, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const expConfig: KernelConfig = createUnaryKernelConfig(Exp, 'float32');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\n\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from './Reshape';\n\nexport function expandDims(args: {\n inputs: ExpandDimsInputs,\n attrs: ExpandDimsAttrs,\n backend: BackendWasm\n}) {\n const {inputs, attrs, backend} = args;\n const {input}\n = inputs;\n const {dim} = attrs;\n\n const inputRank = input.shape.length;\n const newShape = input.shape.slice();\n let $dim = dim;\n if (dim < 0) {\n   // Negative value is counted from the tail of rank.\n util.assert(\n   -(inputRank + 1) <= dim,\n   () => `Axis must be in the interval [${- (inputRank + 1)}, ${\n  inputRank}]`);\n $dim = inputRank + dim + 1;\n }\n newShape.splice($dim, 0, 1);\n\n return reshape({inputs: {x: input}, backend, attrs: {shape: newShape}});\n}\n\nexport const expandDimsConfig: KernelConfig = {\n kernelName: ExpandDims,\n backendName: 'wasm',\n kernelFunc: expandDims as {} as KernelFunc,\n};\n","/**\n

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FusedBatchNormInputs,\n attrs: FusedBatchNormAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {varianceEpsilon} = attrs;\n const {x, mean, variance, offset, scale} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const meanId = backend.dataIdMap.get(mean.dataId).id;\n const varianceId = backend.dataIdMap.get(variance.dataId).id;\n const offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n const scaleId = scale != null ? backend.dataIdMap.get(scale.dataId).id : 0;\n\n const out = backend.makeOutput(x.shape, x.dtype);\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(x.shape) === 0) {\n   return out;\n }\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmBatchNorm(\n   xId, meanId, varianceId, offsetId, scaleId, varianceEpsilon, outId);\n return out;\n}\n\nexport const fusedBatchNormConfig: KernelConfig = {\n kernelName: FusedBatchNorm,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchNorm as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
 License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under
 the License.\n * ==========\n */\n\nimport {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const floorDivConfig: KernelConfig =\n createBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under
 the License.\n * ==========\n */\n\nimport {backend_util, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet wasmFusedConv2d:\n   (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n   filterId: number, filterHeight: number, filterWidth: number,\n   biasId: number, padTop: number, padRight: number, padBottom: number,\n   padLeft: number, isSamePad: number, dilationHeight: number,\n   dilationWidth: number, strideHeight: number, strideWidth: number,\n   inputChannels: number, outputChannels: number, activation: number,\n   preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n   void;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedConv2d = backend.wasm.cwrap(FusedConv2D, null /* void

*/, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // biasId\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // activation\n 'number', // preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number', // outId\n]);\n}\n\nfunction fusedConv2d(args: {\n inputs: FusedConv2DInputs,\n backend: BackendWasm,\n attrs: FusedConv2DAttrs\n}) {\n const {inputs, attrs, backend} = args;\n const {x, filter, bias, preluActivationWeights} = inputs;\n const {\n strides,\n pad,\n dilations,\n dataFormat,\n dimRoundingMode,\n activation,\n leakyreluAlpha\n } = attrs;\n\n const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode);\n\n const fusedActivation =\n FusableActivation[activation as {} as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n throw new Error(\n `${activation} activation not yet supported for FusedConv2D ` +\n `in the wasm backend.`);\n }\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n if (bias != null) {\n const biasData = backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n throw new Error(\n `FusedConv2D only supports rank-1 bias but got ` +\n `rank ${biasData.shape.length}.`);\n }\n if (biasData.shape[0] !== outputChannels)
{\n throw new Error(\n `FusedConv2D bias shape (${biasData.shape}) does not ` +\n `match the number of output channels (${outputChannels})`);\n }\n biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize = convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if (dataFormat !== 'NHWC') {\n throw new Error(\n `wasm backend FusedConv2D does not support
dataFormat:'` +\n `${dataFormat}'. Please use 'NHWC'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const preluActivationWeightsId = preluActivationWeights == null ?\n 0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedConv2d(\n xId, batchSize, inHeight, inWidth, filterId, filterHeight, filterWidth,\n biasId, padTop, padRight, padBottom, padLeft, isSamePad, dilationHeight,\n dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedConv2DConfig: KernelConfig = {\n kernelName: FusedConv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedConv2d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {backend_util, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs, FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet

wasmFusedDepthwiseConv2d:\n (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight:
number, filterWidth: number,\n biasId: number, padTop: number, padRight: number, padBottom: number,\n padLeft: number, isSamePad: number, dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels: number, activation: number,\n preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedDepthwiseConv2d =\n backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // biasId\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // activation\n 'number', // preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number', // outId\n]);\n}\n\nfunction fusedDepthwiseConv2d(args: {\n inputs: FusedDepthwiseConv2DInputs,\n backend: BackendWasm,\n attrs: FusedDepthwiseConv2DAttrs\n}) {\n const {inputs, attrs, backend} = args;\n const {x, filter, bias, preluActivationWeights} = inputs;\n const {\n strides,\n pad,\n dilations,\n dataFormat,\n dimRoundingMode,\n activation,\n leakyreluAlpha\n } = attrs;\n\n const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode, true /* depthwise */);\n\n const fusedActivation =\n FusableActivation[activation as {} as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n throw new Error(\n `${activation} activation not yet supported for FusedDepthwiseConv2D ` +\n `in the wasm backend.`);\n }\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n if (bias != null) {\n const biasData = backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n throw new Error(\n `FusedDepthwiseConv2D only supports rank-1 bias but got ` +\n `rank ${biasData.shape.length}.`);\n }\n if (biasData.shape[0] !== outputChannels) {\n throw new Error(\n `FusedDepthwiseConv2D bias shape (${biasData.shape}) does not ` +\n `match the number of output channels (${outputChannels})`);\n }\n biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize = convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if (dataFormat !== 'NHWC') {\n throw new Error(\n `wasm backend FusedDepthwiseConv2D does not support dataFormat:'` +\n `${dataFormat}'. Please use 'NHWC'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const preluActivationWeightsId = preluActivationWeights == null
?\n 0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedDepthwiseConv2d(\n xId, batchSize, inHeight, inWidth, filterId, filterHeight, filterWidth,\n biasId, padTop, padRight, padBottom, padLeft, isSamePad, dilationHeight,\n dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedDepthwiseConv2DConfig: KernelConfig = {\n kernelName: FusedDepthwiseConv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedDepthwiseConv2d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *

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==========\n
*/\n\nimport {gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmGatherNd: (\n xId: number, dtype: CppDType, indicesId: number, numSlices: number,\n sliceRank: number, sliceSize: number, strides: Uint8Array, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n 'number', // xId\n 'number', // dtype\n 'number', // indicesId\n 'number', // numSlices\n 'number', // sliceRank\n
'number', // sliceSize\n 'array', // strides\n 'number' // outId\n]);\n}\n\nfunction gatherNd(args: {backend: BackendWasm, inputs: GatherNdInputs}):\n TensorInfo {\n const {backend, inputs} = args;\n const {params, indices} = inputs;\n\n const [resultShape, numSlices, sliceSize, strides] =\n gather_util.prepareAndValidate(params, indices);\n\n const out = backend.makeOutput(resultShape, params.dtype);\n if (numSlices === 0) {\n return out;\n }\n\n const indicesShape = indices.shape;\n const sliceRank = indicesShape[indicesShape.length - 1];\n\n const xData = backend.dataIdMap.get(params.dataId);\n const xId = xData.id;\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const stridesBytes = new Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmGatherNd(\n xId, CppDType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n
stridesBytes, outId);\n\n return out;\n}\n\nexport const gatherNdConfig: KernelConfig = {\n kernelName: GatherNd,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherNd\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc,
Tensor, TensorInfo, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from './Reshape';\nimport {CppDType} from './types';\n\nlet wasmGather: (\n xId: number, dtype: CppDType, xStrides: Uint8Array, stridesSize: number,\n indicesId: number, batchSize: number, outStrides: Uint8Array,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmGather = backend.wasm.cwrap('Gather', null /*void*/, [\n 'number', // xId\n 'number', // dtype\n 'array', // xStrides\n 'number', // stridesSize\n 'number', // indicesId\n 'number', // batchSize\n 'array', // outStrides\n 'number' // outId\n]);\n}\n\nfunction gatherV2(\n args: {backend: BackendWasm, inputs: GatherV2Inputs, attrs: GatherV2Attrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x, indices} = inputs;\n const {axis, batchDims} = attrs;\n\n // Throw error when any index
is out of bound.\n const parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n const indicesVals = backend.readSync(indices.dataId) as TypedArray;\n const axisDim = x.shape[parsedAxis];\n for (let i = 0; i < indicesVals.length; ++i) {\n const index = indicesVals[i];\n util.assert(\n index <= axisDim - 1 && index >= 0,\n () =>\n `GatherV2: the index value ${index} is not in [0, ${axisDim - 1}]`);\n }\n\n const shapeInfo = backend_util.segment_util.collectGatherOpShapeInfo(\n x as Tensor, indices as Tensor, parsedAxis, batchDims);\n\n const flattenX = reshape({\n inputs: {x},\n attrs: {\n shape: [\n shapeInfo.batchSize, shapeInfo.outerSize, shapeInfo.dimSize,\n shapeInfo.sliceSize\n]\n },\n backend\n });\n const indicesSize = util.sizeFromShape(indices.shape);\n const flattenIndex = reshape({\n inputs: {x: indices},\n attrs:

{shape: [shapeInfo.batchSize, indicesSize / shapeInfo.batchSize]},\n backend\n });\n const flattenOutputShape = [\n shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n shapeInfo.sliceSize\n];\n\n const out = backend.makeOutput(flattenOutputShape, x.dtype);\n if (util.sizeFromShape(x.shape) === 0) {\n return out;\n }\n const stridesSize = flattenX.shape.length - 1;\n\n const xData = backend.dataIdMap.get(flattenX.dataId);\n const xId = xData.id;\n\n const indicesData = backend.dataIdMap.get(flattenIndex.dataId);\n const indicesId = indicesData.id;\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const xStridesBytes = new Uint8Array(\n new Int32Array(util.computeStrides(flattenX.shape)).buffer);\n const outStridesBytes = new Uint8Array(\n new Int32Array(util.computeStrides(flattenOutputShape)).buffer);\n\n wasmGather(\n xId, CppDType[x.dtype], xStridesBytes, stridesSize, indicesId,\n shapeInfo.batchSize, outStridesBytes, outId);\n\n backend.disposeData(flattenX.dataId);\n backend.disposeData(flattenIndex.dataId);\n\n // reshape\n out.shape = shapeInfo.outputShape;\n return out;\n}\n\nexport const gatherV2Config: KernelConfig = {\n kernelName: GatherV2,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherV2 as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==*/\n\nimport {KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmFunc: (\n xId: number, dtype: number, leakyreluAlpha: number, outId: number) => void;\n\nfunction setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(LeakyRelu, null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // leakyrelu_alpha\n 'number', // out_id\n]);\n}\n\nexport function leakyRelu(\n args:\n {inputs: LeakyReluInputs, attrs: LeakyReluAttrs, backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, attrs: {alpha}, backend} = args;\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n // According to TF API, LeakyRelu returns float32 when input is either float32\n // or int32.\n const out = backend.makeOutput(x.shape, 'float32');\n\n if (util.sizeFromShape(x.shape) !== 0)\n {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(xId, CppDType[x.dtype], alpha, outId);\n }\n\n return out;\n}\n\nexport const leakyReluConfig: KernelConfig = {\n kernelName: LeakyRelu,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: leakyRelu as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==*/\n\nimport {Greater, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterConfig: KernelConfig =\n createBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES

OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\nimport {GreaterEqual, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterEqualConfig: KernelConfig =\n createBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmMax: (xId: number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMax = backend.wasm.cwrap(Max, null /*void*/, [\n 'number', // x_id\n 'number', // dtype\n 'number', // reduce_size\n 'number', // out_id\n]);\n}\n\nfunction max(args: {backend: BackendWasm, inputs: MaxInputs, attrs: MaxAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {reductionIndices: axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed}\n =\n permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n input = transposed;\n inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('max', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmMax(inputId, CppDType[x.dtype], reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return out;\n}\n\nexport
const maxConfig: KernelConfig = {\n kernelName: Max,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: max as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\nimport {KernelConfig, Less} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst
supportsFullBroadcast = false;\nexport const lessConfig: KernelConfig =\n createBinaryKernelConfig(Less, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *

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==========\n */\n\nimport {KernelConfig, LessEqual} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst
supportsFullBroadcast = false;\nexport const lessEqualConfig: KernelConfig =\n createBinaryKernelConfig(LessEqual, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {KernelConfig, Log} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport
const logConfig: KernelConfig = createUnaryKernelConfig(Log);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {KernelConfig, LogicalAnd} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const logicalAndConfig: KernelConfig
=\n createBinaryKernelConfig(LogicalAnd, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet
wasmMaxPool: (\n xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterHeight: number, filterWidth: number, padTop: number, padRight: number,\n padBottom: number, padLeft: number, dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmMaxPool = backend.wasm.cwrap(MaxPool, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // outId\n

]);\n}\n\nfunction maxPool(\n args: {inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n const {inputs, attrs, backend} = args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n // TF API supports int32 input. CPU and WebGL backend also support int32\n // input. WASM backend doesn't support it because it uses xnnpack which only\n // supports float32.\n //\n // Add the following assert only for the WASM backend instead of at core op\n // level.\n //\n // TODO: add support for int32 input.\n util.assert(\n   x.dtype === 'float32',\n   () =>\n   `Error in MaxPool: only float32 input is supported. Got ${x.dtype}.`);\n\n const {filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n   x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n   throw new Error(\n   `wasm backend does not support dataFormat:'` +\n   `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmMaxPool(\n   xId, x.shape[0], x.shape[1], x.shape[2], filterHeight, filterWidth,\n   padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n   strideHeight, strideWidth, inputChannels, outputChannels, outId);\n return out;\n}\n\nexport const maxPoolConfig: KernelConfig = {\n kernelName: MaxPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: maxPool as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const maximumConfig: KernelConfig =\n   createBinaryKernelConfig(Maximum, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {cast} from './Cast';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmMean: (xId: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMean =\n   backend.wasm.cwrap(Mean, null /*void*/, ['number, number, number']);\n}\n\nexport function mean(\n   args: {backend: BackendWasm, inputs: MeanInputs, attrs: MeanAttrs}):\n   TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n   const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   if (transposedId

```
!== xId) {\n      //
 transpose was not a no-op. We will need to dispose of this\n      // once we are done.\n      input = transposed;\n
inputId = transposedId;\n      reductionAxes = backend_util.getInnerMostAxes(\n          reductionAxes.length,
input.shape.length);\n    }\n  }\n\n  backend_util.assertAxesAreInnerMostDims(\n      'mean', reductionAxes,
input.shape.length);\n  const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n  const reduceSize =
util.sizeFromShape(reduceShape);\n  let castedInput = input;\n  if (input.dtype !== 'float32') {\n    castedInput =\n
 cast({backend, inputs: {x: input}, attrs: {dtype: 'float32'}});\n    inputId =
backend.dataIdMap.get(castedInput.dataId).id;\n  }\n\n  const out = backend.makeOutput(outShape, 'float32');\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmMean(inputId, reduceSize, outId);\n  }\n\n  if (inputWasTransposed) {\n    //
 dispose of the transposed tensor.\n    backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    //
reshape\n    const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape =
newShape;\n  }\n\n  if (input.dtype !== 'float32') {\n    backend.disposeData(castedInput.dataId);\n  }\n\n  return
out;\n}\n\nexport const meanConfig: KernelConfig = {\n  kernelName: Mean,\n  backendName: 'wasm',\n
setupFunc: setup,\n  kernelFunc: mean as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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under the License.\n *
==========================================================================\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmMin: (xId:
number, dtype: number, reduceSize: number, outId: number) =>\n    void;\n\nfunction setup(backend:
BackendWasm): void {\n  wasmMin = backend.wasm.cwrap(Min, null /*void*/, [\n    'number',  // x_id\n
'number',  // dtype\n    'number',  // reduce_size\n    'number',  // out_id\n  ]);\n}\n\nfunction min(args: {backend:
BackendWasm, inputs: MinInputs, attrs: MinAttrs}):\n    TensorInfo {\n  const {backend, inputs, attrs} = args;\n
const {axis, keepDims} = attrs;\n  const {x} = inputs;\n
  const xId = backend.dataIdMap.get(x.dataId).id;\n  let inputId = xId;\n  let input = x;\n\n  const {transposed, axes,
originalAxes, inputWasTransposed} =\n      permuteAxesAndTranspose(x, axis, backend);\n\n  if
(inputWasTransposed) {\n    const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n    if (transposedId
!== xId) {\n      // transpose was not a no-op. We will need to dispose of this\n      // once we are done.\n      input =
transposed;\n      inputId = transposedId;\n    }\n  }\n\n  const inputRank = input.shape.length;\n\n
backend_util.assertAxesAreInnerMostDims('min', axes, inputRank);\n  const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape, axes);\n  const reduceSize =
util.sizeFromShape(reduceShape);\n\n  const out = backend.makeOutput(outShape, input.dtype);\n  if
(util.sizeFromShape(input.shape) !== 0) {\n    const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmMin(inputId, CppDType[x.dtype], reduceSize,
 outId);\n  }\n\n  if (inputWasTransposed) {\n    // dispose of the transposed tensor.\n
backend.disposeData(transposed.dataId);\n  }\n\n  if (keepDims) {\n    // reshape\n    const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n    out.shape = newShape;\n  }\n\n  return
out;\n}\n\nexport const minConfig: KernelConfig = {\n  kernelName: Min,\n  backendName: 'wasm',\n  setupFunc:
setup,\n  kernelFunc: min as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
```

except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\n// Must match enum in MirrorPad.cc\nenum MirrorPaddingMode {\n reflect = 0,\n symmetric = 1\n}\n\nlet wasmMirrorPad: (\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array, mode: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmMirrorPad = backend.wasm.cwrap(MirrorPad, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n 'array', // pre-paddings\n 'array', // post-paddings\n 'number', // mode\n 'number', // outId\n]);\n}\n\nfunction mirrorPad(args: {\n inputs: MirrorPadInputs,\n backend: BackendWasm,\n attrs: MirrorPadAttrs\n}) {\n const {inputs: {x}, backend, attrs: {paddings, mode}} = args;\n\n const outShape = paddings.map(\n (p, i) => p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(outShape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n const prePaddingsBytes =\n new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const postPaddingsBytes =\n new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmMirrorPad(\n xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n postPaddingsBytes, MirrorPaddingMode[mode], outId);\n return out;\n}\n\nexport const mirrorPadConfig: KernelConfig = {\n kernelName: MirrorPad,\n backendName: 'wasm',\n kernelFunc: mirrorPad as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\nimport {KernelConfig, Minimum} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const minimumConfig: KernelConfig =\n createBinaryKernelConfig(Minimum, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs, NonMaxSuppressionV3Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number,

scoreThreshold: number) => number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n NonMaxSuppressionV3,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', // scoreThreshold\n]);\n}\n\nfunction kernelFunc(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV3Inputs,\n attrs: NonMaxSuppressionV3Attrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold} = attrs;\n const {boxes, scores} = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset =\n wasmFunc(boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V3, we have to delete it from the heap.\n backend.wasm._free(pSelectedScores);\n backend.wasm._free(pValidOutputs);\n\n const selectedIndicesTensor =\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n return selectedIndicesTensor;\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n kernelName: NonMaxSuppressionV3,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, Multiply} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = true;\nexport const multiplyConfig: KernelConfig =\n createBinaryKernelConfig(Multiply, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport {KernelConfig, Neg} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const negConfig: KernelConfig = createUnaryKernelConfig(Neg);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {BackendWasm} from '../backend_wasm';\n\n// Analogous to `struct Result` in `non_max_suppression_impl.h`.\ninterface Result {\n pSelectedIndices: number;\n selectedSize: number;\n pSelectedScores: number;\n pValidOutputs: number;\n}\n\n/**\n * Parse the result of the c++ method, which has the shape equivalent to\n * `Result`.\n */\nexport function parseResultStruct(\n backend: BackendWasm, resOffset:

number): Result {\n const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);\n const pSelectedIndices
 = result[0];\n const selectedSize = result[1];\n const pSelectedScores = result[2];\n const pValidOutputs = result[3];\n // Since the result was allocated on the heap, we have to delete it.\n backend.wasm._free(resOffset);\n return {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs};\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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 /\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs, NonMaxSuppressionV4Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n boxesId: number, scoresId: number, maxOutputSize: number,\n   iouThreshold: number, scoreThreshold: number,\n padToMaxOutputSize: boolean) => number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n   NonMaxSuppressionV4,\n   'number', // Result\n   [\n   'number', // boxesId\n 'number', // scoresId\n   'number', // maxOutputSize\n   'number', // iouThreshold\n   'number', // scoreThreshold\n   'bool',   // padToMaxOutputSize\n   ]);\n}\n\nfunction nonMaxSuppressionV4(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV4Inputs,\n attrs: NonMaxSuppressionV4Attrs\n}): TensorInfo[]
 {\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold, padToMaxOutputSize} =\n   attrs;\n const {boxes, scores} = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset = wasmFunc(\n   boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n padToMaxOutputSize);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V4, we have to delete it from the heap.\n backend.wasm._free(pSelectedScores);\n\n const selectedIndicesTensor =\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n const validOutputsTensor = backend.makeOutput([], 'int32', pValidOutputs);\n\n return [selectedIndicesTensor, validOutputsTensor];\n}\n\nexport const nonMaxSuppressionV4Config: KernelConfig = {\n kernelName: NonMaxSuppressionV4,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: nonMaxSuppressionV4 as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs, NonMaxSuppressionV5Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport
 {BackendWasm} from '../backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc:\n   (boxesId: number, scoresId: number, maxOutputSize: number,\n   iouThreshold: number, scoreThreshold: number, softNmsSigma: number) =>\n   number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n   NonMaxSuppressionV5,\n   'number', // Result*\n   [\n 'number', // boxesId\n   'number', // scoresId\n   'number', // maxOutputSize\n   'number', //

iouThreshold\n 'number', // scoreThreshold\n 'number', // softNmsSigma\n]);\n}\n\nfunction kernelFunc(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV5Inputs,\n attrs: NonMaxSuppressionV5Attrs\n}): TensorInfo[] {\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold, softNmsSigma} = attrs;\n const {boxes, scores} = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n
const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset = wasmFunc(\n boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n softNmsSigma);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using validOutputs for V5, we have to delete it from the\n // heap.\n backend.wasm._free(pValidOutputs);\n\n const selectedIndicesTensor =\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n const selectedScoresTensor =\n backend.makeOutput([selectedSize], 'float32', pSelectedScores);\n\n return [selectedIndicesTensor, selectedScoresTensor];\n}\n\nexport const nonMaxSuppressionV5Config: KernelConfig = {\n kernelName: NonMaxSuppressionV5,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n
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==========\n */\n\nimport {KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmOneHot: (\n indicesId: number, depth: number, onValue: number, offValue: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmOneHot = backend.wasm.cwrap(OneHot,
null /* void */, [\n 'number', // indices_id\n 'number', // depth,\n 'number', // onValue\n 'number', // offValue\n 'number' // out_id\n]);\n}\n\nfunction oneHot(\n args: {inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm}) {\n const {inputs, backend, attrs} = args;\n const {indices} = inputs;\n const {depth, onValue, offValue} = attrs;\n\n const out = backend.makeOutput([...indices.shape, depth], 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n wasmOneHot(indicesId, depth, onValue, offValue, outId);\n\n return out;\n}\n\nexport const oneHotConfig: KernelConfig = {\n kernelName: OneHot,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: oneHot as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
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==========\n */\nimport {KernelConfig, NotEqual} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const notEqualConfig: KernelConfig =\n createBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0
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==========\n
*/\n\nimport {KernelConfig, KernelFunc, OnesLike, OnesLikeInputs} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nfunction onesLike(args: {inputs: OnesLikeInputs, backend:
BackendWasm}) {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n
const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(1);\n return out;\n}\n\nexport
 const onesLikeConfig: KernelConfig = {\n kernelName: OnesLike,\n backendName: 'wasm',\n kernelFunc:
onesLike as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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==========\n
*/\n\nimport {KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util} from '@tensorflow/tfjs-
core';\nimport {BackendWasm}
 from '../backend_wasm';\n\nimport {concat} from './Concat';\nimport {expandDims} from
'./ExpandDims';\n\nexport function pack(\n   args: {inputs: PackInputs, backend: BackendWasm, attrs:
PackAttrs}):\n   TensorInfo {\n const {inputs, backend, attrs} = args;\n const {axis} = attrs;\n\n if (inputs.length
=== 1) {\n   return expandDims(\n   {inputs: {input: inputs[0]}, backend, attrs: {dim: axis}});\n }\n\n const
shape = inputs[0].shape;\n const dtype = inputs[0].dtype;\n\n inputs.forEach(t => {\n   util.assertShapesMatch(\n
  shape, t.shape,\n   'All tensors passed to stack must have matching shapes');\n   util.assert(\n   dtype ===
t.dtype,\n   () => 'All tensors passed to stack must have matching dtypes');\n });\n\n const
intermediateTensorInfos: TensorInfo[] = [];\n const expandedTensors = inputs.map(t => {\n   const expandedT =\n
    expandDims({inputs: {input: t}, backend, attrs: {dim: axis}});\n   intermediateTensorInfos.push(expandedT);\n
   return expandedT;\n });\n\n const result = concat({inputs: expandedTensors, backend, attrs: {axis}});\n\n
intermediateTensorInfos.forEach(t => backend.disposeData(t.dataId));\n\n return result;\n}\n\nexport const
packConfig: KernelConfig = {\n kernelName: Pack,\n backendName: 'wasm',\n kernelFunc: pack as {} as
KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
==========\n
 */\n\nimport {KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, util} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {fill} from './Fill';\n\nimport {CppDType}
from './types';\n\nlet wasmPadV2: (\n   xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype:
number,\n   prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array,\n   constantValue: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmPadV2 = backend.wasm.cwrap(PadV2, null
/* void */, [\n   'number', // xId\n   'array', // x.shape\n   'number', // x.shape.length\n   'number', // x.dtype\n
'array', // pre-paddings\n   'array', // post-paddings\n   'number', // constantValue\n   'number', // outId\n
]);\n}\n\nfunction pad(\n   args: {inputs: PadV2Inputs, backend: BackendWasm, attrs: PadV2Attrs}) {\n const
{inputs: {x}, backend, attrs:
 {paddings, constantValue}} = args;\n\n const outShape = paddings.map(\n   (p, i) => p[0] /* beforePad */ +
x.shape[i] + p[1] /* afterPad */);\n\n if (util.sizeFromShape(x.shape) === 0) {\n   // Short-circuit the computation,

since x doesn't have value, only\n   // the shape is used to compute output shape to pad.\n   return fill({\n backend,\n   attrs: {shape: outShape, value: constantValue, dtype: x.dtype}\n   });\n }\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(outShape, x.dtype);\n const outTensorData = backend.dataIdMap.get(out.dataId);\n const outId = outTensorData.id;\n\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n const prePaddingsBytes =\n   new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const postPaddingsBytes =\n   new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmPadV2(\n   xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n postPaddingsBytes, constantValue, outId);\n return out;\n}\n\nexport const padV2Config: KernelConfig = {\n kernelName: PadV2,\n backendName: 'wasm',\n kernelFunc: pad as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, KernelFunc, Prelu, PreluInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from './Cast';\n\nlet wasmPrelu: (xId: number, weightsId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmPrelu = backend.wasm.cwrap(Prelu, null /* void */, [\n   'number', // x_id\n   'number', // weights_id\n   'number'   // out_id\n]);\n}\n\nfunction prelu(args: {inputs: PreluInputs, backend: BackendWasm}) {\n const {inputs, backend} = args;\n const {x, alpha} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const weightsId = backend.dataIdMap.get(alpha.dataId).id;\n\n let inputId = xId;\n const input = x;\n let castedInput = input;\n if (input.dtype !== 'float32') {\n   castedInput = cast({backend, inputs: {x}, attrs: {dtype: 'float32'}});\n   inputId = backend.dataIdMap.get(castedInput.dataId).id;\n\n }\n\n const out = backend.makeOutput(x.shape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmPrelu(inputId, weightsId, outId);\n\n if (input.dtype !== 'float32') {\n   backend.disposeData(castedInput.dataId);\n }\n return out;\n}\n\nexport const preluConfig: KernelConfig = {\n kernelName: Prelu,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prelu as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language\n governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, Pow} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\n\nexport const powConfig: KernelConfig =\n createBinaryKernelConfig(Pow, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language

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==========\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nimport {CppDType} from './types';\n\nlet wasmProd: (\n
xId: number, reduceSize: number,\n dtype: number, outId: number) => void;\n\nfunction setup(backend:
BackendWasm): void {\n wasmProd = backend.wasm.cwrap(Prod, null /*void*/, [\n 'number',\n 'number',\n
'number',\n 'number'\n]);\n}\n\nfunction prod(args: {\n backend: BackendWasm,\n inputs: ProdInputs,\n attrs:
ProdAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x}
= inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const
{transposed,
 axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let
reductionAxes = axes;\n if (inputWasTransposed) {\n const transposedId =
backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was not a no-op. We
will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n
reductionAxes = backend_util.getInnerMostAxes(\n reductionAxes.length, input.shape.length);\n }\n }\n\n
backend_util.assertAxesAreInnerMostDims(\n 'prod', reductionAxes, input.shape.length);\n const [outShape,
reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize
= util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if
(util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmProd(inputId, reduceSize,
 CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n
backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return
out;\n}\n\nexport const prodConfig: KernelConfig = {\n kernelName: Prod,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: prod as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All
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License.\n *
==========\n
*/\n\nimport {KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo,
util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from
'./Cast';\n\nlet wasmResizeBilinear: (\n xId: number, batch: number, oldHeight: number, oldWidth: number,\n
numChannels: number, newHeight: number, newWidth: number,\n alignCorners: number, halfPixelCenters:
number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmResizeBilinear =
backend.wasm.cwrap(ResizeBilinear, null /*void*/, [\n 'number', // xId\n 'number', // batch\n 'number', //
oldHeight\n 'number', // oldWidth\n 'number', // numChannels\n 'number', // newHeight\n 'number', //
newWidth\n 'number',
  // alignCorners\n 'number', // halfPixelCenters\n 'number' // outId\n]);\n}\n\nfunction resizeBilinear(args: {\n
backend: BackendWasm,\n inputs: ResizeBilinearInputs,\n attrs: ResizeBilinearAttrs\n}): TensorInfo {\n const
{backend, inputs, attrs} = args;\n\n const {images} = inputs;\n const {alignCorners, halfPixelCenters, size} =
attrs;\n const [newHeight, newWidth] = size;\n\n const [batch, oldHeight, oldWidth, numChannels] =
images.shape;\n const outShape = [batch, newHeight, newWidth, numChannels];\n\n let xData =

backend.dataIdMap.get(images.dataId);\n let castedData;\n if (xData.dtype !== 'float32') {\n   castedData =\n cast({backend, inputs: {x: images}, attrs: {dtype: 'float32'}});\n   xData =
backend.dataIdMap.get(castedData.dataId);\n }\n const xId = xData.id;\n\n const out =
backend.makeOutput(outShape, 'float32');\n if (util.sizeFromShape(images.shape) === 0) {\n   return out;\n }\n
const outId = backend.dataIdMap.get(out.dataId).id;\n\n
  wasmResizeBilinear(\n   xId, batch, oldHeight, oldWidth, numChannels, newHeight, newWidth,\n
alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId);\n\n if (castedData != null) {\n
backend.disposeData(castedData.dataId);\n }\n\n return out;\n}\n\nexport const resizeBilinearConfig:
KernelConfig = {\n kernelName: ResizeBilinear,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc:
resizeBilinear as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights
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==\n
*/\n\nimport {KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\nimport {rangeImplCPU} from '../kernel_utils/shared';\n\nexport const
range =\n   (args: {backend: BackendWasm, attrs: RangeAttrs}): TensorInfo => {\n   const {backend, attrs} =
args;\n   const {start, stop, step, dtype} = attrs;\n   const values = rangeImplCPU(start, stop, step, dtype);\n\n
const out = backend.makeOutput([values.length], dtype);\n   const outVals =
backend.typedArrayFromHeap(out);\n   outVals.set(values);\n   return out;\n   };\n\nexport const rangeConfig:
KernelConfig = {\n kernelName: Range,\n backendName: 'wasm',\n kernelFunc: range as {} as
KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights
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==\n
*/\nimport { util } from '@tensorflow/tfjs-core';\nexport function rangeImpl(start, stop, step, dtype) {\n   const
sameStartStop = start === stop;\n   const increasingRangeNegativeStep = start < stop && step < 0;\n   const
decreasingRangePositiveStep = stop < start && step > 1;\n   if (sameStartStop || increasingRangeNegativeStep ||\n
        decreasingRangePositiveStep) {\n   return util.makeZerosTypedArray(0, dtype);\n   }\n   const
numElements = Math.abs(Math.ceil((stop - start) / step));\n   const values =
util.makeZerosTypedArray(numElements, dtype);\n   if (stop < start && step === 1) {\n   // Auto adjust the
step's sign if it hasn't been set\n   // (or was set to 1)\n   step = -1;\n   }\n   values[0] = start;\n   for (let i = 1; i
< values.length; i++) {\n   values[i] = values[i - 1] + step;\n   }\n   return values;\n}\n//#
sourceMappingURL=data:application/json; base64,eyJ2ZXJzaW9uIjozLCJmaWxlIjoiUmFuZ2VfaW1wbC5qcyIsIn
NvdXJjZVJvb3QiOiIiLCJzb3VyY2VzIjpbIi4uLy4uLy4uLy4uLy4uLy4uL3RmanMtYmFja2VuZC1jcHUvc3JjL3tlc
m5lbHMvUmFuZ2VfaW1wbC50cyJdLCJuYW1lcyI6W10sIm1hcHBpbmdzIjoiQUFBQTs7Ozs7Ozs7Ozs7O0
dBZUc7QUFFSCxPQUFPLEVBQWMsSUFBSSxFQUFFLE1BQU0sdUJBQXVCLENBQUM7QUFFbkQsTUFBTSxVQUFVLFNCxPQUFPLEVBQUUsS0FBYSxFQUFFLElBQWEsRUFBRSxLQUFhO0lBQzlELE1BQU0sV
FCLE1BQU0sYUFBYSxHQUFHLEtBQUssR0FBRyxJQUFJLEdBQUcsQ0FBQyxDQUFDO0lBQ3ZDLE1BQU0sMkJBQTJCLEdBQUcsS0FBSyxHQ0lBRyxJQUFJLEdBQUcsQ0FBQztJQUN4RCxNBRyxyLQUFFLLLEdBQUcsSUFBSSxHQUFHLENBQUMsQ0FBQztJQUNyR

xhQUFhLElBQUksMkJBQTJCO1FBQzVDLDJCQUEyQixFQUFFO1FBQy9CLE9BQU8sSUFBSSxDQUFDLG1CQUFtQixDQUFDLENBQUMsRUFBRSRSxLQUFLLENBQUMsQ0FBQztLQUMzQzQztQztJQUVELE1BQU0sV0FBVyxxHQUFHHLElBQUksQ0FBQyxHQUFHHLENBQUMsSUFBSSxDQUFDLDLElBQUksR0FBRyxDQUFDLyxDQUFDLENBQUMsR0FBRyxDQUFDLyxDQUFDLENBQUMsR0FBRyxDQUFDLyxJQUFJLENBQUMsQ0lBQy9ELE1BTUFBTSxxHQUFHLElBQUksQ0FBQyxxtQkFBbUIsQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM7SUFFRCxNTUFBTSxxHQUFHLElBQUksQ0FBQyxxXQUFFXLEVBQUUsU0FBSyxDQUFDLDLENBQUM7QUM7SUFFLENBQUM;

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==========\n
*/\n\nimport
```

{KernelConfig, RealDiv} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = true;\nexport const realDivConfig: KernelConfig =\n createBinaryKernelConfig(RealDiv, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\nimport {KernelConfig, Relu} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const reluConfig: KernelConfig = createUnaryKernelConfig(Relu);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\nimport {KernelConfig, Relu6} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const relu6Config: KernelConfig = createUnaryKernelConfig(Relu6);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\n\nlet wasmReverse: (\n   xId: number, axes: Uint8Array, axesLength: number, outShape: Uint8Array,\n   outShapeLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmReverse = backend.wasm.cwrap(Reverse, null, [\n   'number', // x_id\n   'array',   // axes\n   'number', // axes_length\n   'array',   // out_shape\n   'number', // out_shape_length\n   'number'   // out_id\n]);\n}\n\nexport function reverse(\n   args: {inputs: ReverseInputs, backend: BackendWasm, attrs: ReverseAttrs}):\n   TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {dims} = attrs;\n\n const axes = util.parseAxisParam(dims, x.shape);\n\n if (x.shape.length === 0) {\n   return identity({inputs: {x}, backend});\n }\n\n const out = backend.makeOutput(x.shape, x.dtype);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const axesBytes = new Uint8Array(new Int32Array(axes).buffer);\n const outShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n wasmReverse(\n   xId, axesBytes, axes.length, outShapeBytes, x.shape.length,\n   outId);\n\n const reshaped =\n   reshape({inputs: {x: out}, attrs: {shape: x.shape}, backend});\n\n backend.disposeData(out.dataId);\n return reshaped;\n}\n\nexport const reverseConfig: KernelConfig = {\n kernelName: Reverse,\n backendName: 'wasm',\n kernelFunc: reverse as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *

Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\n\nimport {KernelConfig, KernelFunc, RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmRotate: (\n xId: number, batch: number, imageHeight: number, imageWidth: number,\n numChannels: number, radians: number, centerX: number, centerY: number,\n fillBytes: Uint8Array, fillLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmRotate = backend.wasm.cwrap(RotateWithOffset, null /* void */, [\n 'number', // xId\n 'number', // batch\n 'number', // imageHeight\n 'number', // imageWidth\n 'number', // numChannels\n 'number', // radians\n 'number', // centerX\n 'number', // centerY\n 'array', // fillBytes\n 'number', // fillLength\n 'number', // outId\n]);\n}\n\nexport function rotateWithOffset(args: {\n inputs: RotateWithOffsetInputs,\n backend: BackendWasm,\n attrs: RotateWithOffsetAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {image} = inputs;\n const {radians, fillValue, center} = attrs;\n\n const out = backend.makeOutput(image.shape, image.dtype);\n const imageId = backend.dataIdMap.get(image.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n\n const [centerX, centerY] =\n backend_util.getImageCenter(center, imageHeight, imageWidth);\n\n const fillIsBlack = fillValue === 0;\n const fullOpacityValue = 255;\n\n const fillValues = typeof fillValue === 'number' ?\n [fillValue, fillValue, fillValue, fillIsBlack ? 0 : fullOpacityValue] :\n [...fillValue, fullOpacityValue];\n const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);\n\n wasmRotate(\n imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX,\n centerY, fillBytes, fillValues.length, outId);\n return out;\n}\n\nexport const rotateWithOffsetConfig: KernelConfig = {\n kernelName: RotateWithOffset,\n backendName: 'wasm',\n kernelFunc: rotateWithOffset as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS
OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\n\nimport {KernelConfig, KernelFunc, scatter_util, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmScatterNd: (\n indicesId: number, updatesId: number, dtype: CppDType, sliceRank: number,\n numUpdates: number, sliceSize: number, strides: Uint8Array,\n outputSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmScatterNd = backend.wasm.cwrap(ScatterNd, null /*void*/, [\n 'number', // indicesId\n 'number', // updatesId\n 'number', // dtype\n 'number', // sliceRank\n 'number', // numUpdates\n 'number', // sliceSize\n 'array', // strides\n 'number', // outputSize\n 'number' // outId\n]);\n}\n\nfunction scatterNd(\n args:\n {backend: BackendWasm, inputs: ScatterNdInputs, attrs: ScatterNdAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {indices, updates} = inputs;\n const {shape} = attrs;\n\n const out = backend.makeOutput(shape, updates.dtype);\n if (util.sizeFromShape(shape) === 0) {\n return out;\n }\n\n const {sliceRank, numUpdates, sliceSize, strides, outputSize} =\n scatter_util.calculateShapes(updates, indices, shape);\n\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const updatesData = backend.dataIdMap.get(updates.dataId);\n const updatesId = updatesData.id;\n\n const stridesBytes = new

Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmScatterNd(\n   indicesId, updatesId, CppDType[updates.dtype], sliceRank, numUpdates,\n   sliceSize, stridesBytes, outputSize, outId);\n\n return out;\n}\n\nexport const scatterNdConfig: KernelConfig = {\n kernelName: ScatterNd,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: scatterNd as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport {KernelConfig, Round} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, KernelFunc, Select, SelectInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmSelect: (\n   conditionId: number, tId: number, eId: number, offset: number,\n   outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmSelect = backend.wasm.cwrap('SelectV2', null, [\n   'number', // conditionId\n   'number', // tId\n   'number', // eId\n   'number', // offset\n   'number', // outId\n]);\n}\n\nfunction select(args: {inputs: SelectInputs, backend: BackendWasm}) {\n const {inputs, backend} = args;\n const {condition, t, e} = inputs;\n\n const conditionId = backend.dataIdMap.get(condition.dataId).id;\n const tId = backend.dataIdMap.get(t.dataId).id;\n const eId = backend.dataIdMap.get(e.dataId).id;\n const out = backend.makeOutput(t.shape, t.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const cRank = condition.shape.length;\n const tRank = t.shape.length;\n\n const offset = cRank === 0 || cRank > 1 || tRank === 1 ?\n   1 :\n   util.sizeFromShape(t.shape.slice(1));\n\n wasmSelect(conditionId, tId, eId, offset, outId);\n return out;\n}\n\nexport const selectConfig:
 KernelConfig = {\n kernelName: Select,\n backendName: 'wasm',\n kernelFunc: select as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *

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==========\n */\n\nimport {KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Sigmoid, null /* void */, ['number', 'number']);\n}\n\nfunction sigmoid(args: {backend: BackendWasm, inputs: SigmoidInputs}):\n TensorInfo {\n const {backend, inputs: {x}} = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId, outId);\n return out;\n}\n\nexport const sigmoidConfig: KernelConfig = {\n kernelName: 'Sigmoid',\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sigmoid as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except
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==========\n */\n\nimport {KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number, channels: number, batch: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Softmax, null /* void */, [\n 'number', // xId\n 'number', // outId\n 'number', // channels\n
'number' // batch\n]);\n}\n\nfunction softmax(\n args: {backend: BackendWasm, inputs: SoftmaxInputs, attrs: SoftmaxAttrs}):\n TensorInfo {\n const {backend, inputs: {logits}, attrs: {dim}} = args;\n const xId = backend.dataIdMap.get(logits.dataId).id;\n const out = backend.makeOutput(logits.shape, logits.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const channels = logits.shape[dim];\n const batch = util.sizeFromShape(logits.shape) / channels;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId, outId, channels, batch);\n return out;\n}\n\nexport const softmaxConfig: KernelConfig = {\n kernelName: Softmax,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: softmax as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except
in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {KernelConfig, Sin} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the

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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, ReshapeAttrs, ReshapeInputs, SpaceToBatchND, SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, TransposeAttrs, TransposeInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {padV2Config} from './PadV2';\nimport {reshape} from './Reshape';\nimport {transpose} from './Transpose';\n\nfunction spaceToBatchND(args: {\n inputs: SpaceToBatchNDInputs,\n backend: BackendWasm,\n attrs: SpaceToBatchNDAttrs\n}) {\n const {inputs, backend,
attrs} = args;\n const {x} = inputs;\n const {blockShape, paddings} = attrs;\n\n const prod = util.sizeFromShape(blockShape);\n\n const completePaddings: Array<[number, number]> = [[0, 0]];\n completePaddings.push(...(paddings as Array<[number, number]>));\n\n for (let i = 1 + blockShape.length; i < x.shape.length; ++i) {\n   completePaddings.push([0, 0]);\n }\n\n const paddedX = padV2Config.kernelFunc({\n inputs: {x},\n   backend,\n   attrs: {paddings: completePaddings, constantValue: 0}\n }) as TensorInfo;\n\n const reshapedPaddedShape =\n   backend_util.getReshaped(paddedX.shape, blockShape, prod, false);\n\n const permutedReshapedPaddedPermutation = backend_util.getPermuted(\n   reshapedPaddedShape.length, blockShape.length, false);\n\n const flattenShape =\n   backend_util.getReshapedPermuted(paddedX.shape, blockShape, prod, false);\n\n const reshapeInputs: ReshapeInputs = {x: paddedX};\n const reshapeAttrs: ReshapeAttrs = {shape: reshapedPaddedShape};\n
  const paddedXReshaped =\n   reshape({inputs: reshapeInputs, backend, attrs: reshapeAttrs});\n\n const transposeInputs: TransposeInputs = {x: paddedXReshaped};\n const transposeAttrs:\n   TransposeAttrs = {perm: permutedReshapedPaddedPermutation};\n const paddedXT =\n   transpose({inputs: transposeInputs, backend, attrs: transposeAttrs});\n\n const resultReshapeInputs: ReshapeInputs = {x: paddedXT};\n const resultReshapeAttrs: ReshapeAttrs = {shape: flattenShape};\n const result = reshape(\n   {inputs: resultReshapeInputs, backend, attrs: resultReshapeAttrs});\n\n backend.disposeData(paddedX.dataId);\n backend.disposeData(paddedXReshaped.dataId);\n backend.disposeData(paddedXT.dataId);\n\n return result;\n}\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n kernelName: SpaceToBatchND,\n backendName: 'wasm',\n kernelFunc: spaceToBatchND as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, util} from '@tensorflow/tfjs-core';\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {slice} from './Slice';\n\nexport function splitV(\n   args: {inputs: SplitVInputs, attrs: SplitVAttrs, backend: BackendWasm}) {\n const {inputs,
attrs, backend} = args;\n const {x} = inputs;\n const {numOrSizeSplits, axis} = attrs;\n\n const $axis = util.parseAxisParam(axis, x.shape)[0];\n\n const splitSizes = backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n const begin = new Array(x.shape.length).fill(0);\n const size = x.shape.slice();\n return splitSizes.map(s => {\n   const xSliceSize = [...size];\n   xSliceSize[$axis] = s;\n   const xSlice =\n   slice({inputs: {x}, attrs: {begin, size: xSliceSize}, backend});\n   begin[$axis] += s;\n   return xSlice;\n });\n}\n\nexport const

splitVConfig: KernelConfig = {\n kernelName: SplitV,\n backendName: 'wasm',\n kernelFunc: splitV as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\n\nimport {KernelConfig, KernelFunc, Step, StepAttrs, StepInputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmStep: (xId: number, alpha: number, dtype: number, outId: number) =>\n   void;\n\nfunction setup(backend: BackendWasm): void {\n wasmStep = backend.wasm.cwrap(Step, null /*void*/, [\n   'number', // x_id\n   'number', // alpha\n   'number', // dtype\n   'number', // out_id\n]);\n}\n\nfunction step(\n   args: {backend: BackendWasm, inputs: StepInputs, attrs: StepAttrs}):\n   TensorInfo {\n const {backend, inputs, attrs} = args;\n const {alpha} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmStep(xId, alpha, CppDType[x.dtype], outId);\n return out;\n}\n\nexport const stepConfig: KernelConfig = {\n kernelName: Step,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: step as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS
 OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\n\nimport {KernelConfig, Sqrt} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const sqrtConfig: KernelConfig = createUnaryKernelConfig(Sqrt);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
 governing permissions and\n * limitations under the License.\n *\n==========\n*/\nimport {KernelConfig, Square} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const squareConfig: KernelConfig = createUnaryKernelConfig(Square);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n

*/\nimport {KernelConfig, SquaredDifference} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const squaredDifferenceConfig: KernelConfig =\n createBinaryKernelConfig(SquaredDifference, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n*/\n\nimport {KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from './Reshape';\nimport {slice} from './Slice';\n\nlet wasmStridedSlice: (\n xId: number, xStridesBytes: Uint8Array, xRank: number,\n beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n outShapeBytes: Uint8Array, outStridesBytes: Uint8Array,\n outShapeLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n 'number', // xId\n 'array', // xStrides\n 'number', // xRank\n 'array', // beginBytes\n 'array', // endBytes\n 'array', // stridesBytes\n 'array', // outShapeBytes\n 'array', // outStridesBytes\n 'number',\n // outShapeLength\n 'number', // outId\n]);\n}\n\nexport function stridedSlice(args: {\n backend: BackendWasm,\n inputs: StridedSliceInputs,\n attrs: StridedSliceAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x} = inputs;\n\n const {\n begin,\n end,\n strides,\n beginMask,\n endMask,\n ellipsisMask,\n newAxisMask,\n shrinkAxisMask\n } = attrs;\n\n const {\n finalShapeSparse,\n finalShape,\n isIdentity,\n sliceDim0,\n isSimpleSlice,\n begin: $begin,\n end: $end,\n strides: $strides\n } =\n slice_util.sliceInfo(\n x.shape, begin, end, strides, beginMask, endMask, ellipsisMask,\n newAxisMask, shrinkAxisMask);\n\n let result;\n\n if (isIdentity) {\n // Optimization #1, slice is a no-op plus reshape\n result = reshape({inputs: {x}, backend, attrs: {shape: finalShape}});\n } else if (sliceDim0 || isSimpleSlice) {\n // Optimization #2, slice is memory contiguous\n (only occurs in dim 0)\n util.assert(\n x.shape.length >= 1,\n () => `Input must have rank at least 1, got: ${x.shape.length}`);\n\n const size = slice_util.computeOutShape($begin, $end, $strides);\n // To tolerate begin[0] > end[0] (a 0-output slice), we min(begin, end).\n const sliced = slice({inputs: {x}, backend, attrs: {begin: $begin, size}});\n result =\n reshape({inputs: {x: sliced}, backend, attrs: {shape: finalShape}});\n backend.disposeData(sliced.dataId);\n } else {\n const out = backend.makeOutput(finalShapeSparse, 'float32');\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const xStridesBytes =\n new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n const beginBytes = new Uint8Array(new Int32Array($begin).buffer);\n const endBytes = new Uint8Array(new Int32Array($end).buffer);\n const stridesBytes = new Uint8Array(new Int32Array($strides).buffer);\n\n const outputShapeBytes =\n new Uint8Array(new Int32Array(finalShapeSparse).buffer);\n const outStridesBytes = new Uint8Array(\n new Int32Array(util.computeStrides(finalShapeSparse)).buffer);\n const outId =\n backend.dataIdMap.get(out.dataId).id;\n\n wasmStridedSlice(\n xId, xStridesBytes, x.shape.length,\n beginBytes, endBytes, stridesBytes,\n outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);\n\n result = reshape({inputs: {x: out}, backend, attrs: {shape: finalShape}});\n\n backend.disposeData(out.dataId);\n }\n\n return result;\n}\n\nexport const stridedSliceConfig: KernelConfig = {\n kernelName: StridedSlice,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: stridedSlice as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License\n at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT

WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmSum: (xId: number, reduceSize: number, dtype: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmSum = backend.wasm.cwrap(Sum, null /*void*/, [\n   'number', // input_id\n   'number', // reduce_size\n   'number', // dtype\n   'number', // out_id\n]);\n}\n\nfunction sum(args: {backend: BackendWasm, inputs: SumInputs, attrs: SumAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n   const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   if (transposedId !== xId) {\n   // transpose was not a no-op. We will need to dispose of this\n   // once we are done.\n   input = transposed;\n   inputId = transposedId;\n   reductionAxes = backend_util.getInnerMostAxes(\n   reductionAxes.length, input.shape.length);\n   }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n   'sum', reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n   backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n   wasmSum(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n return out;\n}\n\nexport const sumConfig: KernelConfig = {\n kernelName: Sum,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sum as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\nimport {KernelConfig, Sub} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const subConfig: KernelConfig =\n createBinaryKernelConfig(Sub, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {KernelConfig, KernelFunc, Tile, TileAttrs, TileInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmTile: (\n   xId: number, xShape: Uint8Array, xShapeSize: number, newShape: Uint8Array,\n   newShapeSize: number, dtype:

number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTile = backend.wasm.cwrap(Tile, null /* void */, [\n   'number',
  // x_id\n   'array',   // x_shape\n   'number', // x_shape.length\n   'array',   // new_shape\n   'number', // new_shape.length\n   'number'   // out_id\n]);\n}\n\nfunction tile(\n   args: {inputs: TileInputs, backend: BackendWasm, attrs: TileAttrs}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const {reps} = attrs;\n\n const newShape: number[] = new Array(x.shape.length);\n for (let i = 0; i < newShape.length; i++) {\n   newShape[i] = x.shape[i] * reps[i];\n }\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n const newShapeBytes = new Uint8Array(new Int32Array(newShape).buffer);\n\n const out = backend.makeOutput(newShape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmTile(\n   xId, xShapeBytes, x.shape.length,
newShapeBytes, newShape.length,\n   CppDType[out.dtype], outId);\n return out;\n}\n\nexport const tileConfig: KernelConfig
  = {\n kernelName: Tile,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: tile as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {KernelConfig, Tan} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const tanConfig: KernelConfig =
  createUnaryKernelConfig(Tan);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n","/**\n * @license\n * Copyright 2020 Google LLC. All
  Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {CppDType} from './types';\n\nlet wasmTopK: (\n   xId: number, xShapeBytes: Uint8Array, xShapeLength: number,\n   xDtype: CppDType, k: number, sorted: boolean, outValuesId:
  number,\n   outIndicesId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n   'number', // xId\n   'array',   // x.shape\n   'number', // x.shape.length\n   'number', // x.dtype\n   'number', // k\n   'bool',   // sorted\n   'number', // outValuesId\n

'number', // outIndicesId\n]);\n}\n\nexport const topk:\n   (args: {inputs: TopKInputs, backend: BackendWasm, attrs: TopKAttrs}) =>\n   TensorInfo[] | TensorInfo = ({inputs, backend, attrs}) => {\n   const {x} = inputs;\n   const {k, sorted} = attrs;\n\n   const xId = backend.dataIdMap.get(x.dataId).id;\n   const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n   const outputShape = x.shape.slice();\n   outputShape[outputShape.length - 1] = k;\n   const outValues = backend.makeOutput(outputShape, x.dtype);\n   const outValuesId = backend.dataIdMap.get(outValues.dataId).id;\n\n   const outIndices = backend.makeOutput(outputShape, 'int32');\n   const outIndicesId = backend.dataIdMap.get(outIndices.dataId).id;\n\n   wasmTopK(\n   xId, xShapeBytes, x.shape.length, CppDType[x.dtype], k, sorted,\n   outValuesId, outIndicesId);\n\n   return [outValues, outIndices];\n   };\n\nexport const topKConfig: KernelConfig = {\n kernelName: TopK,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: topk as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS
 OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transform, TransformAttrs, TransformInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmTransform: (\n   imageId: number, transformsId: number, isBatchTransform: boolean,\n   batch: number, outHeight: number, outWidth: number, numChannels: number,\n   imageWidth: number, imageHeight: number, strides: Uint8Array,\n   stridesLength: number, interpolationModeId: number, fillModeId: number,\n   fillValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmTransform = backend.wasm.cwrap(Transform, null /*void*/, [\n   'number', // imageId\n   'number', // transformsId\n   'bool',   // isBatchTransform\n   'number', // batch\n   'number', // outHeight\n   'number', // outWidth\n   'number', // numChannels\n   'number', // imageWidth\n   'number', // imageHeight\n   'array',   // strides\n   'number', // stridesLength\n   'number', // interpolationModeId\n   'number', // fillModeId\n   'number', // fillValue\n   'number'   // outId\n]);\n}\n\nfunction transform(\n   args:\n   {backend: BackendWasm, inputs: TransformInputs, attrs: TransformAttrs}):\n   TensorInfo {\n const {backend, inputs, attrs} = args;\n const {image, transforms} = inputs;\n const {interpolation, fillMode, fillValue, outputShape} = attrs;\n\n const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n const [outHeight, outWidth] =\n   outputShape != null ? outputShape : [imageHeight, imageWidth];\n const outShape =\n   [batch, outHeight, outWidth,\n   numChannels] as [number, number, number, number];\n const strides =\n   new Uint8Array(new Int32Array(util.computeStrides(image.shape)).buffer);\n\n
  const out = backend.makeOutput(outShape, image.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const imageData = backend.dataIdMap.get(image.dataId);\n const imageId = imageData.id;\n\n const transformsData = backend.dataIdMap.get(transforms.dataId);\n const transformsId = transformsData.id;\n\n const interpolationModeId = interpolation === 'nearest' ? 1 : 2;\n let fillModeId;\n switch (fillMode) {\n   case 'constant':\n   fillModeId = 1;\n   break;\n   case 'reflect':\n   fillModeId = 2;\n   break;\n   case 'wrap':\n   fillModeId = 3;\n   break;\n   case 'nearest':\n   fillModeId = 4;\n   break;\n   default:\n   fillModeId = 1;\n   break;\n }\n\n wasmTransform(\n   imageId, transformsId, (transforms.shape[0] > 1), batch, outHeight,\n   outWidth, numChannels, imageWidth, imageHeight, strides,\n   image.shape.length - 1, interpolationModeId, fillModeId, fillValue,\n   outId);\n\n
  return out;\n}\n\nexport const transformConfig: KernelConfig = {\n kernelName: Transform,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: transform as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n *

you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {slice} from './Slice';\n\nfunction unpack(\n args: {inputs: UnpackInputs, backend: BackendWasm, attrs: UnpackAttrs}):\n TensorInfo[] {\n const {inputs, backend, attrs} = args;\n const {value} = inputs;\n let {axis} = attrs;\n\n if (axis < 0) {\n axis += value.shape.length;\n }\n\n const numOutputs = value.shape[axis];\n const rank = value.shape.length;\n const outShape: number[] = new Array(rank - 1);\n let outIndex = 0;\n for (let i = 0; i < rank; i++) {\n if (i !== axis) {\n outShape[outIndex++] = value.shape[i];\n }\n }\n const outs: TensorInfo[] = new Array(numOutputs);\n const begin = new Array(rank).fill(0);\n const size = value.shape.slice();\n size[axis] = 1;\n for (let i = 0; i < outs.length; i++) {\n begin[axis] = i;\n outs[i] = slice({inputs: {x: value}, attrs: {begin, size}, backend});\n }\n return outs.map(({dataId, dtype}) => ({dataId, dtype, shape: outShape}));\n}\n\nexport const unpackConfig: KernelConfig = {\n kernelName: Unpack,\n backendName: 'wasm',\n kernelFunc: unpack as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n//\n// We explicitly import the modular kernels so they get registered in the\n// global registry when we compile the library. A modular build would replace\n// the contents of this file and import only the kernels that are needed.\nimport {KernelConfig, registerKernel} from '@tensorflow/tfjs-core';\n\nimport {fusedMatMulConfig} from './kernels/_FusedMatMul';\nimport {absConfig} from './kernels/Abs';\nimport {addConfig} from './kernels/Add';\nimport {addNConfig} from './kernels/AddN';\nimport {allConfig} from './kernels/All';\nimport {anyConfig} from './kernels/Any';\nimport {argMaxConfig} from './kernels/ArgMax';\nimport {avgPoolConfig} from './kernels/AvgPool';\nimport {batchMatMulConfig} from './kernels/BatchMatMul';\nimport {batchToSpaceNDConfig} from './kernels/BatchToSpaceND';\nimport {castConfig} from './kernels/Cast';\nimport {ceilConfig} from './kernels/Ceil';\nimport {clipByValueConfig} from './kernels/ClipByValue';\nimport {concatConfig} from './kernels/Concat';\nimport {conv2DConfig} from './kernels/Conv2D';\nimport {conv2DBackpropInputConfig} from './kernels/Conv2DBackpropInput';\nimport {cosConfig} from './kernels/Cos';\nimport {coshConfig} from './kernels/Cosh';\nimport {cropAndResizeConfig} from './kernels/CropAndResize';\nimport {cumsumConfig} from './kernels/Cumsum';\nimport {depthToSpaceConfig} from './kernels/DepthToSpace';\nimport {depthwiseConv2dNativeConfig} from './kernels/DepthwiseConv2dNative';\nimport {eluConfig} from './kernels/Elu';\nimport {equalConfig} from './kernels/Equal';\nimport {expConfig} from './kernels/Exp';\nimport {expandDimsConfig} from './kernels/ExpandDims';\nimport {fillConfig} from './kernels/Fill';\nimport {flipLeftRightConfig} from './kernels/FlipLeftRight';\nimport {floorConfig} from './kernels/Floor';\nimport {floorDivConfig} from './kernels/FloorDiv';\nimport {fusedBatchNormConfig} from './kernels/FusedBatchNorm';\nimport {fusedConv2DConfig} from './kernels/FusedConv2D';\nimport {fusedDepthwiseConv2DConfig} from './kernels/FusedDepthwiseConv2D';\nimport {gatherNdConfig} from './kernels/GatherNd';\nimport {gatherV2Config} from

'./kernels/GatherV2';\nimport {greaterConfig} from './kernels/Greater';\nimport {greaterEqualConfig} from
'./kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport {leakyReluConfig} from
'./kernels/LeakyRelu';\nimport {lessConfig} from './kernels/Less';\nimport {lessEqualConfig} from
'./kernels/LessEqual';\nimport {logConfig} from './kernels/Log';\nimport {logicalAndConfig} from
'./kernels/LogicalAnd';\nimport {maxConfig} from './kernels/Max';\nimport {maximumConfig} from
'./kernels/Maximum';\nimport {maxPoolConfig} from './kernels/MaxPool';\nimport {meanConfig} from
'./kernels/Mean';\nimport {minConfig} from './kernels/Min';\nimport {minimumConfig} from
'./kernels/Minimum';\nimport {mirrorPadConfig} from './kernels/MirrorPad';\nimport {multiplyConfig} from
'./kernels/Multiply';\nimport {negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from
'./kernels/NonMaxSuppressionV3';\nimport {nonMaxSuppressionV4Config} from
'./kernels/NonMaxSuppressionV4';\nimport
{nonMaxSuppressionV5Config} from './kernels/NonMaxSuppressionV5';\nimport {notEqualConfig} from
'./kernels/NotEqual';\nimport {oneHotConfig} from './kernels/OneHot';\nimport {onesLikeConfig} from
'./kernels/OnesLike';\nimport {packConfig} from './kernels/Pack';\nimport {padV2Config} from
'./kernels/PadV2';\nimport {powConfig} from './kernels/Pow';\nimport {preluConfig} from './kernels/Prelu';\nimport
{prodConfig} from './kernels/Prod';\nimport {rangeConfig} from './kernels/Range';\nimport {realDivConfig} from
'./kernels/RealDiv';\nimport {reluConfig} from './kernels/Relu';\nimport {relu6Config} from
'./kernels/Relu6';\nimport {reshapeConfig} from './kernels/Reshape';\nimport {resizeBilinearConfig} from
'./kernels/ResizeBilinear';\nimport {reverseConfig} from './kernels/Reverse';\nimport {rotateWithOffsetConfig}
from './kernels/RotateWithOffset';\nimport {roundConfig} from './kernels/Round';\nimport {rsqrtConfig} from
'./kernels/Rsqrt';\nimport {scatterNdConfig} from './kernels/ScatterNd';\nimport
{selectConfig} from './kernels/Select';\nimport {sigmoidConfig} from './kernels/Sigmoid';\nimport {sinConfig}
from './kernels/Sin';\nimport {sliceConfig} from './kernels/Slice';\nimport {softmaxConfig} from
'./kernels/Softmax';\nimport {spaceToBatchNDConfig} from './kernels/SpaceToBatchND';\nimport {splitVConfig}
from './kernels/SplitV';\nimport {sqrtConfig} from './kernels/Sqrt';\nimport {squareConfig} from
'./kernels/Square';\nimport {squaredDifferenceConfig} from './kernels/SquaredDifference';\nimport {stepConfig}
from './kernels/Step';\nimport {stridedSliceConfig} from './kernels/StridedSlice';\nimport {subConfig} from
'./kernels/Sub';\nimport {sumConfig} from './kernels/Sum';\nimport {tanConfig} from './kernels/Tan';\nimport
{tanhConfig} from './kernels/Tanh';\nimport {tileConfig} from './kernels/Tile';\nimport {topKConfig} from
'./kernels/TopK';\nimport {transformConfig} from './kernels/Transform';\nimport {transposeConfig} from
'./kernels/Transpose';\nimport
{unpackConfig} from './kernels/Unpack';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all
kernel configs here\nconst kernelConfigs: KernelConfig[] = [\n absConfig,\n addConfig,\n addNConfig,\n
allConfig,\n anyConfig,\n argMaxConfig,\n avgPoolConfig,\n batchMatMulConfig,\n batchToSpaceNDConfig,\n
castConfig,\n ceilConfig,\n clipByValueConfig,\n concatConfig,\n conv2DConfig,\n
conv2DBackpropInputConfig,\n cosConfig,\n coshConfig,\n cropAndResizeConfig,\n cumsumConfig,\n
depthToSpaceConfig,\n depthwiseConv2dNativeConfig,\n eluConfig,\n equalConfig,\n expConfig,\n
expandDimsConfig,\n fillConfig,\n flipLeftRightConfig,\n floorConfig,\n floorDivConfig,\n
fusedMatMulConfig,\n fusedBatchNormConfig,\n fusedConv2DConfig,\n fusedDepthwiseConv2DConfig,\n
gatherNdConfig,\n gatherV2Config,\n greaterConfig,\n greaterEqualConfig,\n identityConfig,\n
leakyReluConfig,\n lessConfig,\n lessEqualConfig,\n logConfig,\n logicalAndConfig,\n
maxConfig,\n maximumConfig,\n maxPoolConfig,\n meanConfig,\n minConfig,\n minimumConfig,\n
mirrorPadConfig,\n multiplyConfig,\n negConfig,\n nonMaxSuppressionV3Config,\n
nonMaxSuppressionV4Config,\n nonMaxSuppressionV5Config,\n notEqualConfig,\n oneHotConfig,\n
onesLikeConfig,\n packConfig,\n padV2Config,\n powConfig,\n preluConfig,\n prodConfig,\n rangeConfig,\n
realDivConfig,\n reluConfig,\n relu6Config,\n reshapeConfig,\n resizeBilinearConfig,\n reverseConfig,\n
rotateWithOffsetConfig,\n rsqrtConfig,\n roundConfig,\n scatterNdConfig,\n selectConfig,\n sigmoidConfig,\n
sinConfig,\n sliceConfig,\n softmaxConfig,\n spaceToBatchNDConfig,\n splitVConfig,\n sqrtConfig,\n

squareConfig,\n squaredDifferenceConfig,\n stepConfig,\n stridedSliceConfig,\n subConfig,\n sumConfig,\n tanConfig,\n tanhConfig,\n tileConfig,\n topKConfig,\n transformConfig,\n transposeConfig,\n unpackConfig,\n zerosLikeConfig\n];\n\nfor (const kernelConfig of kernelConfigs)
{\n registerKernel(kernelConfig);\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, ZerosLike, ZerosLikeInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nfunction zerosLike(args: {inputs: ZerosLikeInputs, backend: BackendWasm}) {\n
const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(0);\n return out;\n}\n\nexport const zerosLikeConfig: KernelConfig = {\n kernelName: ZerosLike,\n backendName: 'wasm',\n kernelFunc: zerosLike as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {env} from '@tensorflow/tfjs-core';\n\nconst ENV = env();\n\n/**\n * True if SIMD is supported.\n */\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag(\n // This typed array passed in to WebAssembly.validate is WebAssembly binary\n // code. In this case it is a small program that contains SIMD\n // instructions.\n 'WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new Uint8Array([\n 0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3,\n 2, 1, 0, 10, 9, 1, 7, 0, 65, 0, 253, 15, 26, 11\n])));\n\n/**\n * True if threads are supported.\n */\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag('WASM_HAS_MULTITHREAD_SUPPORT', async () => {\n // TODO(annxingyuan): Enable node support once this is resolved:\n // https://github.com/tensorflow/tfjs/issues/3830\n if (ENV.get('IS_NODE')) {\n return false;\n }\n\n try {\n // Test for transferability of SABs (needed for Firefox)\n // https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkBZlHETpA/dwsMNchWEQAJ\n new MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n // This typed array is a WebAssembly program containing threaded\n // instructions.\n return WebAssembly.validate(new Uint8Array([\n 0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3, 2, 1, 0, 5,\n 4, 1, 3, 1, 1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26, 11\n]));\n } catch (e) {\n return false;\n }\n});\n","\nvar WasmBackendModuleThreadedSimd = (function() {\n var _scriptDir = typeof document !== 'undefined' && document.currentScript ? document.currentScript.src : undefined;\n if (typeof __filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return (\nfunction(WasmBackendModuleThreadedSimd) {\n WasmBackendModuleThreadedSimd = WasmBackendModuleThreadedSimd || {};\n\nfunction GROWABLE_HEAP_I8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return
HEAP8}function GROWABLE_HEAP_U8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)

}return HEAPU8}function
GROWABLE_HEAP_I32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)
}return HEAP32}function
GROWABLE_HEAP_U32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer
)}return HEAPU32}function
GROWABLE_HEAP_F64(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer
)}return HEAPF64}var Module=typeof
WasmBackendModuleThreadedSimd!==\"undefined\"?WasmBackendModuleThreadedSimd:{};var
readyPromiseResolve,readyPromiseReject;Module[\"ready\"]=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var
thisProgram=\"./this.program\";var quit_=function(status,toThrow){throw
toThrow};var ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window===\"object\";ENVIRONMENT_IS_WORKER=typeof
importScripts===\"function\";ENVIRONMENT_IS_NODE=typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof
process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var
ENVIRONMENT_IS_PTHREAD=Module[\"ENVIRONMENT_IS_PTHREAD\"]||false;if(ENVIRONMENT_IS_P
THREAD){buffer=Module[\"buffer\"]}var scriptDirectory=\"\";function
locateFile(path){if(Module[\"locateFile\"]){return Module[\"locateFile\"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\"path\").
dirname(scriptDirectory)+\"/\"}else{scriptDirectory=__dirname+\"/\"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=n
odePath[\"normalize\"](filename);return
nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\")};readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process[\"argv\"].length>1){thisProgram=process[\"argv\"][1].replace(/\\\\/g,\"/\")}arguments_=process[\"arg
v\"].slice(2);process[\"on\"](\"uncaughtException\",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process[\"on\"](\"unhandledRejection\",abort);quit_=function(status){process[\"exit\"](status)};Module[\"insp
ect\"]=function(){return\"[Emscripten Module object]\"};var
nodeWorkerThreads;try{nodeWorkerThreads=require(\"worker_threads\")}catch(e){console.error('The
\"worker_threads\" module is not supported in this node.js build - perhaps a newer version is needed?');throw
e}global.Worker=nodeWorkerThreads.Worker}else if(ENVIRONMENT_IS_SHELL){if(typeof
read!=\"undefined\"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var
data;if(typeof readbuffer===\"function\"){return new
Uint8Array(readbuffer(f))}data=read(f,\"binary\");assert(typeof data===\"object\");return data};if(typeof
scriptArgs!=\"undefined\"){arguments_=scriptArgs}else if(typeof
arguments!=\"undefined\"){arguments_=arguments}if(typeof
quit===\"function\"){quit_=function(status){quit(status)}}if(typeof print!==\"undefined\"){if(typeof
console===\"undefined\")console={};console.log=print;console.warn=console.error=typeof
printErr!==\"undefined\"?printErr:print}}else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!==\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(typeof

_scriptDir !== \"undefined\" &&
_scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf(\"blob:\")!==0){scriptDirectory=scriptDirectory.substr(0,scriptDirectory.lastIndexOf(\"/\")+1)}else{scriptDirectory=\"\"}if(ENVIRONMENT_IS_NODE){read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=nodePath[\"normalize\"](filename);return
nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\")};readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret}}else{read_=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.responseType=\"arraybuffer\";xhr.send(null);return new
Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,true);xhr.responseType=\"arraybuffer\";xhr.onload=function(){if(xhr.status
==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror()};xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title}}else{}if(ENVIRONMENT_IS_NODE){if(typeof
performance===\"undefined\"){global.performance=require(\"perf_hooks\").performance}}var
out=Module[\"print\"]||console.log.bind(console);var err=Module[\"printErr\"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverrides=null;if(Module[\"arguments\"])arguments_=Module[\"arguments\"];if(Module[\"thisProgram\"])thisProgram=Module[\"thisProgram\"];if(Module[\"quit\"])quit_=Module[\"quit\"];function
warnOnce(text){if(!warnOnce.shown)warnOnce.shown={};if(!warnOnce.shown[text]){warnOnce.shown[text]=1;err(text)}}var Atomics_load=Atomics.load;var Atomics_store=Atomics.store;var
Atomics_compareExchange=Atomics.compareExchange;var
wasmBinary;if(Module[\"wasmBinary\"])wasmBinary=Module[\"wasmBinary\"];var
noExitRuntime=Module[\"noExitRuntime\"]||true;if(typeof WebAssembly!==\"object\"){abort(\"no
native wasm support detected\")}var wasmMemory;var wasmModule;var ABORT=false;var
EXITSTATUS;function assert(condition,text){if(!condition){abort(\"Assertion failed: \"+text)}}function
getCFunc(ident){var func=Module[\"_\"+ident];assert(func,\"Cannot call unknown function \"+ident+\", make sure it is exported\");return func}function ccall(ident,returnType,argTypes,args,opts){var
toC={\"string\":function(str){var ret=0;if(str!==null&&str!==undefined&&str!==0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\"array\":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType===\"string\")return UTF8ToString(ret);if(returnType===\"boolean\")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i]=args[i]}}}var
ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return ret}function
cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type===\"number\"});var
numericRet=returnType!==\"string\";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}}function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
str=\"\";while(!(idx>=endIdx)){var u0=heap[idx++];if(!u0)return
str;if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id

x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function UTF8ToString(ptr,maxBytesToRead){return ptr?UTF8ArrayToString(GROWABLE_HEAP_U8(),ptr,maxBytesToRead):\"\"}function stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var u=str.charCodeAt(i);if(u>=55296&&u<=57343){var u1=str.charCodeAt(++i);u=65536+((u&1023)<<10)|u1&1023}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function stringToUTF8(str,outPtr,maxBytesToWrite){return stringToUTF8Array(str,GROWABLE_HEAP_U8(),outPtr,maxBytesToWrite)}function lengthBytesUTF8(str){var len=0;for(var i=0;i<str.length;++i){var u=str.charCodeAt(i);if(u>=55296&&u<=57343)u=65536+((u&1023)<<10)|str.charCodeAt(++i)&1023;if(u<=127)++len;else if(u<=2047)len+=2;else if(u<=65535)len+=3;else len+=4}return len}function writeArrayToMemory(array,buffer){GROWABLE_HEAP_I8().set(array,buffer)}function alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function updateGlobalBufferAndViews(buf){buffer=buf;Module[\"HEAP8\"]=HEAP8=new Int8Array(buf);Module[\"HEAP16\"]=HEAP16=new Int16Array(buf);Module[\"HEAP32\"]=HEAP32=new Int32Array(buf);Module[\"HEAPU8\"]=HEAPU8=new Uint8Array(buf);Module[\"HEAPU16\"]=HEAPU16=new Uint16Array(buf);Module[\"HEAPU32\"]=HEAPU32=new Uint32Array(buf);Module[\"HEAPF32\"]=HEAPF32=new Float32Array(buf);Module[\"HEAPF64\"]=HEAPF64=new Float64Array(buf)}var INITIAL_MEMORY=Module[\"INITIAL_MEMORY\"]||16777216;if(ENVIRONMENT_IS_PTHREAD){wasmMemory=Module[\"wasmMemory\"];buffer=Module[\"buffer\"]}else{if(Module[\"wasmMemory\"]){wasmMemory=Module[\"wasmMemory\"]}else{wasmMemory=new WebAssembly.Memory({\"initial\":INITIAL_MEMORY/65536,\"maximum\":2147483648/65536,\"shared\":true});if(!(wasmMemory.buffer instanceof SharedArrayBuffer)){err(\"requested a shared WebAssembly.Memory but the returned buffer is not a SharedArrayBuffer, indicating that while the browser has SharedArrayBuffer it does not have WebAssembly threads support - you may need to set a flag\");if(ENVIRONMENT_IS_NODE){console.log(\"(on node you may need: --experimental-wasm-threads --experimental-wasm-bulk-memory and also use a recent version)\")}throw Error(\"bad memory\")}}}if(wasmMemory){buffer=wasmMemory.buffer}INITIAL_MEMORY=buffer.byteLength;updateGlobalBufferAndViews(buffer);var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var __ATEXIT__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;var runtimeExited=false;if(!ENVIRONMENT_IS_PTHREAD)__ATINIT__.push({func:function(){___wasm_call_ctors()}});function preRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module[\"preRun\"]){if(typeof Module[\"preRun\"]==\"function\")Module[\"preRun\"]=[Module[\"preRun\"]];while(Module[\"preRun\"].length){addOnPreRun(Module[\"preRun\"].shift())}}callRuntimeCallbacks(__ATPRERUN__)}function initRuntime(){runtimeInitialized=true;if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATINIT__)}function preMain(){if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATMAIN__)}function exitRuntime(){if(ENVIRONMENT_IS_PTHREAD)return;runtimeExited=true}function postRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module[\"postRun\"]){if(typeof

Module[\"postRun\"]==\"function\")Module[\"postRun\"]=[Module[\"postRun\"]];while(Module[\"postRun\"].length){addOnPostRun(Module[\"postRun\"].shift())}}callRuntimeCallbacks(__ATPOSTRUN__)}function addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function addRunDependency(id){assert(!ENVIRONMENT_IS_PTHREAD,\"addRunDependency cannot be used in a pthread
worker\");runDependencies++;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}}function removeRunDependency(id){runDependencies--
;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}if(runDependencies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}}Module[\"preloadedImages\"]={};Module[\"preloadedAudios\"]={};function
abort(what){if(Module[\"onAbort\"]){Module[\"onAbort\"](what)}if(ENVIRONMENT_IS_PTHREAD)console.error(\"Pthread aborting at \"+(new
Error).stack);what+=\"\";err(what);ABORT=true;EXITSTATUS=1;what=\"abort(\"+what+\"). Build with -s ASSERTIONS=1 for more info.\";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix=\"data:application/octet-stream; base64,\";function isDataURI(filename){return hasPrefix(filename,dataURIPrefix)}var fileURIPrefix=\"file://\";function isFileURI(filename){return hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile=\"tfjs-backend-wasm-threaded-simd.wasm\";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function getBinary(file){try{if(file==wasmBinaryFile&&wasmBinary){return new Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw\"both async and sync fetching of the wasm failed\"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof fetch===\"function\"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){if(!response[\"ok\"]){throw\"failed to load wasm binary file at '\"+wasmBinaryFile+\"'\"}return
response[\"arrayBuffer\"]()}).catch(function(){return getBinary(wasmBinaryFile)})}else{if(readAsync){return new Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new Uint8Array(response))},reject)})}}}return Promise.resolve().then(function(){return getBinary(wasmBinaryFile)})}function createWasm(){var info={\"a\":asmLibraryArg};function receiveInstance(instance,module){var
exports=instance.exports;Module[\"asm\"]=exports;wasmTable=Module[\"asm\"][\"I\"];wasmModule=module;if(!ENVIRONMENT_IS_PTHREAD){var
numWorkersToLoad=PThread.unusedWorkers.length;PThread.unusedWorkers.forEach(function(w){PThread.loadWasmModuleToWorker(w,function(){if(!--numWorkersToLoad)removeRunDependency(\"wasm-instantiate\")})})}if(!ENVIRONMENT_IS_PTHREAD){addRunDependency(\"wasm-instantiate\")}function receiveInstantiatedSource(output){receiveInstance(output[\"instance\"],output[\"module\"])}function instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err(\"failed to asynchronously prepare wasm: \"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof WebAssembly.instantiateStreaming===\"function\"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFile)&&typeof fetch===\"function\"){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return result.then(receiveInstantiatedSource,function(reason){err(\"wasm streaming compile failed: \"+reason);err(\"falling

back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)})})}else{return instantiateArrayBuffer(receiveInstantiatedSource)}}if(Module[\"instantiateWasm\"]){try{var exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports}catch(e){err(\"Module.instantiateWasm callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}var ASM_CONSTS={10520:function(){throw\"Canceled!\"},10538:function($0,$1){setTimeout(function(){__emscripten_do_dispatch_to_thread($0,$1)},0)}};function initPthreadsJS(){PThread.initRuntime()}function callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof callback==\"function\"){callback(Module);continue}var func=callback.func;if(typeof func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)()}else{wasmTable.get(func)(callback.arg)}}else{func(callback.arg===undefined?null:callback.arg)}}}var ERRNO_CODES={EPERM:63,ENOENT:44,ESRCH:71,EINTR:27,EIO:29,ENXIO:60,E2BIG:1,ENOEXEC:45,EBADF:8,ECHILD:12,EAGAIN:6,EWOULDBLOCK:6,ENOMEM:48,EACCES:2,EFAULT:21,ENOTBLK:105,EBUSY:10,EEXIST:20,EXDEV:75,ENODEV:43,ENOTDIR:54,EISDIR:31,EINVAL:28,ENFILE:41,EMFILE:33,ENOTTY:59,ETXTBSY:74,EFBIG:22,ENOSPC:51,ESPIPE:70,EROFS:69,EMLINK:34,EPIPE:64,EDOM:18,ERANGE:68,ENOMSG:49,EIDRM:24,ECHRNG:106,EL2NSYNC:156,EL3HLT:107,EL3RST:108,ELNRNG:109,EUNATCH:110,ENOCSI:111,EL2HLT:112,EDEADLK:16,ENOLCK:46,EBADE:113,EBADR:114,EXFULL:115,ENOANO:104,EBADRQC:103,EBADSLT:102,EDEADLOCK:16,EBFONT:101,ENOSTR:100,ENODATA:116,ETIME:117,ENOSR:118,ENONET:119,ENOPKG:120,EREMOTE:121,ENOLINK:47,EADV:122,ESRMNT:123,ECOMM:124,EPROTO:65,EMULTIHOP:36,EDOTDOT:125,EBADMSG:9,ENOTUNIQ:126,EBADFD:127,EREMCHG:128,ELIBACC:129,ELIBBAD:130,ELIBSCN:131,ELIBMAX:132,ELIBEXEC:133,ENOSYS:52,ENOTEMPTY:55,ENAMETOOLONG:37,ELOOP:32,EOPNOTSUPP:138,EPFNOSUPPORT:139,ECONNRESET:15,ENOBUFS:42,EAFNOSUPPORT:5,EPROTOTYPE:67,ENOTSOCK:57,ENOPROTOOPT:50,ESHUTDOWN:140,ECONNREFUSED:14,EADDRINUSE:3,ECONNABORTED:13,ENETUNREACH:40,ENETDOWN:38,ETIMEDOUT:73,EHOSTDOWN:142,EHOSTUNREACH:23,EINPROGRESS:26,EALREADY:7,EDESTADDRREQ:17,EMSGSIZE:35,EPROTONOSUPPORT:66,ESOCKTNOSUPPORT:137,EADDRNOTAVAIL:4,ENETRESET:39,EISCONN:30,ENOTCONN:53,ETOOMANYREFS:141,EUSERS:136,EDQUOT:19,ESTALE:72,ENOTSUP:138,ENOMEDIUM:148,EILSEQ:25,EOVERFLOW:61,ECANCELED:11,ENOTRECOVERABLE:56,EOWNERDEAD:62,ESTRPIPE:135};function _emscripten_futex_wake(addr,count){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0||count<0)return-28;if(count==0)return 0;if(count>=2147483647)count=Infinity;var mainThreadWaitAddress=Atomics.load(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2);var mainThreadWoken=0;if(mainThreadWaitAddress==addr){var loadedAddr=Atomics.compareExchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,mainThreadWaitAddress,0);if(loadedAddr==mainThreadWaitAddress){--count;mainThreadWoken=1;if(count<=0)return 1}}var ret=Atomics.notify(GROWABLE_HEAP_I32(),addr>>2,count);if(ret>=0)return ret+mainThreadWoken;throw\"Atomics.notify returned an unexpected value \"+ret}Module[\"_emscripten_futex_wake\"]=_emscripten_futex_wake;function killThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! killThread() can only ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in killThread!\";GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var pthread=PThread.pthreads[pthread_ptr];pthread.worker.terminate();PThread.freeThreadData(pthread);PThread.runningWorkers.splice(PThread.runningWorkers.indexOf(pthread.worker),1);pthread.worker.pthread=undefined}function cancelThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cancelThread() can only ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in cancelThread!\";var pthread=PThread.pthreads[pthread_ptr];pthread.worker.postMessage({\"cmd\":\"cancel\"})}function cleanupThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cleanupThread() can only ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in

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cleanupThread!\";var
pthread=PThread.pthreads[pthread_ptr];if(pthread){GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
worker=pthread.worker;PThread.returnWorkerToPool(worker)}}var
PThread={unusedWorkers:[],runningWorkers:[],initMainThreadBlock:function(){var
 pthreadPoolSize=8;for(var
i=0;i<pthreadPoolSize;++i){PThread.allocateUnusedWorker()}},initRuntime:function(){var
tb=_malloc(228);for(var
i=0;i<228/4;++i)GROWABLE_HEAP_U32()[tb/4+i]=0;GROWABLE_HEAP_I32()[tb+12>>2]=tb;var
headPtr=tb+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var tlsMemory=_malloc(512);for(var
i=0;i<128;++i)GROWABLE_HEAP_U32()[tlsMemory/4+i]=0;Atomics.store(GROWABLE_HEAP_U32(),tb+100
>>2,tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tb+40>>2,tb);__emscripten_thread_init(tb,!ENVIRON
MENT_IS_WORKER,1);_emscripten_register_main_browser_thread_id(tb)},initWorker:function(){},pthreads:{},t
hreadExitHandlers:[],setThreadStatus:function(){},runExitHandlers:function(){while(PThread.threadExitHandlers.l
ength>0){PThread.threadExitHandlers.pop()()}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self())___pthread
_tsd_run_dtors()},runExitHandlersAndDeinitThread:function(tb,exitCode){Atomics.store(GROWABLE_HEAP_U
32(),tb+56>>2,1);Atomics.store(GROWABLE_HEAP_U32(),tb+60>>2,0);PThread.runExitHandlers();Atomics.stor
e(GROWABLE_HEAP_U32(),tb+4>>2,exitCode);Atomics.store(GROWABLE_HEAP_U32(),tb+0>>2,1);_emscri
pten_futex_wake(tb+0,2147483647);__emscripten_thread_init(0,0,0)},threadExit:function(exitCode){var
tb=_pthread_self();if(tb){PThread.runExitHandlersAndDeinitThread(tb,exitCode);if(ENVIRONMENT_IS_PTHRE
AD){postMessage({\"cmd\":\"exit\"})}}},threadCancel:function(){PThread.runExitHandlersAndDeinitThread(_pthr
ead_self(),-1);postMessage({\"cmd\":\"cancelDone\"})},terminateAllThreads:function(){for(var t in
PThread.pthreads){var
pthread=PThread.pthreads[t];if(pthread&&pthread.worker){PThread.returnWorkerToPool(pthread.worker)}}PThre
ad.pthreads={};for(var i=0;i<PThread.unusedWorkers.length;++i){var
worker=PThread.unusedWorkers[i];worker.terminate()}PThread.unusedWorkers=[];for(var
i=0;i<PThread.runningWorkers.length;++i){var worker=PThread.runningWorkers[i];var
pthread=worker.pthread;PThread.freeThreadData(pthread);worker.terminate()}PThread.runningWorkers=[]},freeTh
readData:function(pthread){if(!pthread)return;if(pthread.threadInfoStruct){var
tlsMemory=GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2];GROWABLE_HEAP_I32()[pthread.thr
eadInfoStruct+100>>2]=0;_free(tlsMemory);_free(pthread.threadInfoStruct)}pthread.threadInfoStruct=0;if(pthread.
allocatedOwnStack&&pthread.stackBase)_free(pthread.stackBase);pthread.stackBase=0;if(pthread.worker)pthread.
worker.pthread=null},returnWorkerToPool:function(worker){PThread.runWithoutMainThreadQueuedCalls(functio
n(){delete
PThread.pthreads[worker.pthread.threadInfoStruct];PThread.unusedWorkers.push(worker);PThread.runningWorker
s.splice(PThread.runningWorkers.indexOf(worker),1);PThread.freeThreadData(worker.pthread);worker.pthread=un
defined})},runWithoutMainThreadQueuedCalls:function(func){GROWABLE_HEAP_I32()[__emscripten_allow_m
ain_runtime_queued_calls>>2]=0;try{func()}finally{GROWABLE_HEAP_I32()[__emscripten_allow_main_runti
me_queued_calls>>2]=1}},receiveObjectTransfer:function(data){},loadWasmModuleToWorker:function(worker,o
nFinishedLoading){worker.onmessage=function(e){var
 d=e[\"data\"];var
cmd=d[\"cmd\"];if(worker.pthread)PThread.currentProxiedOperationCallerThread=worker.pthread.threadInfoStruct;
if(d[\"targetThread\"]&&d[\"targetThread\"]!=_pthread_self()){var
thread=PThread.pthreads[d.targetThread];if(thread){thread.worker.postMessage(e.data,d[\"transferList\"])}else{con
sole.error('Internal error! Worker sent a message \"'+cmd+'\" to target pthread '+d[\"targetThread\"]+\", but that
thread no longer
exists!\")}PThread.currentProxiedOperationCallerThread=undefined;return}if(cmd===\"processQueuedMainThread
Work\"){_emscripten_main_thread_process_queued_calls()}else
if(cmd===\"spawnThread\"){spawnThread(e.data)}else
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if(cmd===\"cleanupThread\"){cleanupThread(d[\"thread\"])}else
if(cmd===\"killThread\"){killThread(d[\"thread\"])}else
if(cmd===\"cancelThread\"){cancelThread(d[\"thread\"])}else
if(cmd===\"loaded\"){worker.loaded=true;if(onFinishedLoading)onFinishedLoading(worker);if(worker.runPthread)
{worker.runPthread();delete
 worker.runPthread}}else if(cmd===\"print\"){out(\"Thread \"+d[\"threadId\"]+\": \"+d[\"text\"])}else
if(cmd===\"printErr\"){err(\"Thread \"+d[\"threadId\"]+\": \"+d[\"text\"])}else if(cmd===\"alert\"){alert(\"Thread
\"+d[\"threadId\"]+\": \"+d[\"text\"])}else if(cmd===\"exit\"){var
detached=worker.pthread&&Atomics.load(GROWABLE_HEAP_U32(),worker.pthread.threadInfoStruct+64>>2);if
(detached){PThread.returnWorkerToPool(worker)}}else
if(cmd===\"exitProcess\"){try{exit(d[\"returnCode\"])}catch(e){if(e instanceof ExitStatus)return;throw e}}else
if(cmd===\"cancelDone\"){PThread.returnWorkerToPool(worker)}else
if(cmd===\"objectTransfer\"){PThread.receiveObjectTransfer(e.data)}else
if(e.data.target===\"setimmediate\"){worker.postMessage(e.data)}else{err(\"worker sent an unknown command
\"+cmd)}PThread.currentProxiedOperationCallerThread=undefined};worker.onerror=function(e){err(\"pthread sent
an error! \"+e.filename+\":\"+e.lineno+\":
\"+e.message)};if(ENVIRONMENT_IS_NODE){worker.on(\"message\",function(data){worker.onmessage({data:d
ata})});worker.on(\"error\",function(data){worker.onerror(data)});worker.on(\"exit\",function(data){})}worker.post
Message({\"cmd\":\"load\",\"urlOrBlob\":Module[\"mainScriptUrlOrBlob\"]||_scriptDir,\"wasmMemory\":wasmMe
mory,\"wasmModule\":wasmModule})},allocateUnusedWorker:function(){var
 pthreadMainJs=locateFile(\"tfjs-backend-wasm-threaded-simd.worker.js\");PThread.unusedWorkers.push(new
Worker(pthreadMainJs))},getNewWorker:function(){if(PThread.unusedWorkers.length==0){PThread.allocateUnus
edWorker();PThread.loadWasmModuleToWorker(PThread.unusedWorkers[0])}if(PThread.unusedWorkers.length>
0)return PThread.unusedWorkers.pop();else return null},busySpinWait:function(msecs){var
t=performance.now()+msecs;while(performance.now()<t){}}};function
establishStackSpace(stackTop,stackMax){_emscripten_stack_set_limits(stackTop,stackMax);stackRestore(stackTop
)}Module[\"establishStackSpace\"]=establishStackSpace;function getNoExitRuntime(){return
 noExitRuntime}Module[\"getNoExitRuntime\"]=getNoExitRuntime;function invokeEntryPoint(ptr,arg){return
wasmTable.get(ptr)(arg)}Module[\"invokeEntryPoint\"]=invokeEntryPoint;function
___assert_fail(condition,filename,line,func){abort(\"Assertion failed: \"+UTF8ToString(condition)+\", at:
\"+[filename?UTF8ToString(filename):\"unknown filename\",line,func?UTF8ToString(func):\"unknown
function\"])}function ___call_main(argc,argv){var returnCode=_main(argc,argv)}var
_emscripten_get_now;if(ENVIRONMENT_IS_NODE){_emscripten_get_now=function(){var
t=process[\"hrtime\"]();return t[0]*1e3+t[1]/1e6}}else
if(ENVIRONMENT_IS_PTHREAD){_emscripten_get_now=function(){return performance.now()-
Module[\"__performance_now_clock_drift\"]}}else if(typeof
dateNow!==\"undefined\"){_emscripten_get_now=dateNow}else _emscripten_get_now=function(){return
performance.now()};function setErrNo(value){GROWABLE_HEAP_I32()[___errno_location()>>2]=value;return
value}function _atexit(func,arg){if(ENVIRONMENT_IS_PTHREAD)return
 _emscripten_proxy_to_main_thread_js(1,1,func,arg)}function
__emscripten_notify_thread_queue(targetThreadId,mainThreadId){if(targetThreadId==mainThreadId){postMessag
e({\"cmd\":\"processQueuedMainThreadWork\"})}else
if(ENVIRONMENT_IS_PTHREAD){postMessage({\"targetThread\":targetThreadId,\"cmd\":\"processThreadQueu
e\"})}else{var pthread=PThread.pthreads[targetThreadId];var
worker=pthread&&pthread.worker;if(!worker){return}worker.postMessage({\"cmd\":\"processThreadQueue\"})}ret
urn 1}function _abort(){abort()}function _emscripten_asm_const_int(code,sigPtr,argbuf){var
args=readAsmConstArgs(sigPtr,argbuf);return ASM_CONSTS[code].apply(null,args)}function
_emscripten_conditional_set_current_thread_status(expectedStatus,newStatus){}function
```

_emscripten_futex_wait(addr,val,timeout){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0)return-28;if(!ENVIRONMENT_IS_WEB){var ret=Atomics.wait(GROWABLE_HEAP_I32(),addr>>2,val,timeout);if(ret===\"timed-out\")return-73;if(ret===\"not-equal\")return-6;if(ret===\"ok\")return 0;throw\"Atomics.wait returned an unexpected value \"+ret}else{if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}var tNow=performance.now();var tEnd=tNow+timeout;var lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr);while(1){tNow=performance.now();if(tNow>tEnd){lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,0);return-73}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,0);if(lastAddr==0){break}_emscripten_main_thread_process_queued_calls();if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr)}return 0}}function _emscripten_memcpy_big(dest,src,num){GROWABLE_HEAP_U8().copyWithin(dest,src,src+num)}function _emscripten_num_logical_cores(){if(ENVIRONMENT_IS_NODE)return require(\"os\").cpus().length;return navigator[\"hardwareConcurrency\"]}function _emscripten_proxy_to_main_thread_js(index,sync){var numCallArgs=arguments.length-2;var stack=stackSave();var serializedNumCallArgs=numCallArgs;var args=stackAlloc(serializedNumCallArgs*8);var b=args>>3;for(var i=0;i<numCallArgs;i++){var arg=arguments[2+i];GROWABLE_HEAP_F64()[b+i]=arg}var ret=_emscripten_run_in_main_runtime_thread_js(index,serializedNumCallArgs,args,sync);stackRestore(stack);return ret}var _emscripten_receive_on_main_thread_js_callArgs=[];var readAsmConstArgsArray=[];function readAsmConstArgs(sigPtr,buf){readAsmConstArgsArray.length=0;var ch;buf>>=2;while(ch=GROWABLE_HEAP_U8()[sigPtr++]){var double=ch<105;if(double&&buf&1)buf++;readAsmConstArgsArray.push(double?GROWABLE_HEAP_F64()[buf++>>1]:GROWABLE_HEAP_I32()[buf]);++buf}return readAsmConstArgsArray}function _emscripten_receive_on_main_thread_js(index,numCallArgs,args){_emscripten_receive_on_main_thread_js_callArgs.length=numCallArgs;var b=args>>3;for(var i=0;i<numCallArgs;i++){_emscripten_receive_on_main_thread_js_callArgs[i]=GROWABLE_HEAP_F64()[b+i]}var isEmAsmConst=index<0;var func=!isEmAsmConst?proxiedFunctionTable[index]:ASM_CONSTS[-index-1];return func.apply(null,_emscripten_receive_on_main_thread_js_callArgs)}function _emscripten_get_heap_size(){return GROWABLE_HEAP_U8().length}function emscripten_realloc_buffer(size){try{wasmMemory.grow(size-buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return 1}catch(e){}}function _emscripten_resize_heap(requestedSize){var oldSize=_emscripten_get_heap_size();if(requestedSize<=oldSize){return false}var maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var cutDown=1;cutDown<=4;cutDown*=2){var overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize+100663296);var newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var JSEvents={inEventHandler:0,removeAllEventListeners:function(){for(var i=JSEvents.eventHandlers.length-1;i>=0;--i){JSEvents._removeHandler(i)}JSEvents.eventHandlers=[];JSEvents.deferredCalls=[]},registerRemoveEventListeners:function(){if(!JSEvents.removeEventListenersRegistered){__ATEXIT__.push(JSEvents.removeAllEventListene

rs);JSEvents.removeEventListenersRegistered=true}},deferredCalls:[],deferCall:function(targetFunction,precedence,argsList){function arraysHaveEqualContent(arrA,arrB){if(arrA.length!=arrB.length)return false;for(var i in arrA){if(arrA[i]!=arrB[i])return false}return true}for(var i in JSEvents.deferredCalls){var call=JSEvents.deferredCalls[i];if(call.targetFunction==targetFunction&&arraysHaveEqualContent(call.argsList,argsList)){return}}JSEvents.deferredCalls.push({targetFunction:targetFunction,precedence:precedence,argsList:argsList});JSEvents.deferredCalls.sort(function(x,y){return x.precedence<y.precedence})},removeDeferredCalls:function(targetFunction){for(var i=0;i<JSEvents.deferredCalls.length;++i){if(JSEvents.deferredCalls[i].targetFunction==targetFunction){JSEvents.deferredCalls.splice(i,1);--i}}},canPerformEventHandlerRequests:function(){return JSEvents.inEventHandler&&JSEvents.currentEventHandler.allowsDeferredCalls},runDeferredCalls:function(){if(!JSEvents.canPerformEventHandlerRequests()){return}for(var i=0;i<JSEvents.deferredCalls.length;++i){var call=JSEvents.deferredCalls[i];JSEvents.deferredCalls.splice(i,1);--i;call.targetFunction.apply(null,call.argsList)}},eventHandlers:[],removeAllHandlersOnTarget:function(target,eventTypeString){for(var i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==target&&(!eventTypeString||eventTypeString==JSEvents.eventHandlers[i].eventTypeString)){JSEvents._removeHandler(i--)}}},_removeHandler:function(i){var h=JSEvents.eventHandlers[i];h.target.removeEventListener(h.eventTypeString,h.eventListenerFunc,h.useCapture);JSEvents.eventHandlers.splice(i,1)},registerOrRemoveHandler:function(eventHandler){var jsEventHandler=function jsEventHandler(event){++JSEvents.inEventHandler;JSEvents.currentEventHandler=eventHandler;JSEvents.runDeferredCalls();eventHandler.handlerFunc(event);JSEvents.runDeferredCalls();--JSEvents.inEventHandler};if(eventHandler.callbackfunc){eventHandler.eventListenerFunc=jsEventHandler;eventHandler.target.addEventListener(eventHandler.eventTypeString,jsEventHandler,eventHandler.useCapture);JSEvents.eventHandlers.push(eventHandler);JSEvents.registerRemoveEventListeners()}else{for(var i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==eventHandler.target&&JSEvents.eventHandlers[i].eventTypeString==eventHandler.eventTypeString){JSEvents._removeHandler(i--)}}}},queueEventHandlerOnThread_iiii:function(targetThread,eventHandlerFunc,eventTypeId,eventData,userData){var stackTop=stackSave();var varargs=stackAlloc(12);GROWABLE_HEAP_I32()[varargs>>2]=eventTypeId;GROWABLE_HEAP_I32()[varargs+4>>2]=eventData;GROWABLE_HEAP_I32()[varargs+8>>2]=userData;__emscripten_call_on_thread(0,targetThread,637534208,eventHandlerFunc,eventData,varargs);stackRestore(stackTop)},getTargetThreadForEventCallback:function(targetThread){switch(targetThread){case 1:return 0;case 2:return PThread.currentProxiedOperationCallerThread;default:return targetThread}},getNodeNameForTarget:function(target){if(!target)return\"\";if(target==window)return\"#window\";if(target==screen)return\"#screen\";return target&&target.nodeName?target.nodeName:\"\"},fullscreenEnabled:function(){return document.fullscreenEnabled||document.webkitFullscreenEnabled}};function stringToNewUTF8(jsString){var length=lengthBytesUTF8(jsString)+1;var cString=_malloc(length);stringToUTF8(jsString,cString,length);return cString}function _emscripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height){var stackTop=stackSave();var varargs=stackAlloc(12);var targetCanvasPtr=0;if(targetCanvas){targetCanvasPtr=stringToNewUTF8(targetCanvas)}GROWABLE_HEAP_I32()[varargs>>2]=targetCanvasPtr;GROWABLE_HEAP_I32()[varargs+4>>2]=width;GROWABLE_HEAP_I32()[varargs+8>>2]=height;__emscripten_call_on_thread(0,targetThread,657457152,0,targetCanvasPtr,varargs);stackRestore(stackTop)}function _emscripten_set_offscreencanvas_size_on_target_thread(targetThread,targetCanvas,width,height){targetCanvas=targetCanvas?UTF8ToString(targetCanvas):\"\";_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThr

ead,targetCanvas,width,height)}function maybeCStringToJsString(cString){return cString>2?UTF8ToString(cString):cString}var specialHTMLTargets=[0,typeof document!==\"undefined\"?document:0,typeof window!==\"undefined\"?window:0];function findEventTarget(target){target=maybeCStringToJsString(target);var domElement=specialHTMLTargets[target]||(typeof document!==\"undefined\"?document.querySelector(target):undefined);return domElement}function findCanvasEventTarget(target){return findEventTarget(target)}function _emscripten_set_canvas_element_size_calling_thread(target,width,height){var canvas=findCanvasEventTarget(target);if(!canvas)return-4;if(canvas.canvasSharedPtr){GROWABLE_HEAP_I32()[canvas.canvasSharedPtr>>2]=width;GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+4>>2]=height}if(canvas.offscreenCanvas||!canvas.controlTransferredOffscreen){if(canvas.offscreenCanvas)canvas=canvas.offscreenCanvas;var autoResizeViewport=false;if(canvas.GLctxObject&&canvas.GLctxObject.GLctx){var prevViewport=canvas.GLctxObject.GLctx.getParameter(2978);autoResizeViewport=prevViewport[0]===0&&prevViewport[1]===0&&prevViewport[2]===canvas.width&&prevViewport[3]===canvas.height}canvas.width=width;canvas.height=height;if(autoResizeViewport){canvas.GLctxObject.GLctx.viewport(0,0,width,height)}}else if(canvas.canvasSharedPtr){var targetThread=GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+8>>2];_emscripten_set_offscreencanvas_size_on_target_thread(targetThread,target,width,height);return 1}else{return-4}return 0}function _emscripten_set_canvas_element_size_main_thread(target,width,height){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(2,1,target,width,height);return _emscripten_set_canvas_element_size_calling_thread(target,width,height)}function _emscripten_set_canvas_element_size(target,width,height){var canvas=findCanvasEventTarget(target);if(canvas){return _emscripten_set_canvas_element_size_calling_thread(target,width,height)}else{return _emscripten_set_canvas_element_size_main_thread(target,width,height)}}function _emscripten_set_current_thread_status(newStatus){}function _emscripten_set_thread_name(threadId,name){}function __webgl_enable_ANGLE_instanced_arrays(ctx){var ext=ctx.getExtension(\"ANGLE_instanced_arrays\");if(ext){ctx[\"vertexAttribDivisor\"]=function(index,divisor){ext[\"vertexAttribDivisorANGLE\"](index,divisor)};ctx[\"drawArraysInstanced\"]=function(mode,first,count,primcount){ext[\"drawArraysInstancedANGLE\"](mode,first,count,primcount)};ctx[\"drawElementsInstanced\"]=function(mode,count,type,indices,primcount){ext[\"drawElementsInstancedANGLE\"](mode,count,type,indices,primcount)};return 1}}function __webgl_enable_OES_vertex_array_object(ctx){var ext=ctx.getExtension(\"OES_vertex_array_object\");if(ext){ctx[\"createVertexArray\"]=function(){return ext[\"createVertexArrayOES\"]()};ctx[\"deleteVertexArray\"]=function(vao){ext[\"deleteVertexArrayOES\"](vao)};ctx[\"bindVertexArray\"]=function(vao){ext[\"bindVertexArrayOES\"](vao)};ctx[\"isVertexArray\"]=function(vao){return ext[\"isVertexArrayOES\"](vao)};return 1}}function __webgl_enable_WEBGL_draw_buffers(ctx){var ext=ctx.getExtension(\"WEBGL_draw_buffers\");if(ext){ctx[\"drawBuffers\"]=function(n,bufs){ext[\"drawBuffersWEBGL\"](n,bufs)};return 1}}function __webgl_enable_WEBGL_multi_draw(ctx){return!!(ctx.multiDrawWebgl=ctx.getExtension(\"WEBGL_multi_draw\"))}var GL={counter:1,buffers:[],programs:[],framebuffers:[],renderbuffers:[],textures:[],uniforms:[],shaders:[],vaos:[],contexts:{},offscreenCanvases:{},timerQueriesEXT:[],programInfos:{},stringCache:{},unpackAlignment:4,recordError:function recordError(errorCode){if(!GL.lastError){GL.lastError=errorCode}},getNewId:function(table){var ret=GL.counter++;for(var i=table.length;i<ret;i++){table[i]=null}return

ret},getSource:function(shader,count,string,length){var source=\"\";for(var i=0;i<count;++i){var len=length?GROWABLE_HEAP_I32()[length+i*4>>2]:-1;source+=UTF8ToString(GROWABLE_HEAP_I32()[string+i*4>>2],len<0?undefined:len)}return source},createContext:function(canvas,webGLContextAttributes){var ctx=canvas.getContext(\"webgl\",webGLContextAttributes);if(!ctx)return 0;var handle=GL.registerContext(ctx,webGLContextAttributes);return handle},registerContext:function(ctx,webGLContextAttributes){var handle=_malloc(8);GROWABLE_HEAP_I32()[handle+4>>2]=_pthread_self();var context={handle:handle,attributes:webGLContextAttributes,version:webGLContextAttributes.majorVersion,GLctx:ctx};if(ctx.canvas)ctx.canvas.GLctxObject=context;GL.contexts[handle]=context;if(typeof webGLContextAttributes.enableExtensionsByDefault===\"undefined\"||webGLContextAttributes.enableExtensionsByDefault){GL.initExtensions(context)}return handle},makeContextCurrent:function(contextHandle){GL.currentContext=GL.contexts[contextHandle];Module.ctx=GLctx=GL.currentContext&&GL.currentContext.GLctx;return!(contextHandle&&!GLctx)},getContext:function(contextHandle){return GL.contexts[contextHandle]},deleteContext:function(contextHandle){if(GL.currentContext===GL.contexts[contextHandle])GL.currentContext=null;if(typeof JSEvents===\"object\")JSEvents.removeAllHandlersOnTarget(GL.contexts[contextHandle].GLctx.canvas);if(GL.contexts[contextHandle]&&GL.contexts[contextHandle].GLctx.canvas)GL.contexts[contextHandle].GLctx.canvas.GLctxObject=undefined;_free(GL.contexts[contextHandle].handle);GL.contexts[contextHandle]=null},initExtensions:function(context){if(!context)context=GL.currentContext;if(context.initExtensionsDone)return;context.initExtensionsDone=true;var GLctx=context.GLctx;__webgl_enable_ANGLE_instanced_arrays(GLctx);__webgl_enable_OES_vertex_array_object(GLctx);__webgl_enable_WEBGL_draw_buffers(GLctx);GLctx.disjointTimerQueryExt=GLctx.getExtension(\"EXT_disjoint_timer_query\");__webgl_enable_WEBGL_multi_draw(GLctx);var exts=GLctx.getSupportedExtensions()||[];exts.forEach(function(ext){if(ext.indexOf(\"lose_context\")<0&&ext.indexOf(\"debug\")<0){GLctx.getExtension(ext)}})},populateUniformTable:function(program){var p=GL.programs[program];var ptable=GL.programInfos[program]={uniforms:{},maxUniformLength:0,maxAttributeLength:-1,maxUniformBlockNameLength:-1};var utable=ptable.uniforms;var numUniforms=GLctx.getProgramParameter(p,35718);for(var i=0;i<numUniforms;++i){var u=GLctx.getActiveUniform(p,i);var name=u.name;ptable.maxUniformLength=Math.max(ptable.maxUniformLength,name.length+1);if(name.slice(-1)==\"]\"){name=name.slice(0,name.lastIndexOf(\"[\"))}var loc=GLctx.getUniformLocation(p,name);if(loc){var id=GL.getNewId(GL.uniforms);utable[name]=[u.size,id];GL.uniforms[id]=loc;for(var j=1;j<u.size;++j){var n=name+\"[\"+j+\"]\";loc=GLctx.getUniformLocation(p,n);id=GL.getNewId(GL.uniforms);GL.uniforms[id]=loc}}}};var __emscripten_webgl_power_preferences=[\"default\",\"low-power\",\"high-performance\"];function _emscripten_webgl_do_create_context(target,attributes){var a=attributes>>2;var powerPreference=GROWABLE_HEAP_I32()[a+(24>>2)];var contextAttributes={\"alpha\":!!GROWABLE_HEAP_I32()[a+(0>>2)],\"depth\":!!GROWABLE_HEAP_I32()[a+(4>>2)],\"stencil\":!!GROWABLE_HEAP_I32()[a+(8>>2)],\"antialias\":!!GROWABLE_HEAP_I32()[a+(12>>2)],\"premultipliedAlpha\":!!GROWABLE_HEAP_I32()[a+(16>>2)],\"preserveDrawingBuffer\":!!GROWABLE_HEAP_I32()[a+(20>>2)],\"powerPreference\":__emscripten_webgl_power_preferences[powerPreference],\"failIfMajorPerformanceCaveat\":!!GROWABLE_HEAP_I32()[a+(28>>2)],majorVersion:GROWABLE_HEAP_I32()[a+(32>>2)],minorVersion:GROWABLE_HEAP_I32()[a+(36>>2)],enableExtensionsByDefault:GROWABLE_HEAP_I32()[a+(40>>2)],explicitSwapControl:GROWABLE_HEAP_I32()[a+(44>>2)],proxyContextToMainThread:GROWABLE_HEAP_I32()[a+(48>>2)],renderViaOffscreenBackBuffer:GROWABLE_HEAP_I32()[a+(52>>2)]};var

canvas=findCanvasEventTarget(target);if(!canvas){return 0}if(contextAttributes.explicitSwapControl){return 0}var contextHandle=GL.createContext(canvas,contextAttributes);return contextHandle}function _emscripten_webgl_create_context(a0,a1){return _emscripten_webgl_do_create_context(a0,a1)}var SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var ret=GROWABLE_HEAP_I32()[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function _fd_close(fd){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(3,1,fd);return 0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(4,1,fd,offset_low,offset_high,whence,newOffset)}function _fd_write(fd,iov,iovcnt,pnum){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(5,1,fd,iov,iovcnt,pnum);var num=0;for(var i=0;i<iovcnt;i++){var ptr=GROWABLE_HEAP_I32()[iov+i*8>>2];var len=GROWABLE_HEAP_I32()[iov+(i*8+4)>>2];for(var j=0;j<len;j++){SYSCALLS.printChar(fd,GROWABLE_HEAP_U8()[ptr+j])}num+=len}GROWABLE_HEAP_I32()[pnum>>2]=num;return 0}function _pthread_cleanup_pop(execute){var routine=PThread.threadExitHandlers.pop();if(execute)routine()}function _pthread_cleanup_push(routine,arg){PThread.threadExitHandlers.push(function(){wasmTable.get(routine)(arg)})}function spawnThread(threadParams){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! spawnThread() can only ever be called from main application thread!\";var worker=PThread.getNewWorker();if(worker.pthread!==undefined)throw\"Internal error!\";if(!threadParams.pthread_ptr)throw\"Internal error, no pthread ptr!\";PThread.runningWorkers.push(worker);var tlsMemory=_malloc(128*4);for(var i=0;i<128;++i){GROWABLE_HEAP_I32()[tlsMemory+i*4>>2]=0}var stackHigh=threadParams.stackBase+threadParams.stackSize;var pthread=PThread.pthreads[threadParams.pthread_ptr]={worker:worker,stackBase:threadParams.stackBase,stackSize:threadParams.stackSize,allocatedOwnStack:threadParams.allocatedOwnStack,threadInfoStruct:threadParams.pthread_ptr};var tis=pthread.threadInfoStruct>>2;Atomics.store(GROWABLE_HEAP_U32(),tis+(64>>2),threadParams.detached);Atomics.store(GROWABLE_HEAP_U32(),tis+(100>>2),tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tis+(40>>2),pthread.threadInfoStruct);Atomics.store(GROWABLE_HEAP_U32(),tis+(80>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(76>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),tis+(104>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+8>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+12>>2),threadParams.detached);var global_libc=_emscripten_get_global_libc();var global_locale=global_libc+40;Atomics.store(GROWABLE_HEAP_U32(),tis+(172>>2),global_locale);worker.pthread=pthread;var msg={\"cmd\":\"run\",\"start_routine\":threadParams.startRoutine,\"arg\":threadParams.arg,\"threadInfoStruct\":threadParams.pthread_ptr,\"stackBase\":threadParams.stackBase,\"stackSize\":threadParams.stackSize};worker.runPthread=function(){msg.time=performance.now();worker.postMessage(msg,threadParams.transferList)};if(worker.loaded){worker.runPthread();delete worker.runPthread}}function _pthread_create(pthread_ptr,attr,start_routine,arg){if(typeof SharedArrayBuffer===\"undefined\"){err(\"Current environment does not support SharedArrayBuffer, pthreads are not available!\");return 6}if(!pthread_ptr){err(\"pthread_create called with a null thread pointer!\");return 28}var transferList=[];var error=0;if(ENVIRONMENT_IS_PTHREAD&&(transferList.length===0||error)){return _emscripten_sync_run_in_main_thread_4(687865856,pthread_ptr,attr,start_routine,arg)}if(error)return error;var stackSize=0;var stackBase=0;var detached=0;if(attr&&attr!=-1){stackSize=GROWABLE_HEAP_I32()[attr>>2];stackSize+=81920;stackBase=GROWABLE_HEAP_I32()[attr+

8>>2];detached=GROWABLE_HEAP_I32()[attr+12>>2]!==0}else{stackSize=2097152}var allocatedOwnStack=stackBase==0;if(allocatedOwnStack){stackBase=_memalign(16,stackSize)}else{stackBase-=stackSize;assert(stackBase>0)}var threadInfoStruct=_malloc(228);for(var i=0;i<228>>2;++i)GROWABLE_HEAP_U32()[(threadInfoStruct>>2)+i]=0;GROWABLE_HEAP_I32()[pthread_ptr>>2]=threadInfoStruct;GROWABLE_HEAP_I32()[threadInfoStruct+12>>2]=threadInfoStruct;var headPtr=threadInfoStruct+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var threadParams={stackBase:stackBase,stackSize:stackSize,allocatedOwnStack:allocatedOwnStack,detached:detached,startRoutine:start_routine,pthread_ptr:threadInfoStruct,arg:arg,transferList:transferList};if(ENVIRONMENT_IS_PTHREAD){threadParams.cmd=\"spawnThread\";postMessage(threadParams,transferList)}else{spawnThread(threadParams)}return 0}function __pthread_testcancel_js(){if(!ENVIRONMENT_IS_PTHREAD)return;var tb=_pthread_self();if(!tb)return;var cancelDisabled=Atomics.load(GROWABLE_HEAP_U32(),tb+56>>2);if(cancelDisabled)return;var canceled=Atomics.load(GROWABLE_HEAP_U32(),tb+0>>2);if(canceled==2)throw\"Canceled!\"}function _emscripten_check_blocking_allowed(){if(ENVIRONMENT_IS_NODE)return;if(ENVIRONMENT_IS_WORKER)return;warnOnce(\"Blocking on the main thread is very dangerous, see https://emscripten.org/docs/porting/pthreads.html#blocking-on-the-main-browser-thread\")}function __emscripten_do_pthread_join(thread,status,block){if(!thread){err(\"pthread_join attempted on a null thread pointer!\");return ERRNO_CODES.ESRCH}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self()==thread){err(\"PThread \"+thread+\" is attempting to join to itself!\");return ERRNO_CODES.EDEADLK}else if(!ENVIRONMENT_IS_PTHREAD&&_emscripten_main_browser_thread_id()==thread){err(\"Main thread \"+thread+\" is attempting to join to itself!\");return ERRNO_CODES.EDEADLK}var self=GROWABLE_HEAP_I32()[thread+12>>2];if(self!==thread){err(\"pthread_join attempted on thread \"+thread+\", which does not point to a valid thread, or does not exist anymore!\");return ERRNO_CODES.ESRCH}var detached=Atomics.load(GROWABLE_HEAP_U32(),thread+64>>2);if(detached){err(\"Attempted to join thread \"+thread+\", which was already detached!\");return ERRNO_CODES.EINVAL}if(block){_emscripten_check_blocking_allowed()}for(;;){var threadStatus=Atomics.load(GROWABLE_HEAP_U32(),thread+0>>2);if(threadStatus==1){var threadExitCode=Atomics.load(GROWABLE_HEAP_U32(),thread+4>>2);if(status)GROWABLE_HEAP_I32()[status>>2]=threadExitCode;Atomics.store(GROWABLE_HEAP_U32(),thread+64>>2,1);if(!ENVIRONMENT_IS_PTHREAD)cleanupThread(thread);else postMessage({\"cmd\":\"cleanupThread\",\"thread\":thread});return 0}if(!block){return ERRNO_CODES.EBUSY}__pthread_testcancel_js();if(!ENVIRONMENT_IS_PTHREAD)_emscripten_main_thread_process_queued_calls();_emscripten_futex_wait(thread+0,threadStatus,ENVIRONMENT_IS_PTHREAD?100:1)}}function _pthread_join(thread,status){return __emscripten_do_pthread_join(thread,status,true)}function _sysconf(name){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(6,1,name);switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case

69:case 70:case 4:return 1024;case 31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-1}if(!ENVIRONMENT_IS_PTHREAD)PThread.initMainThreadBlock();var GLctx;var proxiedFunctionTable=[null,_atexit,_emscripten_set_canvas_element_size_main_thread,_fd_close,_fd_seek,_fd_write,_sysconf];var asmLibraryArg={\"e\":___assert_fail,\"r\":___call_main,\"x\":__emscripten_notify_thread_queue,\"b\":_abort,\"y\":_emscripten_asm_const_int,\"j\":_emscripten_conditional_set_current_thread_status,\"d\":_emscripten_futex_wait,\"c\":_emscripten_futex_wake,\"f\":_emscripten_get_now,\"p\":_emscripten_memcpy_big,\"A\":_emscripten_num_logical_cores,\"u\":_emscripten_receive_on_main_thread_js,\"q\":_emscripten_resize_heap,\"v\":_emscripten_set_canvas_element_size,\"i\":_emscripten_set_current_thread_status,\"s\":_emscripten_set_thread_name,\"w\":_emscripten_webgl_create_context,\"l\":_fd_close,\"n\":_fd_seek,\"g\":_fd_write,\"o\":initPthreadsJS,\"a\":wasmMemory||Module[\"wasmMemory\"],\"z\":_pthread_cleanup_pop,\"k\":_pthread_cleanup_push,\"h\":_pthread_create,\"m\":_pthread_join,\"t\":_sysconf};var asm=createWasm();var ___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=function(){return(___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=Module[\"asm\"][\"B\"]).apply(null,arguments)};var _init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"C\"]).apply(null,arguments)};var _init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Module[\"_init_with_threads_count\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var _get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads_count\"]=Module[\"asm\"][\"E\"]).apply(null,arguments)};var _register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=Module[\"asm\"][\"F\"]).apply(null,arguments)};var _dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"asm\"][\"G\"]).apply(null,arguments)};var _dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"H\"]).apply(null,arguments)};var _Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"J\"]).apply(null,arguments)};var _Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"K\"]).apply(null,arguments)};var _AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"L\"]).apply(null,arguments)};var _All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"M\"]).apply(null,arguments)};var _Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"N\"]).apply(null,arguments)};var _ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"O\"]).apply(null,arguments)};var _AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"P\"]).apply(null,arguments)};var _BatchMatMul=Module[\"_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\"_BatchMatMul\"]=Module[\"asm\"][\"Q\"]).apply(null,arguments)};var _Ceil=Module[\"_Ceil\"]=function(){return(_Ceil=Module[\"_Ceil\"]=Module[\"asm\"][\"R\"]).apply(null,argument

s)};var
_ClipByValue=Module[\"_ClipByValue\"]=function(){return(_ClipByValue=Module[\"_ClipByValue\"]=Module[\"asm\"][\"S\"]).apply(null,arguments)};var
_Conv2D=Module[\"_Conv2D\"]=function(){return(_Conv2D=Module[\"_Conv2D\"]=Module[\"asm\"][\"T\"]).apply(null,arguments)};var
_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=function(){return(_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=Module[\"asm\"][\"U\"]).apply(null,arguments)};var
_Cos=Module[\"_Cos\"]=function(){return(_Cos=Module[\"_Cos\"]=Module[\"asm\"][\"V\"]).apply(null,arguments)};var
_Cosh=Module[\"_Cosh\"]=function(){return(_Cosh=Module[\"_Cosh\"]=Module[\"asm\"][\"W\"]).apply(null,arguments)};var
_CropAndResize=Module[\"_CropAndResize\"]=function(){return(_CropAndResize=Module[\"_CropAndResize\"]=Module[\"asm\"][\"X\"]).apply(null,arguments)};var
_Cumsum=Module[\"_Cumsum\"]=function(){return(_Cumsum=Module[\"_Cumsum\"]=Module[\"asm\"][\"Y\"]).apply(null,arguments)};var
_DepthToSpace=Module[\"_DepthToSpace\"]=function(){return(_DepthToSpace=Module[\"_DepthToSpace\"]=Module[\"asm\"][\"Z\"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=function(){return(_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=Module[\"asm\"][\"_\"]).apply(null,arguments)};var
_Elu=Module[\"_Elu\"]=function(){return(_Elu=Module[\"_Elu\"]=Module[\"asm\"][\"$\"]).apply(null,arguments)};var
_Equal=Module[\"_Equal\"]=function(){return(_Equal=Module[\"_Equal\"]=Module[\"asm\"][\"aa\"]).apply(null,arguments)};var
_Exp=Module[\"_Exp\"]=function(){return(_Exp=Module[\"_Exp\"]=Module[\"asm\"][\"ba\"]).apply(null,arguments)};var
_FlipLeftRight=Module[\"_FlipLeftRight\"]=function(){return(_FlipLeftRight=Module[\"_FlipLeftRight\"]=Module[\"asm\"][\"ca\"]).apply(null,arguments)};var
_Floor=Module[\"_Floor\"]=function(){return(_Floor=Module[\"_Floor\"]=Module[\"asm\"][\"da\"]).apply(null,arguments)};var
_FloorDiv=Module[\"_FloorDiv\"]=function(){return(_FloorDiv=Module[\"_FloorDiv\"]=Module[\"asm\"][\"ea\"]).apply(null,arguments)};var
_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=function(){return(_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=Module[\"asm\"][\"fa\"]).apply(null,arguments)};var
_FusedConv2D=Module[\"_FusedConv2D\"]=function(){return(_FusedConv2D=Module[\"_FusedConv2D\"]=Module[\"asm\"][\"ga\"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=function(){return(_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=Module[\"asm\"][\"ha\"]).apply(null,arguments)};var
_Gather=Module[\"_Gather\"]=function(){return(_Gather=Module[\"_Gather\"]=Module[\"asm\"][\"ia\"]).apply(null,arguments)};var
_GatherNd=Module[\"_GatherNd\"]=function(){return(_GatherNd=Module[\"_GatherNd\"]=Module[\"asm\"][\"ja\"]).apply(null,arguments)};var
_Greater=Module[\"_Greater\"]=function(){return(_Greater=Module[\"_Greater\"]=Module[\"asm\"][\"ka\"]).apply(null,arguments)};var
_GreaterEqual=Module[\"_GreaterEqual\"]=function(){return(_GreaterEqual=Module[\"_GreaterEqual\"]=Module[\"asm\"][\"la\"]).apply(null,arguments)};var
_LeakyRelu=Module[\"_LeakyRelu\"]=function(){return(_LeakyRelu=Module[\"_LeakyRelu\"]=Module[\"asm\"][\"ma\"]).apply(null,arguments)};var
_Less=Module[\"_Less\"]=function(){return(_Less=Module[\"_Less\"]=Module[\"asm\"][\"na\"]).apply(null,argume

nts)};var
_LessEqual=Module[\"_LessEqual\"]=function(){return(_LessEqual=Module[\"_LessEqual\"]=Module[\"asm\"][\"oa\"]).apply(null,arguments)};var
_Log=Module[\"_Log\"]=function(){return(_Log=Module[\"_Log\"]=Module[\"asm\"][\"pa\"]).apply(null,arguments)};var
_LogicalAnd=Module[\"_LogicalAnd\"]=function(){return(_LogicalAnd=Module[\"_LogicalAnd\"]=Module[\"asm\"][\"qa\"]).apply(null,arguments)};var
_Max=Module[\"_Max\"]=function(){return(_Max=Module[\"_Max\"]=Module[\"asm\"][\"ra\"]).apply(null,arguments)};var
_MaxPool=Module[\"_MaxPool\"]=function(){return(_MaxPool=Module[\"_MaxPool\"]=Module[\"asm\"][\"sa\"]).apply(null,arguments)};var
_Maximum=Module[\"_Maximum\"]=function(){return(_Maximum=Module[\"_Maximum\"]=Module[\"asm\"][\"ta\"]).apply(null,arguments)};var
_Mean=Module[\"_Mean\"]=function(){return(_Mean=Module[\"_Mean\"]=Module[\"asm\"][\"ua\"]).apply(null,arguments)};var
_Min=Module[\"_Min\"]=function(){return(_Min=Module[\"_Min\"]=Module[\"asm\"][\"va\"]).apply(null,arguments)};var
_Minimum=Module[\"_Minimum\"]=function(){return(_Minimum=Module[\"_Minimum\"]=Module[\"asm\"][\"wa\"]).apply(null,arguments)};var
_MirrorPad=Module[\"_MirrorPad\"]=function(){return(_MirrorPad=Module[\"_MirrorPad\"]=Module[\"asm\"][\"xa\"]).apply(null,arguments)};var
_Multiply=Module[\"_Multiply\"]=function(){return(_Multiply=Module[\"_Multiply\"]=Module[\"asm\"][\"ya\"]).apply(null,arguments)};var
_Neg=Module[\"_Neg\"]=function(){return(_Neg=Module[\"_Neg\"]=Module[\"asm\"][\"za\"]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module[\"_NonMaxSuppressionV3\"]=function(){return(_NonMaxSuppressionV3=Module[\"_NonMaxSuppressionV3\"]=Module[\"asm\"][\"Aa\"]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module[\"_NonMaxSuppressionV4\"]=function(){return(_NonMaxSuppressionV4=Module[\"_NonMaxSuppressionV4\"]=Module[\"asm\"][\"Ba\"]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module[\"_NonMaxSuppressionV5\"]=function(){return(_NonMaxSuppressionV5=Module[\"_NonMaxSuppressionV5\"]=Module[\"asm\"][\"Ca\"]).apply(null,arguments)};var
_NotEqual=Module[\"_NotEqual\"]=function(){return(_NotEqual=Module[\"_NotEqual\"]=Module[\"asm\"][\"Da\"]).apply(null,arguments)};var
_OneHot=Module[\"_OneHot\"]=function(){return(_OneHot=Module[\"_OneHot\"]=Module[\"asm\"][\"Ea\"]).apply(null,arguments)};var
_PadV2=Module[\"_PadV2\"]=function(){return(_PadV2=Module[\"_PadV2\"]=Module[\"asm\"][\"Fa\"]).apply(null,arguments)};var
_Pow=Module[\"_Pow\"]=function(){return(_Pow=Module[\"_Pow\"]=Module[\"asm\"][\"Ga\"]).apply(null,arguments)};var
_Prelu=Module[\"_Prelu\"]=function(){return(_Prelu=Module[\"_Prelu\"]=Module[\"asm\"][\"Ha\"]).apply(null,arguments)};var
_Prod=Module[\"_Prod\"]=function(){return(_Prod=Module[\"_Prod\"]=Module[\"asm\"][\"Ia\"]).apply(null,arguments)};var
_RealDiv=Module[\"_RealDiv\"]=function(){return(_RealDiv=Module[\"_RealDiv\"]=Module[\"asm\"][\"Ja\"]).apply(null,arguments)};var
_Relu=Module[\"_Relu\"]=function(){return(_Relu=Module[\"_Relu\"]=Module[\"asm\"][\"Ka\"]).apply(null,arguments)};var
_Relu6=Module[\"_Relu6\"]=function(){return(_Relu6=Module[\"_Relu6\"]=Module[\"asm\"][\"La\"]).apply(null,a

rguments)};var
_ResizeBilinear=Module[\"_ResizeBilinear\"]=function(){return(_ResizeBilinear=Module[\"_ResizeBilinear\"]=Module[\"asm\"][\"Ma\"]).apply(null,arguments)};var
_Reverse=Module[\"_Reverse\"]=function(){return(_Reverse=Module[\"_Reverse\"]=Module[\"asm\"][\"Na\"]).apply(null,arguments)};var
_RotateWithOffset=Module[\"_RotateWithOffset\"]=function(){return(_RotateWithOffset=Module[\"_RotateWithOffset\"]=Module[\"asm\"][\"Oa\"]).apply(null,arguments)};var
_Round=Module[\"_Round\"]=function(){return(_Round=Module[\"_Round\"]=Module[\"asm\"][\"Pa\"]).apply(null,arguments)};var
_Rsqrt=Module[\"_Rsqrt\"]=function(){return(_Rsqrt=Module[\"_Rsqrt\"]=Module[\"asm\"][\"Qa\"]).apply(null,arguments)};var
_ScatterNd=Module[\"_ScatterNd\"]=function(){return(_ScatterNd=Module[\"_ScatterNd\"]=Module[\"asm\"][\"Ra\"]).apply(null,arguments)};var
_SelectV2=Module[\"_SelectV2\"]=function(){return(_SelectV2=Module[\"_SelectV2\"]=Module[\"asm\"][\"Sa\"]).apply(null,arguments)};var
_Sigmoid=Module[\"_Sigmoid\"]=function(){return(_Sigmoid=Module[\"_Sigmoid\"]=Module[\"asm\"][\"Ta\"]).apply(null,arguments)};var
_Sin=Module[\"_Sin\"]=function(){return(_Sin=Module[\"_Sin\"]=Module[\"asm\"][\"Ua\"]).apply(null,arguments)};var
_Softmax=Module[\"_Softmax\"]=function(){return(_Softmax=Module[\"_Softmax\"]=Module[\"asm\"][\"Va\"]).apply(null,arguments)};var
_Sqrt=Module[\"_Sqrt\"]=function(){return(_Sqrt=Module[\"_Sqrt\"]=Module[\"asm\"][\"Wa\"]).apply(null,arguments)};var
_Square=Module[\"_Square\"]=function(){return(_Square=Module[\"_Square\"]=Module[\"asm\"][\"Xa\"]).apply(null,arguments)};var
_SquaredDifference=Module[\"_SquaredDifference\"]=function(){return(_SquaredDifference=Module[\"_SquaredDifference\"]=Module[\"asm\"][\"Ya\"]).apply(null,arguments)};var
_Step=Module[\"_Step\"]=function(){return(_Step=Module[\"_Step\"]=Module[\"asm\"][\"Za\"]).apply(null,arguments)};var
_StridedSlice=Module[\"_StridedSlice\"]=function(){return(_StridedSlice=Module[\"_StridedSlice\"]=Module[\"asm\"][\"_a\"]).apply(null,arguments)};var
_Sub=Module[\"_Sub\"]=function(){return(_Sub=Module[\"_Sub\"]=Module[\"asm\"][\"$a\"]).apply(null,arguments)};var
_Sum=Module[\"_Sum\"]=function(){return(_Sum=Module[\"_Sum\"]=Module[\"asm\"][\"ab\"]).apply(null,arguments)};var
_Tan=Module[\"_Tan\"]=function(){return(_Tan=Module[\"_Tan\"]=Module[\"asm\"][\"bb\"]).apply(null,arguments)};var
_Tanh=Module[\"_Tanh\"]=function(){return(_Tanh=Module[\"_Tanh\"]=Module[\"asm\"][\"cb\"]).apply(null,arguments)};var
_Tile=Module[\"_Tile\"]=function(){return(_Tile=Module[\"_Tile\"]=Module[\"asm\"][\"db\"]).apply(null,arguments)};var
_TopK=Module[\"_TopK\"]=function(){return(_TopK=Module[\"_TopK\"]=Module[\"asm\"][\"eb\"]).apply(null,arguments)};var
_Transform=Module[\"_Transform\"]=function(){return(_Transform=Module[\"_Transform\"]=Module[\"asm\"][\"fb\"]).apply(null,arguments)};var
_Transpose=Module[\"_Transpose\"]=function(){return(_Transpose=Module[\"_Transpose\"]=Module[\"asm\"][\"gb\"]).apply(null,arguments)};var
__FusedMatMul=Module[\"__FusedMatMul\"]=function(){return(__FusedMatMul=Module[\"__FusedMatMul\"]=

Module[\"asm\"][\"hb\"]).apply(null,arguments)};var
_malloc=Module[\"_malloc\"]=function(){return(_malloc=Module[\"_malloc\"]=Module[\"asm\"][\"ib\"]).apply(nul
l,arguments)};var
_free=Module[\"_free\"]=function(){return(_free=Module[\"_free\"]=Module[\"asm\"][\"jb\"]).apply(null,arguments
)};var
___errno_location=Module[\"___errno_location\"]=function(){return(___errno_location=Module[\"___errno_locati
on\"]=Module[\"asm\"][\"kb\"]).apply(null,arguments)};var
_emscripten_get_global_libc=Module[\"_emscripten_get_global_libc\"]=function(){return(_emscripten_get_global
_libc=Module[\"_emscripten_get_global_libc\"]=Module[\"asm\"][\"lb\"]).apply(null,arguments)};var
_pthread_self=Module[\"_pthread_self\"]=function(){return(_pthread_self=Module[\"_pthread_self\"]=Module[\"as
m\"][\"mb\"]).apply(null,arguments)};var
___pthread_tsd_run_dtors=Module[\"___pthread_tsd_run_dtors\"]=function(){return(___pthread_tsd_run_dtors=M
odule[\"___pthread_tsd_run_dtors\"]=Module[\"asm\"][\"nb\"]).apply(null,arguments)};var
_emscripten_main_thread_process_queued_calls=Module[\"_emscripten_main_thread_process_queued_calls\"]=fu
nction(){return(_emscripten_main_thread_process_queued_calls=Module[\"_emscripten_main_thread_process_que
ued_calls\"]=Module[\"asm\"][\"ob\"]).apply(null,arguments)};var
_emscripten_current_thread_process_queued_calls=Module[\"_emscripten_current_thread_process_queued_calls\"]
=function(){return(_emscripten_current_thread_process_queued_calls=Module[\"_emscripten_current_thread_proc
ess_queued_calls\"]=Module[\"asm\"][\"pb\"]).apply(null,arguments)};var
_emscripten_register_main_browser_thread_id=Module[\"_emscripten_register_main_browser_thread_id\"]=functi
on(){return(_emscripten_register_main_browser_thread_id=Module[\"_emscripten_register_main_browser_thread_
id\"]=Module[\"asm\"][\"qb\"]).apply(null,arguments)};var
_emscripten_main_browser_thread_id=Module[\"_emscripten_main_browser_thread_id\"]=function(){return(_ems
cripten_main_browser_thread_id=Module[\"_emscripten_main_browser_thread_id\"]=Module[\"asm\"][\"rb\"]).app
ly(null,arguments)};var
__emscripten_do_dispatch_to_thread=Module[\"__emscripten_do_dispatch_to_thread\"]=function(){return(__emsc
ripten_do_dispatch_to_thread=Module[\"__emscripten_do_dispatch_to_thread\"]=Module[\"asm\"][\"sb\"]).apply(n
ull,arguments)};var
_emscripten_sync_run_in_main_thread_4=Module[\"_emscripten_sync_run_in_main_thread_4\"]=function(){retur
n(_emscripten_sync_run_in_main_thread_4=Module[\"_emscripten_sync_run_in_main_thread_4\"]=Module[\"asm\
"][\"tb\"]).apply(null,arguments)};var
_emscripten_run_in_main_runtime_thread_js=Module[\"_emscripten_run_in_main_runtime_thread_js\"]=function(
){return(_emscripten_run_in_main_runtime_thread_js=Module[\"_emscripten_run_in_main_runtime_thread_js\"]=
Module[\"asm\"][\"ub\"]).apply(null,arguments)};var
__emscripten_call_on_thread=Module[\"__emscripten_call_on_thread\"]=function(){return(__emscripten_call_on_t
hread=Module[\"__emscripten_call_on_thread\"]=Module[\"asm\"][\"vb\"]).apply(null,arguments)};var
_emscripten_tls_init=Module[\"_emscripten_tls_init\"]=function(){return(_emscripten_tls_init=Module[\"_emscript
en_tls_init\"]=Module[\"asm\"][\"wb\"]).apply(null,arguments)};var
__emscripten_thread_init=Module[\"__emscripten_thread_init\"]=function(){return(__emscripten_thread_init=Mod
ule[\"__emscripten_thread_init\"]=Module[\"asm\"][\"xb\"]).apply(null,arguments)};var
stackSave=Module[\"stackSave\"]=function(){return(stackSave=Module[\"stackSave\"]=Module[\"asm\"][\"yb\"]).a
pply(null,arguments)};var
stackRestore=Module[\"stackRestore\"]=function(){return(stackRestore=Module[\"stackRestore\"]=Module[\"asm\"
][\"zb\"]).apply(null,arguments)};var
stackAlloc=Module[\"stackAlloc\"]=function(){return(stackAlloc=Module[\"stackAlloc\"]=Module[\"asm\"][\"Ab\"
]).apply(null,arguments)};var
_emscripten_stack_set_limits=Module[\"_emscripten_stack_set_limits\"]=function(){return(_emscripten_stack_set_
limits=Module[\"_emscripten_stack_set_limits\"]=Module[\"asm\"][\"Bb\"]).apply(null,arguments)};var

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_memalign=Module[\"_memalign\"]=function(){return(_memalign=Module[\"_memalign\"]=Module[\"asm\"][\"Cb
\"]).apply(null,arguments)};var
__emscripten_allow_main_runtime_queued_calls=Module[\"__emscripten_allow_main_runtime_queued_calls\"]=1
0512;var
__emscripten_main_thread_futex=Module[\"__emscripten_main_thread_futex\"]=12148;Module[\"cwrap\"]=cwrap
;Module[\"PThread\"]=PThread;Module[\"PThread\"]=PThread;Module[\"wasmMemory\"]=wasmMemory;Module
[\"ExitStatus\"]=ExitStatus;var
 calledRun;function ExitStatus(status){this.name=\"ExitStatus\";this.message=\"Program terminated with
exit(\"+status+\")\";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}if(ENVIRONMENT_IS_PTHREAD){readyPromis
eResolve(Module);initRuntime();postMessage({\"cmd\":\"loaded\"});return}preRun();if(runDependencies>0){retur
n}function
doRun(){if(calledRun)return;calledRun=true;Module[\"calledRun\"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module[\"onRuntimeInitialized\"])Module[\"onRuntimeInitialized\"]();postRun(
)}if(Module[\"setStatus\"]){Module[\"setStatus\"](\"Running...\");setTimeout(function(){setTimeout(function(){Mo
dule[\"setStatus\"](\"\")},1);doRun()},1)}else{doRun()}}Module[\"run\"]=run;function
exit(status,implicit){if(implicit&&noExitRuntime&&status===0){return}if(!implicit){if(ENVIRONMENT_IS_PT
HREAD){postMessage({\"cmd\":\"exitProcess\",\"returnCode\":status});throw
 new
ExitStatus(status)}else{}}if(noExitRuntime){}else{PThread.terminateAllThreads();EXITSTATUS=status;exitRunti
me();if(Module[\"onExit\"])Module[\"onExit\"](status);ABORT=true}quit_(status,new
ExitStatus(status))}if(Module[\"preInit\"]){if(typeof
Module[\"preInit\"]==\"function\")Module[\"preInit\"]=[Module[\"preInit\"]];while(Module[\"preInit\"].length>0){
Module[\"preInit\"].pop()()}}if(ENVIRONMENT_IS_PTHREAD){noExitRuntime=false;PThread.initWorker()}run
();\n\n\n  return WasmBackendModuleThreadedSimd.ready\n}\n);\n})();\nif (typeof exports === 'object' && typeof
module === 'object')\n  module.exports = WasmBackendModuleThreadedSimd;\nelse if (typeof define ===
'function' && define['amd'])\n  define([], function() { return WasmBackendModuleThreadedSimd; });\nelse if
(typeof exports === 'object')\n  exports[\"WasmBackendModuleThreadedSimd\"]
 = WasmBackendModuleThreadedSimd;\n","\nvar WasmBackendModule = (function() {\n  var _scriptDir = typeof
document !== 'undefined' && document.currentScript ? document.currentScript.src : undefined;\n  if (typeof
__filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n  return (\nfunction(WasmBackendModule) {\n
WasmBackendModule = WasmBackendModule || {};\n\nvar Module=typeof
WasmBackendModule!==\"undefined\"?WasmBackendModule:{};var
readyPromiseResolve,readyPromiseReject;Module[\"ready\"]=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var
thisProgram=\"./this.program\";var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window===\"object\";ENVIRONMENT_IS_WORKER=typeof
 importScripts===\"function\";ENVIRONMENT_IS_NODE=typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof
process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var scriptDirectory=\"\";function
locateFile(path){if(Module[\"locateFile\"]){return Module[\"locateFile\"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
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nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\"path\").dirname(scriptDirectory)+\"/\"}else{scriptDirectory=__dirname+\"/\"}read_=function shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=nodePath[\"normalize\"](filename);return nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\")};readBinary=function readBinary(filename){var ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return ret};if(process[\"argv\"].length>1){thisProgram=process[\"argv\"][1].replace(/\\\\/g,\"/\")}arguments_=process[\"argv\"].slice(2);process[\"on\"](\"uncaughtException\",function(ex){if(!(ex instanceof ExitStatus)){throw ex}});process[\"on\"](\"unhandledRejection\",abort);quit_=function(status){process[\"exit\"](status)};Module[\"inspect\"]=function(){return\"[Emscripten Module object]\"}}else if(ENVIRONMENT_IS_SHELL){if(typeof read!=\"undefined\"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var data;if(typeof readbuffer===\"function\"){return new Uint8Array(readbuffer(f))}data=read(f,\"binary\");assert(typeof data===\"object\");return data};if(typeof scriptArgs!=\"undefined\"){arguments_=scriptArgs}else if(typeof arguments!=\"undefined\"){arguments_=arguments}if(typeof quit===\"function\"){quit_=function(status){quit(status)}}if(typeof print!==\"undefined\"){if(typeof console===\"undefined\")console={};console.log=print;console.warn=console.error=typeof printErr!==\"undefined\"?printErr:print}}else if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDirectory=self.location.href}else if(typeof document!==\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(_scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf(\"blob:\")!==0){scriptDirectory=scriptDirectory.substr(0,scriptDirectory.lastIndexOf(\"/\")+1)}else{scriptDirectory=\"\"}{read_=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.send(null);return xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.responseType=\"arraybuffer\";xhr.send(null);return new Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,true);xhr.responseType=\"arraybuffer\";xhr.onload=function(){if(xhr.status==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror()};xhr.onerror=onerror;xhr.send(null)}}setWindowTitle=function(title){document.title=title}}else{}var out=Module[\"print\"]||console.log.bind(console);var err=Module[\"printErr\"]||console.warn.bind(console);for(key in moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverrides=null;if(Module[\"arguments\"])arguments_=Module[\"arguments\"];if(Module[\"thisProgram\"])thisProgram=Module[\"thisProgram\"];if(Module[\"quit\"])quit_=Module[\"quit\"];var wasmBinary;if(Module[\"wasmBinary\"])wasmBinary=Module[\"wasmBinary\"];var noExitRuntime=Module[\"noExitRuntime\"]||true;if(typeof WebAssembly!==\"object\"){abort(\"no native wasm support detected\")}var wasmMemory;var ABORT=false;var EXITSTATUS;function assert(condition,text){if(!condition){abort(\"Assertion failed: \"+text)}}function getCFunc(ident){var func=Module[\"_\"+ident];assert(func,\"Cannot call unknown function \"+ident+\", make sure it is exported\");return func}function ccall(ident,returnType,argTypes,args,opts){var toC={\"string\":function(str){var ret=0;if(str!==null&&str!==undefined&&str!==0){var len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\"array\":function(arr){var ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function convertReturnValue(ret){if(returnType===\"string\")return UTF8ToString(ret);if(returnType===\"boolean\")return Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var i=0;i<args.length;i++){var converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i

]=args[i]}}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var numericArgs=argTypes.every(function(type){return type===\"number\"});var numericRet=returnType!==\"string\";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return function(){return ccall(ident,returnType,argTypes,arguments,opts)}}var UTF8Decoder=typeof TextDecoder!==\"undefined\"?new TextDecoder(\"utf8\"):undefined;function UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var endPtr=idx;while(heap[endPtr]&&!(endPtr>=endIdx))++endPtr;if(endPtr-idx>16&&heap.subarray&&UTF8Decoder){return UTF8Decoder.decode(heap.subarray(idx,endPtr))}else{var str=\"\";while(idx<endPtr){var u0=heap[idx++];if(!(u0&128)){str+=String.fromCharCode(u0);continue}var u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[idx++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}}return str}function UTF8ToString(ptr,maxBytesToRead){return ptr?UTF8ArrayToString(HEAPU8,ptr,maxBytesToRead):\"\"}function stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var u=str.charCodeAt(i);if(u>=55296&&u<=57343){var u1=str.charCodeAt(++i);u=65536+((u&1023)<<10)|u1&1023}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function stringToUTF8(str,outPtr,maxBytesToWrite){return stringToUTF8Array(str,HEAPU8,outPtr,maxBytesToWrite)}function writeArrayToMemory(array,buffer){HEAP8.set(array,buffer)}function alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function updateGlobalBufferAndViews(buf){buffer=buf;Module[\"HEAP8\"]=HEAP8=new Int8Array(buf);Module[\"HEAP16\"]=HEAP16=new Int16Array(buf);Module[\"HEAP32\"]=HEAP32=new Int32Array(buf);Module[\"HEAPU8\"]=HEAPU8=new Uint8Array(buf);Module[\"HEAPU16\"]=HEAPU16=new Uint16Array(buf);Module[\"HEAPU32\"]=HEAPU32=new Uint32Array(buf);Module[\"HEAPF32\"]=HEAPF32=new Float32Array(buf);Module[\"HEAPF64\"]=HEAPF64=new Float64Array(buf)}var INITIAL_MEMORY=Module[\"INITIAL_MEMORY\"]||16777216;var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;__ATINIT__.push({func:function(){___wasm_call_ctors()}});function preRun(){if(Module[\"preRun\"]){if(typeof Module[\"preRun\"]==\"function\")Module[\"preRun\"]=[Module[\"preRun\"]];while(Module[\"preRun\"].length){addOnPreRun(Module[\"preRun\"].shift())}}callRuntimeCallbacks(__ATPRERUN__)}function initRuntime(){runtimeInitialized=true;callRuntimeCallbacks(__ATINIT__)}function preMain(){callRuntimeCallbacks(__ATMAIN__)}function postRun(){if(Module[\"postRun\"]){if(typeof Module[\"postRun\"]==\"function\")Module[\"postRun\"]=[Module[\"postRun\"]];while(Module[\"postRun\"].length){addOnPostRun(Module[\"postRun\"].shift())}}callRuntimeCallbacks(__ATPOSTRUN__)}function addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function

addRunDependency(id){runDependencies++;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}}function removeRunDependency(id){runDependencies--;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}if(runDependencies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}if(dependenciesFulfilled){var callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}}Module[\"preloadedImages\"]={};Module[\"preloadedAudios\"]={};function abort(what){if(Module[\"onAbort\"]){Module[\"onAbort\"](what)}what+=\"\";err(what);ABORT=true;EXITSTATUS=1;what=\"abort(\"+what+\"). Build with -s ASSERTIONS=1 for more info.\";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var dataURIPrefix=\"data:application/octet-stream; base64,\";function isDataURI(filename){return hasPrefix(filename,dataURIPrefix)}var fileURIPrefix=\"file://\";function isFileURI(filename){return hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile=\"tfjs-backend-wasm.wasm\";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function getBinary(file){try{if(file==wasmBinaryFile&&wasmBinary){return new Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw\"both async and sync fetching of the wasm failed\"}}catch(err){abort(err)}}function getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof fetch===\"function\"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){if(!response[\"ok\"]){throw\"failed to load wasm binary file at '\"+wasmBinaryFile+\"'\"}return response[\"arrayBuffer\"]()}).catch(function(){return getBinary(wasmBinaryFile)})}else{if(readAsync){return new Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new Uint8Array(response))},reject)})}}}return Promise.resolve().then(function(){return getBinary(wasmBinaryFile)})}function createWasm(){var info={\"a\":asmLibraryArg};function receiveInstance(instance,module){var exports=instance.exports;Module[\"asm\"]=exports;wasmMemory=Module[\"asm\"][\"j\"];updateGlobalBufferAndViews(wasmMemory.buffer);wasmTable=Module[\"asm\"][\"r\"];removeRunDependency(\"wasm-instantiate\")}addRunDependency(\"wasm-instantiate\");function receiveInstantiatedSource(output){receiveInstance(output[\"instance\"])}function instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err(\"failed to asynchronously prepare wasm: \"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof WebAssembly.instantiateStreaming===\"function\"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFile)&&typeof fetch===\"function\"){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return result.then(receiveInstantiatedSource,function(reason){err(\"wasm streaming compile failed: \"+reason);err(\"falling back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)})})}else{return instantiateArrayBuffer(receiveInstantiatedSource)}}if(Module[\"instantiateWasm\"]){try{var exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports}catch(e){err(\"Module.instantiateWasm callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}function callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof callback==\"function\"){callback(Module);continue}var func=callback.func;if(typeof func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)()}else{wasmTable.get(func)(callback.arg)}}else{func(callback.arg===undefined?null:callback.arg)}}}function _abort(){abort()}function _emscripten_memcpy_big(dest,src,num){HEAPU8.copyWithin(dest,src,src+num)}function _emscripten_get_heap_size(){return HEAPU8.length}function

emscripten_realloc_buffer(size){try{wasmMemory.grow(size-buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return 1}catch(e){}}function _emscripten_resize_heap(requestedSize){var oldSize=_emscripten_get_heap_size();var maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var cutDown=1;cutDown<=4;cutDown*=2){var overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize+100663296);var newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var ret=HEAP32[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function _fd_close(fd){return 0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){}function _fd_write(fd,iov,iovcnt,pnum){var num=0;for(var i=0;i<iovcnt;i++){var ptr=HEAP32[iov+i*8>>2];var len=HEAP32[iov+(i*8+4)>>2];for(var j=0;j<len;j++){SYSCALLS.printChar(fd,HEAPU8[ptr+j])}num+=len}HEAP32[pnum>>2]=num;return 0}function _pthread_create(){return 6}function _pthread_join(){return 28}function setErrNo(value){HEAP32[___errno_location()>>2]=value;return value}function _sysconf(name){switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-1}var asmLibraryArg={\"a\":_abort,\"d\":_emscripten_memcpy_big,\"e\":_emscripten_resize_heap,\"f\":_fd_close,\"c\":_fd_seek,\"b\":_fd_write,\"h\":_pthread_create,\"g\":_pthread_join,\"i\":_sysconf};var asm=createWasm();var ___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=function(){return(___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=Module[\"asm\"][\"k\"]).apply(null,arguments)};var _init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"l\"]).apply(null,arguments)};var _init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Module[\"_init_with_threads_count\"]=Module[\"asm\"][\"m\"]).apply(null,arguments)};var _get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads_count\"]=Module[\"asm\"][\"n\"]).apply(null,arguments)};var _register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=Module[\"asm\"][\"o\"]).apply(null,arguments)};var _dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"asm\"][\"p\"]).apply(null,arguments)};var

_dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"q\"]).apply(null,arguments)};var
_Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"s\"]).apply(null,arguments)};var
_Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"t\"]).apply(null,arguments)};var
_AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"u\"]).apply(null,arguments)};var
_All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"v\"]).apply(null,arguments)};var
_Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"w\"]).apply(null,arguments)};var
_ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"x\"]).apply(null,arguments)};var
_AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"y\"]).apply(null,arguments)};var
_BatchMatMul=Module[\"_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\"_BatchMatMul\"]=Module[\"asm\"][\"z\"]).apply(null,arguments)};var
_Ceil=Module[\"_Ceil\"]=function(){return(_Ceil=Module[\"_Ceil\"]=Module[\"asm\"][\"A\"]).apply(null,arguments)};var
_ClipByValue=Module[\"_ClipByValue\"]=function(){return(_ClipByValue=Module[\"_ClipByValue\"]=Module[\"asm\"][\"B\"]).apply(null,arguments)};var
_Conv2D=Module[\"_Conv2D\"]=function(){return(_Conv2D=Module[\"_Conv2D\"]=Module[\"asm\"][\"C\"]).apply(null,arguments)};var
_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=function(){return(_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var
_Cos=Module[\"_Cos\"]=function(){return(_Cos=Module[\"_Cos\"]=Module[\"asm\"][\"E\"]).apply(null,arguments)};var
_Cosh=Module[\"_Cosh\"]=function(){return(_Cosh=Module[\"_Cosh\"]=Module[\"asm\"][\"F\"]).apply(null,arguments)};var
_CropAndResize=Module[\"_CropAndResize\"]=function(){return(_CropAndResize=Module[\"_CropAndResize\"]=Module[\"asm\"][\"G\"]).apply(null,arguments)};var
_Cumsum=Module[\"_Cumsum\"]=function(){return(_Cumsum=Module[\"_Cumsum\"]=Module[\"asm\"][\"H\"]).apply(null,arguments)};var
_DepthToSpace=Module[\"_DepthToSpace\"]=function(){return(_DepthToSpace=Module[\"_DepthToSpace\"]=Module[\"asm\"][\"I\"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=function(){return(_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=Module[\"asm\"][\"J\"]).apply(null,arguments)};var
_Elu=Module[\"_Elu\"]=function(){return(_Elu=Module[\"_Elu\"]=Module[\"asm\"][\"K\"]).apply(null,arguments)};var
_Equal=Module[\"_Equal\"]=function(){return(_Equal=Module[\"_Equal\"]=Module[\"asm\"][\"L\"]).apply(null,arguments)};var
_Exp=Module[\"_Exp\"]=function(){return(_Exp=Module[\"_Exp\"]=Module[\"asm\"][\"M\"]).apply(null,arguments)};var
_FlipLeftRight=Module[\"_FlipLeftRight\"]=function(){return(_FlipLeftRight=Module[\"_FlipLeftRight\"]=Module[\"asm\"][\"N\"]).apply(null,arguments)};var
_Floor=Module[\"_Floor\"]=function(){return(_Floor=Module[\"_Floor\"]=Module[\"asm\"][\"O\"]).apply(null,arguments)};var

_FloorDiv=Module[\"_FloorDiv\"]=function(){return(_FloorDiv=Module[\"_FloorDiv\"]=Module[\"asm\"][\"P\"]).apply(null,arguments)};var
_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=function(){return(_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=Module[\"asm\"][\"Q\"]).apply(null,arguments)};var
_FusedConv2D=Module[\"_FusedConv2D\"]=function(){return(_FusedConv2D=Module[\"_FusedConv2D\"]=Module[\"asm\"][\"R\"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=function(){return(_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=Module[\"asm\"][\"S\"]).apply(null,arguments)};var
_Gather=Module[\"_Gather\"]=function(){return(_Gather=Module[\"_Gather\"]=Module[\"asm\"][\"T\"]).apply(null,arguments)};var
_GatherNd=Module[\"_GatherNd\"]=function(){return(_GatherNd=Module[\"_GatherNd\"]=Module[\"asm\"][\"U\"]).apply(null,arguments)};var
_Greater=Module[\"_Greater\"]=function(){return(_Greater=Module[\"_Greater\"]=Module[\"asm\"][\"V\"]).apply(null,arguments)};var
_GreaterEqual=Module[\"_GreaterEqual\"]=function(){return(_GreaterEqual=Module[\"_GreaterEqual\"]=Module[\"asm\"][\"W\"]).apply(null,arguments)};var
_LeakyRelu=Module[\"_LeakyRelu\"]=function(){return(_LeakyRelu=Module[\"_LeakyRelu\"]=Module[\"asm\"][\"X\"]).apply(null,arguments)};var
_Less=Module[\"_Less\"]=function(){return(_Less=Module[\"_Less\"]=Module[\"asm\"][\"Y\"]).apply(null,arguments)};var
_LessEqual=Module[\"_LessEqual\"]=function(){return(_LessEqual=Module[\"_LessEqual\"]=Module[\"asm\"][\"Z\"]).apply(null,arguments)};var
_Log=Module[\"_Log\"]=function(){return(_Log=Module[\"_Log\"]=Module[\"asm\"][\"_\"]).apply(null,arguments)};var
_LogicalAnd=Module[\"_LogicalAnd\"]=function(){return(_LogicalAnd=Module[\"_LogicalAnd\"]=Module[\"asm\"][\"$\"]).apply(null,arguments)};var
_Max=Module[\"_Max\"]=function(){return(_Max=Module[\"_Max\"]=Module[\"asm\"][\"aa\"]).apply(null,arguments)};var
_MaxPool=Module[\"_MaxPool\"]=function(){return(_MaxPool=Module[\"_MaxPool\"]=Module[\"asm\"][\"ba\"]).apply(null,arguments)};var
_Maximum=Module[\"_Maximum\"]=function(){return(_Maximum=Module[\"_Maximum\"]=Module[\"asm\"][\"ca\"]).apply(null,arguments)};var
_Mean=Module[\"_Mean\"]=function(){return(_Mean=Module[\"_Mean\"]=Module[\"asm\"][\"da\"]).apply(null,arguments)};var
_Min=Module[\"_Min\"]=function(){return(_Min=Module[\"_Min\"]=Module[\"asm\"][\"ea\"]).apply(null,arguments)};var
_Minimum=Module[\"_Minimum\"]=function(){return(_Minimum=Module[\"_Minimum\"]=Module[\"asm\"][\"fa\"]).apply(null,arguments)};var
_MirrorPad=Module[\"_MirrorPad\"]=function(){return(_MirrorPad=Module[\"_MirrorPad\"]=Module[\"asm\"][\"ga\"]).apply(null,arguments)};var
_Multiply=Module[\"_Multiply\"]=function(){return(_Multiply=Module[\"_Multiply\"]=Module[\"asm\"][\"ha\"]).apply(null,arguments)};var
_Neg=Module[\"_Neg\"]=function(){return(_Neg=Module[\"_Neg\"]=Module[\"asm\"][\"ia\"]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module[\"_NonMaxSuppressionV3\"]=function(){return(_NonMaxSuppressionV3=Module[\"_NonMaxSuppressionV3\"]=Module[\"asm\"][\"ja\"]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module[\"_NonMaxSuppressionV4\"]=function(){return(_NonMaxSuppressionV4=Module[\"_NonMaxSuppressionV4\"]=Module[\"asm\"][\"ka\"]).apply(null,arguments)};var

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_NonMaxSuppressionV5=Module[\"_NonMaxSuppressionV5\"]=function(){return(_NonMaxSuppressionV5=Mod
ule[\"_NonMaxSuppressionV5\"]=Module[\"asm\"][\"la\"]).apply(null,arguments)};var
_NotEqual=Module[\"_NotEqual\"]=function(){return(_NotEqual=Module[\"_NotEqual\"]=Module[\"asm\"][\"ma\"
]).apply(null,arguments)};var
_OneHot=Module[\"_OneHot\"]=function(){return(_OneHot=Module[\"_OneHot\"]=Module[\"asm\"][\"na\"]).appl
y(null,arguments)};var
_PadV2=Module[\"_PadV2\"]=function(){return(_PadV2=Module[\"_PadV2\"]=Module[\"asm\"][\"oa\"]).apply(nul
l,arguments)};var
_Pow=Module[\"_Pow\"]=function(){return(_Pow=Module[\"_Pow\"]=Module[\"asm\"][\"pa\"]).apply(null,argume
nts)};var
_Prelu=Module[\"_Prelu\"]=function(){return(_Prelu=Module[\"_Prelu\"]=Module[\"asm\"][\"qa\"]).apply(null,argu
ments)};var
_Prod=Module[\"_Prod\"]=function(){return(_Prod=Module[\"_Prod\"]=Module[\"asm\"][\"ra\"]).apply(null,argum
ents)};var
_RealDiv=Module[\"_RealDiv\"]=function(){return(_RealDiv=Module[\"_RealDiv\"]=Module[\"asm\"][\"sa\"]).app
ly(null,arguments)};var
_Relu=Module[\"_Relu\"]=function(){return(_Relu=Module[\"_Relu\"]=Module[\"asm\"][\"ta\"]).apply(null,argume
nts)};var
_Relu6=Module[\"_Relu6\"]=function(){return(_Relu6=Module[\"_Relu6\"]=Module[\"asm\"][\"ua\"]).apply(null,ar
guments)};var
_ResizeBilinear=Module[\"_ResizeBilinear\"]=function(){return(_ResizeBilinear=Module[\"_ResizeBilinear\"]=Mo
dule[\"asm\"][\"va\"]).apply(null,arguments)};var
_Reverse=Module[\"_Reverse\"]=function(){return(_Reverse=Module[\"_Reverse\"]=Module[\"asm\"][\"wa\"]).app
ly(null,arguments)};var
_RotateWithOffset=Module[\"_RotateWithOffset\"]=function(){return(_RotateWithOffset=Module[\"_RotateWith
Offset\"]=Module[\"asm\"][\"xa\"]).apply(null,arguments)};var
_Round=Module[\"_Round\"]=function(){return(_Round=Module[\"_Round\"]=Module[\"asm\"][\"ya\"]).apply(nul
l,arguments)};var
_Rsqrt=Module[\"_Rsqrt\"]=function(){return(_Rsqrt=Module[\"_Rsqrt\"]=Module[\"asm\"][\"za\"]).apply(null,arg
uments)};var
_ScatterNd=Module[\"_ScatterNd\"]=function(){return(_ScatterNd=Module[\"_ScatterNd\"]=Module[\"asm\"][\"Aa
\"]).apply(null,arguments)};var
_SelectV2=Module[\"_SelectV2\"]=function(){return(_SelectV2=Module[\"_SelectV2\"]=Module[\"asm\"][\"Ba\"])
.apply(null,arguments)};var
_Sigmoid=Module[\"_Sigmoid\"]=function(){return(_Sigmoid=Module[\"_Sigmoid\"]=Module[\"asm\"][\"Ca\"]).ap
ply(null,arguments)};var
_Sin=Module[\"_Sin\"]=function(){return(_Sin=Module[\"_Sin\"]=Module[\"asm\"][\"Da\"]).apply(null,arguments)
};var
_Softmax=Module[\"_Softmax\"]=function(){return(_Softmax=Module[\"_Softmax\"]=Module[\"asm\"][\"Ea\"]).ap
ply(null,arguments)};var
_Sqrt=Module[\"_Sqrt\"]=function(){return(_Sqrt=Module[\"_Sqrt\"]=Module[\"asm\"][\"Fa\"]).apply(null,argumen
ts)};var
_Square=Module[\"_Square\"]=function(){return(_Square=Module[\"_Square\"]=Module[\"asm\"][\"Ga\"]).apply(n
ull,arguments)};var
_SquaredDifference=Module[\"_SquaredDifference\"]=function(){return(_SquaredDifference=Module[\"_Squared
Difference\"]=Module[\"asm\"][\"Ha\"]).apply(null,arguments)};var
_Step=Module[\"_Step\"]=function(){return(_Step=Module[\"_Step\"]=Module[\"asm\"][\"Ia\"]).apply(null,argume
nts)};var
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_StridedSlice=Module[\"_StridedSlice\"]=function(){return(_StridedSlice=Module[\"_StridedSlice\"]=Module[\"asm\"][\"Ja\"]).apply(null,arguments)};var
_Sub=Module[\"_Sub\"]=function(){return(_Sub=Module[\"_Sub\"]=Module[\"asm\"][\"Ka\"]).apply(null,arguments)};var
_Sum=Module[\"_Sum\"]=function(){return(_Sum=Module[\"_Sum\"]=Module[\"asm\"][\"La\"]).apply(null,arguments)};var
_Tan=Module[\"_Tan\"]=function(){return(_Tan=Module[\"_Tan\"]=Module[\"asm\"][\"Ma\"]).apply(null,arguments)};var
_Tanh=Module[\"_Tanh\"]=function(){return(_Tanh=Module[\"_Tanh\"]=Module[\"asm\"][\"Na\"]).apply(null,arguments)};var
_Tile=Module[\"_Tile\"]=function(){return(_Tile=Module[\"_Tile\"]=Module[\"asm\"][\"Oa\"]).apply(null,arguments)};var
_TopK=Module[\"_TopK\"]=function(){return(_TopK=Module[\"_TopK\"]=Module[\"asm\"][\"Pa\"]).apply(null,arguments)};var
_Transform=Module[\"_Transform\"]=function(){return(_Transform=Module[\"_Transform\"]=Module[\"asm\"][\"Qa\"]).apply(null,arguments)};var
_Transpose=Module[\"_Transpose\"]=function(){return(_Transpose=Module[\"_Transpose\"]=Module[\"asm\"][\"Ra\"]).apply(null,arguments)};var
__FusedMatMul=Module[\"__FusedMatMul\"]=function(){return(__FusedMatMul=Module[\"__FusedMatMul\"]=Module[\"asm\"][\"Sa\"]).apply(null,arguments)};var
_malloc=Module[\"_malloc\"]=function(){return(_malloc=Module[\"_malloc\"]=Module[\"asm\"][\"Ta\"]).apply(null,arguments)};var
_free=Module[\"_free\"]=function(){return(_free=Module[\"_free\"]=Module[\"asm\"][\"Ua\"]).apply(null,arguments)};var
___errno_location=Module[\"___errno_location\"]=function(){return(___errno_location=Module[\"___errno_location\"]=Module[\"asm\"][\"Va\"]).apply(null,arguments)};var
stackSave=Module[\"stackSave\"]=function(){return(stackSave=Module[\"stackSave\"]=Module[\"asm\"][\"Wa\"]).apply(null,arguments)};var
stackRestore=Module[\"stackRestore\"]=function(){return(stackRestore=Module[\"stackRestore\"]=Module[\"asm\"][\"Xa\"]).apply(null,arguments)};var
stackAlloc=Module[\"stackAlloc\"]=function(){return(stackAlloc=Module[\"stackAlloc\"]=Module[\"asm\"][\"Ya\"]).apply(null,arguments)};Module[\"cwrap\"]=cwrap;var calledRun;function
ExitStatus(status){this.name=\"ExitStatus\";this.message=\"Program terminated with
exit(\"+status+\")\";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}preRun();if(runDependencies>0){return}function
doRun(){if(calledRun)return;calledRun=true;Module[\"calledRun\"]=true;if(ABORT)return;initRuntime();preMain();readyPromiseResolve(Module);if(Module[\"onRuntimeInitialized\"])Module[\"onRuntimeInitialized\"]();postRun()}if(Module[\"setStatus\"]){Module[\"setStatus\"](\"Running...\");setTimeout(function(){setTimeout(function(){Module[\"setStatus\"](\"\")},1);doRun()},1)}else{doRun()}}Module[\"run\"]=run;if(Module[\"preInit\"]){if(typeof
Module[\"preInit\"]==\"function\")Module[\"preInit\"]=[Module[\"preInit\"]];while(Module[\"preInit\"].length>0){
Module[\"preInit\"].pop()()}run();\n\n\n return WasmBackendModule.ready\n}\n);\n})();\nif (typeof exports ===
'object' && typeof module === 'object')\n module.exports = WasmBackendModule;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModule; });\nelse if (typeof exports ===
'object')\n exports[\"WasmBackendModule\"] = WasmBackendModule;\n","/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache
 License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You
may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required

```
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========================================================================\n */\nimport './flags_wasm';\n\nimport {backend_util, BackendTimingInfo, DataStorage, DataType, deprecationWarn, engine, env, KernelBackend, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasmModule, WasmFactoryConfig} from '../wasm-out/tfjs-backend-wasm';\nimport {BackendWasmThreadedSimdModule} from '../wasm-out/tfjs-backend-wasm-threaded-simd';\nimport wasmFactoryThreadedSimd from '../wasm-out/tfjs-backend-wasm-threaded-simd.js';\n// @ts-ignore\nimport {wasmWorkerContents} from '../wasm-out/tfjs-backend-wasm-threaded-simd.worker.js';\nimport wasmFactory from '../wasm-out/tfjs-backend-wasm.js';\n\ninterface TensorData {\n  id: number;\n  memoryOffset: number;\n  shape: number[];\n  dtype: DataType;\n  refCount: number;\n  /** Only used for string tensors, storing encoded bytes. */\n  stringBytes?: Uint8Array[];\n}\n\nexport type DataId = object;  // object instead of {} to force non-primitive.\n\nexport class BackendWasm extends KernelBackend {\n  // 0 is reserved for null data ids.\n  private dataIdNextNumber = 1;\n  dataIdMap: DataStorage<TensorData>;\n\n  constructor(public wasm: BackendWasmModule|BackendWasmThreadedSimdModule) {\n    super();\n    this.wasm.tfjs.initWithThreadsCount(threadsCount);\n    actualThreadsCount = this.wasm.tfjs.getThreadsCount();\n    this.dataIdMap = new DataStorage(this, engine());\n  }\n\n  write(values: backend_util.BackendValues, shape: number[], dtype: DataType):\n      DataId {\n    const dataId = {id: this.dataIdNextNumber++};\n    this.move(dataId, values, shape, dtype, 1);\n    return dataId;\n  }\n\n  numDataIds(): number {\n    return this.dataIdMap.numDataIds();\n  }\n\n  async time(f: () => void): Promise<BackendTimingInfo> {\n    const start = util.now();\n    f();\n    const kernelMs = util.now() - start;\n    return {kernelMs};\n  }\n\n  move(\n      dataId: DataId, values: backend_util.BackendValues, shape: number[],\n      dtype: DataType, refCount: number): void {\n    const id = this.dataIdNextNumber++;\n    if (dtype === 'string') {\n      const stringBytes = values as Uint8Array[];\n      this.dataIdMap.set(\n          dataId,\n          {id, stringBytes, shape, dtype, memoryOffset: null, refCount});\n      return;\n    }\n\n    const size = util.sizeFromShape(shape);\n    const numBytes = size * util.bytesPerElement(dtype);\n    const memoryOffset = this.wasm._malloc(numBytes);\n\n    this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount});\n\n    this.wasm.tfjs.registerTensor(id, size, memoryOffset);\n\n    if (values != null) {\n      this.wasm.HEAPU8.set(\n          new Uint8Array(\n              (values as backend_util.TypedArray).buffer,\n              (values as backend_util.TypedArray).byteOffset, numBytes),\n          memoryOffset);\n    }\n  }\n\n  async read(dataId: DataId): Promise<backend_util.BackendValues> {\n    return this.readSync(dataId);\n  }\n\n  readSync(dataId: DataId): backend_util.BackendValues {\n    const {memoryOffset, dtype, shape, stringBytes} =\n        this.dataIdMap.get(dataId);\n    if (dtype === 'string') {\n      return stringBytes;\n    }\n    const bytes = this.wasm.HEAPU8.slice(\n        memoryOffset,\n        memoryOffset + util.sizeFromShape(shape) * util.bytesPerElement(dtype));\n    return typedArrayFromBuffer(bytes.buffer, dtype);\n  }\n\n  /**\n   * Dispose the memory if the dataId has 0 refCount. Return true if the memory\n   * is released, false otherwise.\n   * @param dataId\n   * @oaram force Optional, remove the data regardless of refCount\n   */\n  disposeData(dataId: DataId, force = false): boolean {\n    if (this.dataIdMap.has(dataId)) {\n      const data = this.dataIdMap.get(dataId);\n      data.refCount--;\n      if (!force && data.refCount > 0) {\n        return false;\n      }\n\n      this.wasm._free(data.memoryOffset);\n      this.wasm.tfjs.disposeData(data.id);\n      this.dataIdMap.delete(dataId);\n    }\n    return true;\n  }\n\n  /** Return refCount of a `TensorData`. */\n  refCount(dataId: DataId): number {\n    if (this.dataIdMap.has(dataId)) {\n      const tensorData = this.dataIdMap.get(dataId);\n      return tensorData.refCount;\n    }\n    return 0;\n  }\n\n  incRef(dataId: DataId) {\n    const data = this.dataIdMap.get(dataId);\n    if (data != null) {\n      data.refCount++;\n    }\n  }\n\n  floatPrecision(): 32 {\n    return 32;\n  }\n\n  // Returns the memory offset of a tensor. Useful for debugging and unit\n  // testing.\n  getMemoryOffset(dataId: DataId): number {\n    return this.dataIdMap.get(dataId).memoryOffset;\n  }\n\n  dispose() {\n
```

```
this.wasm.tfjs.dispose();\n    if ('PThread' in this.wasm) {\n      this.wasm.PThread.terminateAllThreads();\n    }\n
this.wasm = null;\n  }\n\n  memory() {\n    return {unreliable: false};\n  }\n\n  /**\n   * Make a tensor info for the
output of an op. If `memoryOffset` is not\n   * present, this method allocates memory on the WASM heap. If
`memoryOffset`\n   * is present, the memory was allocated elsewhere (in c++) and we just record\n   * the pointer
where that memory lives.\n   */\n  makeOutput(shape: number[], dtype: DataType, memoryOffset?: number):\n
TensorInfo {\n    let dataId: {};\n    if (memoryOffset == null) {\n      dataId = this.write(null /* values */, shape,
dtype);\n    } else {\n      const id = this.dataIdNextNumber++;\n      dataId = {id};\n      this.dataIdMap.set(dataId,
{id, memoryOffset, shape, dtype, refCount: 1});\n      const size = util.sizeFromShape(shape);\n
this.wasm.tfjs.registerTensor(id, size, memoryOffset);\n    }\n    return {dataId, shape, dtype};\n  }\n\n
typedArrayFromHeap({shape, dtype, dataId}: TensorInfo):\n      backend_util.TypedArray {\n    const buffer =
this.wasm.HEAPU8.buffer;\n    const {memoryOffset} = this.dataIdMap.get(dataId);\n    const size =
util.sizeFromShape(shape);\n    switch (dtype) {\n      case 'float32':\n        return new Float32Array(buffer,
memoryOffset, size);\n      case 'int32':\n        return new Int32Array(buffer, memoryOffset, size);\n      case 'bool':\n
      return new Uint8Array(buffer, memoryOffset, size);\n      default:\n        throw new Error(`Unknown dtype
${dtype}`);\n    }\n  }\n}\n\nfunction createInstantiateWasmFunc(path: string) {\n  // this will be replace by rollup
plugin patchWechatWebAssembly in\n  // minprogram's output.\n  // tslint:disable-next-line:no-any\n
  return (imports: any, callback: any) => {\n    util.fetch(path, {credentials: 'same-origin'}).then((response) => {\n
if (!response['ok']) {\n        imports.env.a(`failed to load wasm binary file at '${path}'`);\n      }\n
response.arrayBuffer().then(binary => {\n        WebAssembly.instantiate(binary, imports).then(output => {\n
callback(output.instance, output.module);\n        });\n      });\n    });\n    return {};\n  };\n}\n\n/**\n * Returns the
path of the WASM binary.\n * @param simdSupported whether SIMD is supported\n * @param threadsSupported
whether multithreading is supported\n * @param wasmModuleFolder the directory containing the WASM
binaries.\n */\nfunction getPathToWasmBinary(\n    simdSupported: boolean, threadsSupported: boolean,\n
wasmModuleFolder: string) {\n  if (wasmPath != null) {\n    // If wasmPath is defined, the user has supplied a full
path to\n    // the vanilla .wasm binary.\n    return wasmPath;\n  }\n\n  let path: WasmBinaryName
 = 'tfjs-backend-wasm.wasm';\n  if (simdSupported && threadsSupported) {\n    path = 'tfjs-backend-wasm-
threaded-simd.wasm';\n  } else if (simdSupported) {\n    path = 'tfjs-backend-wasm-simd.wasm';\n  }\n\n  if
(wasmFileMap != null) {\n    if (wasmFileMap[path] != null) {\n      return wasmFileMap[path];\n    }\n  }\n\n
return wasmModuleFolder + path;\n}\n\n/**\n * Initializes the wasm module and creates the js <--> wasm bridge.\n
*\n * NOTE: We wrap the wasm module in a object with property 'wasm' instead of\n * returning
Promise<BackendWasmModule> to avoid freezing Chrome (last tested\n * in Chrome 76).\n */\nexport async
function init(): Promise<{wasm: BackendWasmModule}> {\n  const [simdSupported, threadsSupported] = await
Promise.all([\n    env().getAsync('WASM_HAS_SIMD_SUPPORT'),\n
env().getAsync('WASM_HAS_MULTITHREAD_SUPPORT')\n  ]);\n\n  return new Promise((resolve, reject) =>
{\n    const factoryConfig: WasmFactoryConfig = {};\n\n    /**\n     * This function overrides
 the Emscripten module locateFile utility.\n     * @param path The relative path to the file that needs to be loaded.\n
  * @param prefix The path to the main JavaScript file's directory.\n     */\n    factoryConfig.locateFile = (path,
prefix) => {\n      if (path.endsWith('.worker.js')) {\n        const response = wasmWorkerContents;\n        const blob
= new Blob([response], {type: 'application/javascript'});\n        return URL.createObjectURL(blob);\n      }\n\n      if
(path.endsWith('.wasm')) {\n        return getPathToWasmBinary(\n            simdSupported as boolean,
threadsSupported as boolean,\n            wasmPathPrefix != null ? wasmPathPrefix : prefix);\n      }\n      return prefix
+ path;\n    };\n\n    // Use the instantiateWasm override when system fetch is not available.\n    // Reference:\n    //
https://github.com/emscripten-
core/emscripten/blob/2bca083cbbd5a4133db61fbd74d04f7feecfa907/tests/manual_wasm_instantiate.html#L170\n
if (customFetch) {\n
 factoryConfig.instantiateWasm =\n          createInstantiateWasmFunc(getPathToWasmBinary(\n
simdSupported as boolean, threadsSupported as boolean,\n              wasmPathPrefix != null ? wasmPathPrefix :
''));\n    }\n\n    let initialized = false;\n    factoryConfig.onAbort = () => {\n      if (initialized) {\n        // Emscripten
```

already called console.warn so no need to double log.\n return;\n }\n if (initAborted) {\n // Emscripten calls `onAbort` twice, resulting in double error\n // messages.\n return;\n }\n initAborted = true;\n const rejectMsg =\n 'Make sure the server can serve the `.wasm` file relative to the ' +\n 'bundled js file. For more details see https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers';\n reject({message: rejectMsg});\n };\n\n let wasm: Promise<BackendWasmModule>;\n // If `wasmPath` has been defined we must initialize the vanilla module.\n if (threadsSupported && simdSupported && wasmPath == null) {\n factoryConfig.mainScriptUrlOrBlob = new Blob(\n [`var WasmBackendModuleThreadedSimd = ` +\n wasmFactoryThreadedSimd.toString()],\n {type: 'text/javascript'});\n wasm = wasmFactoryThreadedSimd(factoryConfig);\n } else {\n // The wasmFactory works for both vanilla and SIMD binaries.\n wasm = wasmFactory(factoryConfig);\n }\n\n // The WASM module has been successfully created by the factory.\n // Any error will be caught by the onAbort callback defined above.\n wasm.then((module) => {\n initialized = true;\n initAborted = false;\n\n const voidReturnType: string = null;\n // Using the tfjs namespace to avoid conflict with emscripten's API.\n module.tfjs = {\n init: module.cwrap('init', null, []),\n initWithThreadsCount:\n module.cwrap('init_with_threads_count', null, ['number']),\n getThreadsCount: module.cwrap('get_threads_count', 'number', []),\n registerTensor: module.cwrap(\n 'register_tensor', null,\n [\n 'number', // id\n 'number', // size\n 'number', // memoryOffset\n]),\n disposeData: module.cwrap('dispose_data', voidReturnType, ['number']),\n dispose: module.cwrap('dispose', voidReturnType, []),\n };\n\n resolve({wasm: module});\n });\n });\n}\n\nfunction typedArrayFromBuffer(\n buffer: ArrayBuffer, dtype: DataType): backend_util.TypedArray {\n switch (dtype) {\n case 'float32':\n return new Float32Array(buffer);\n case 'int32':\n return new Int32Array(buffer);\n case 'bool':\n return new Uint8Array(buffer);\n default:\n throw new Error(`Unknown dtype ${dtype}`);\n }\n}\n\nconst wasmBinaryNames = [\n 'tfjs-backend-wasm.wasm', 'tfjs-backend-wasm-simd.wasm',\n 'tfjs-backend-wasm-threaded-simd.wasm'\n] as const ;\ntype WasmBinaryName = typeof wasmBinaryNames[number];\n\nlet wasmPath: string = null;\nlet wasmPathPrefix: string = null;\nlet wasmFileMap: {[key in WasmBinaryName]?: string} = {};\nlet initAborted = false;\nlet customFetch = false;\n\n/**\n * @deprecated Use `setWasmPaths` instead.\n * Sets the path to the `.wasm` file which will be fetched when the wasm\n * backend is initialized. See\n * https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n * for more details.\n * @param path wasm file path or url\n * @param usePlatformFetch optional boolean to use platform fetch to download\n * the wasm file, default to false.\n *\n * @doc {heading: 'Environment', namespace: 'wasm'}\n */\nexport function setWasmPath(path: string, usePlatformFetch = false): void {\n deprecationWarn(\n 'setWasmPath has been deprecated in favor of setWasmPaths and' +\n ' will be removed in a future release.');\n if (initAborted) {\n throw new Error(\n 'The WASM backend was already initialized. Make sure you call ' +\n '`setWasmPath()` before you call `tf.setBackend()` or `tf.ready()`');\n }\n wasmPath = path;\n customFetch = usePlatformFetch;\n}\n\n/**\n * Configures the locations of the WASM binaries.\n *\n * ```js\n * setWasmPaths({\n * 'tfjs-backend-wasm.wasm': 'renamed.wasm',\n * 'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n * 'tfjs-backend-wasm-threaded-simd.wasm': 'renamed-threaded-simd.wasm'\n * });\n * tf.setBackend('wasm');\n * ```\n *\n * @param prefixOrFileMap This can be either a string or object:\n * - (string) The path to the directory where the WASM binaries are located.\n * Note that this prefix will be used to load each binary (vanilla,\n * SIMD-enabled, threading-enabled, etc.).\n * - (object) Mapping from names of WASM binaries to custom\n * full paths specifying the locations of those binaries. This is useful if\n * your WASM binaries are not all located in the same directory, or if your\n * WASM binaries have been renamed.\n * @param usePlatformFetch optional boolean to use platform fetch to download\n * the wasm file, default to false.\n *\n * @doc {heading: 'Environment', namespace: 'wasm'}\n */\nexport function setWasmPaths(\n prefixOrFileMap: string|{[key in WasmBinaryName]?: string},\n

usePlatformFetch = false): void {\n if (initAborted) {\n   throw new Error(\n   'The WASM backend was already initialized. Make sure you call ' +\n   '`setWasmPaths()` before you call `tf.setBackend()` or ' +\n   '`tf.ready()`');\n }\n\n if (typeof prefixOrFileMap === 'string') {\n   wasmPathPrefix = prefixOrFileMap;\n } else {\n   wasmFileMap = prefixOrFileMap;\n   const missingPaths =\n   wasmBinaryNames.filter(name => wasmFileMap[name] == null);\n   if (missingPaths.length > 0) {\n   throw new Error(\n   `There were no entries found for the following binaries: ` +\n   `${missingPaths.join(',')}. Please either call setWasmPaths with a ` +\n   `map providing a path for each binary, or with a string indicating ` +\n   `the directory where all the binaries can be found.`);\n   }\n }\n\n customFetch = usePlatformFetch;\n}\n\n/** Used in unit tests. */\nexport function resetWasmPath(): void {\n wasmPath = null;\n wasmPathPrefix = null;\n wasmFileMap = {};\n customFetch = false;\n initAborted = false;\n}\n\nlet threadsCount = -1;\nlet actualThreadsCount = -1;\n\n/**\n * Sets the number of threads that will be used by XNNPACK to create\n * threadpool (default to the number of logical CPU cores).\n *\n * This must be called before calling `tf.setBackend('wasm')`.\n */\nexport function setThreadsCount(numThreads: number) {\n threadsCount = numThreads;\n}\n\n/**\n * Gets the actual threads count that is used by XNNPACK.\n *\n * It is set after the backend is intialized.\n */\nexport function getThreadsCount(): number {\n if (actualThreadsCount === -1) {\n   throw new Error(`WASM backend not initialized.`);\n }\n return actualThreadsCount;\n}\n","export const wasmWorkerContents = 'var Module={};function threadPrintErr(){var text=Array.prototype.slice.call(arguments).join(\" \");console.error(text)}function threadAlert(){var text=Array.prototype.slice.call(arguments).join(\" \");postMessage({cmd:\"alert\",text:text,threadId:Module[\"_pthread_self\"]()})}var err=threadPrintErr;this.alert=threadAlert;Module[\"instantiateWasm\"]=function(info,receiveInstance){var instance=new WebAssembly.Instance(Module[\"wasmModule\"],info);Module[\"wasmModule\"]=null;receiveInstance(instance);return instance.exports};function moduleLoaded(){}this.onmessage=function(e){try{if(e.data.cmd===\"load\"){Module[\"wasmModule\"]=e.data.wasmModule;Module[\"wasmMemory\"]=e.data.wasmMemory;Module[\"buffer\"]=Module[\"wasmMemory\"].buffer;Module[\"ENVIRONMENT_IS_PTHREAD\"]=true;if(typeof e.data.urlOrBlob===\"string\"){importScripts(e.data.urlOrBlob)}else{var objectUrl=URL.createObjectURL(e.data.urlOrBlob);importScripts(objectUrl);URL.revokeObjectURL(objectUrl)}WasmBackendModuleThreadedSimd(Module).then(function(instance){Module=instance;moduleLoaded()})}else if(e.data.cmd===\"objectTransfer\"){Module[\"PThread\"].receiveObjectTransfer(e.data)}else if(e.data.cmd===\"run\"){Module[\"__performance_now_clock_drift\"]=performance.now()-e.data.time;Module[\"__emscripten_thread_init\"](e.data.threadInfoStruct,0,0);var max=e.data.stackBase;var top=e.data.stackBase+e.data.stackSize;Module[\"establishStackSpace\"](top,max);Module[\"_emscripten_tls_init\"]();Module[\"PThread\"].receiveObjectTransfer(e.data);Module[\"PThread\"].setThreadStatus(Module[\"_pthread_self\"](),1);try{var result=Module[\"invokeEntryPoint\"](e.data.start_routine,e.data.arg);if(!Module[\"getNoExitRuntime\"]())Module[\"PThread\"].threadExit(result)}catch(ex){if(ex===\"Canceled!\"){Module[\"PThread\"].threadCancel()}else if(ex!=\"unwind\"){if(ex instanceof Module[\"ExitStatus\"]){if(Module[\"getNoExitRuntime\"]()){}else{Module[\"PThread\"].threadExit(ex.status)}}else{Module[\"PThread\"].threadExit(-2);throw ex}}}}else if(e.data.cmd===\"cancel\"){if(Module[\"_pthread_self\"]()){Module[\"PThread\"].threadCancel()}}else if(e.data.target===\"setimmediate\"){}else if(e.data.cmd===\"processThreadQueue\"){if(Module[\"_pthread_self\"]()){Module[\"_emscripten_current_thread_process_queued_calls\"]()}}else{err(\"worker.js received unknown command \"+e.data.cmd);err(e.data)}}catch(ex){err(\"worker.js onmessage() captured an uncaught exception: \"+ex);if(ex&&ex.stack)err(ex.stack);throw ex}};if(typeof process===\"object\"&&typeof

process.versions===\"object\"&&typeof process.versions.node===\"string\"){self={location:{href:__filename}};var onmessage=this.onmessage;var nodeWorkerThreads=require(\"worker_threads\");global.Worker=nodeWorkerThreads.Worker;var parentPort=nodeWorkerThreads.parentPort;parentPort.on(\"message\",function(data){onmessage({data:data})});var nodeFS=require(\"fs\");var nodeRead=function(filename){return nodeFS.readFileSync(filename,\"utf8\")};function globalEval(x){global.require=require;global.Module=Module;eval.call(null,x)}importScripts=function(f){globalEval(nodeRead(f))};postMessage=function(msg){parentPort.postMessage(msg)};if(typeof performance===\"undefined\"){performance={now:function(){return Date.now()}}}';","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport './flags_wasm';\n\nimport {registerBackend} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm, init} from './backend_wasm';\n\nexport {BackendWasm, getThreadsCount, setThreadsCount, setWasmPath, setWasmPaths} from './backend_wasm';\nexport {version as version_wasm} from './version';\n\nconst WASM_PRIORITY = 2;\nregisterBackend('wasm', async () => {\n const {wasm} = await init();\n return new BackendWasm(wasm);\n}, WASM_PRIORITY);\n","/** @license See the LICENSE file. */\n\n// This code is auto-generated, do not modify this file!\nconst version = '3.11.0';\nexport {version};\n"],"names":["CppDType","FusableActivation","wasmFusedMatMul","fusedMatMulConfig","kernelName","_FusedMatMul","backendName","setupFunc","backend","wasm","cwrap","kernelFunc","args","inputs","attrs","a","b","bias","preluActivationWeights","dtype","Error","transposeA","transposeB","activation","leakyreluAlpha","aId","dataIdMap","get","dataId","id","bId","biasId","biasData","shape","length","preluActivationWeightsId","fusedActivation","leftDim","rightDim","batchDim","out","makeOutput","outId","aShapeBytes","Uint8Array","Int32Array","buffer","bShapeBytes","createUnaryKernelConfig","outType","wasmFunc","x","xId","util","sizeFromShape","absConfig","Abs","createBinaryKernelConfig","supportsFullBroadcast","outputType","newShape","backend_util","assertAndGetBroadcastShape","aBroadcastDims","getBroadcastDims","bBroadcastDims","loopsOverAllOfA","every","v","i","loopsOverAllOfB","addConfig","Add","addNConfig","AddN","inputIds","map","inputIdsBytes","identity","inVals","typedArrayFromHeap","set","wasmTranspose","identityConfig","Identity","transpose","_a","perm","newPerm","push","minValIdx","j","reducedShape","permIsNoOp","outShape","inShape","Array","computeOutShape","cloned","permBytes","xShapeBytes","wasmAll","transposeConfig","Transpose","permuteAxesAndTranspose","axis","xShape","xRank","originalAxes","parseAxisParam","axes","permutedAxes","getAxesPermutation","xTransposed","inputWasTransposed","getInnerMostAxes","transposed","wasmAny","allConfig","All","keepDims","inputId","input","inputRank","assertAxesAreInnerMostDims","_b","reduceShape","reduceSize","disposeData","expandShapeToKeepDim","anyConfig","Any","wasmAvgPool","argMaxConfig","ArgMax","transposedId","slice","outerSize","innerSize","avgPoolConfig","AvgPool","filterSize","strides","pad","dimRoundingMode","convInfo","computePool2DInfo","filterHeight","filterWidth","padTop","padInfo","top","padRight","right","padBottom","bottom","padLeft","left","strideHeight","strideWidth","channels","inChannels","dataFormat","dilationWidth","dilationHeight","reshape","xSize","$shape","inferFromImplicitShape","assert","incRef","wasmBatchMatMul","reshapeConfig","Reshape","batchMatMulConfig","BatchMatMul","aRank","bRank","innerShapeA","innerShapeB","outerShapeA","outerShapeB","outerDimsA","outerDimsB","batchDimA","batchDimB","batchDimsCompatible","concat","b3dShape","a3d","b3d","a3dId","b3dId","Math","max","sliceImpl","vals","begin","size","isContinous","slice_util","isSliceContinous","xStrides","computeStrides","flatOffset","computeFlatOffset","subarray","decodedData","fromUint8ToStringArray","inBuf","outBuf","outLoc","indexToLoc","inLoc","idx","fromStringArrayToUint8","values","begin_","size_","xVals","readSync","outData","stringBytes","res","sliceImplCPU","outVals","rank","xStride","outOffset","beginI","b

eginJ","endI","xOffset","slice2d","xStride1","xStride2","beginK","endJ","slice3d","xStride3","endK","beginL","k","slice4d","sliceConfig","Slice","batchToSpaceNDConfig","BatchToSpaceND","blockShape","crops","prod","reduce","reshaped","getReshaped","permuted","getPermuted","reshapedPermuted","getReshapedPermuted","sliceBeginCoords","getSliceBeginCoords","sliceSize","getSliceSize","xReshaped","result","cast","wasmClip","castConfig","Cast","ceilConfig","Ceil","clipByValueConfig","ClipByValue","clipValueMin","clipValueMax","t","$inputs","filter","shapes","assertParamsConsistent","inputs2D","inputsValShapes","simplyConcat","outVals_1","getArrayFromDType","offset","forEach","colOffset","tIdx","row","resIdx","col","concatImplCPU","finalOutShape","sumInnerDims","innerDims","innerDim","inOffset","wasmConv2d","concatConfig","Concat","wasmConv2DBackpropInput","conv2DConfig","Conv2D","filterId","dilations","$dataFormat","convertConv2DDataFormat","computeConv2DInfo","inputChannels","outputChannels","outChannels","isSamePad","type","InterpolationMethod","wasmCropAndResize","conv2DBackpropInputConfig","Conv2DBackpropInput","dy","inputShape","batchSize","inHeight","inWidth","outHeight","outWidth","topPad","leftPad","isChannelsLast","dxStrides","dyStrides","fltS0","fltS1","fltS2","xBatchStride","xRowStride","xColStride","xChannelStride","yBatchStride","yRowStride","yColStride","yChannelStride","dyId","cosConfig","Cos","coshConfig","Cosh","wasmCumsum","cropAndResizeConfig","CropAndResize","castedData","method","extrapolationValue","cropSize","image","boxes","boxInd","numBoxes","cropHeight","cropWidth","imagesData","imagesId","boxesId","boxIndId","imagesShapeBytes","wasmDepthToSpace","cumsumConfig","Cumsum","exclusive","reverse","permutation","permutedX","permutedAxis","permutedOut","finalDim","permutedXId","permutedOutId","getUndoAxesPermutation","wasmDepthwiseConv2d","depthToSpaceConfig","DepthToSpace","blockSize","outputHeight","outputWidth","outputDepth","outputShape","xStridesBytes","outputShapeBytes","outStridesBytes","depthwiseConv2dNativeConfig","DepthwiseConv2dNative","$dilations","eluConfig","Elu","equalConfig","Equal","expConfig","Exp","expandDims","dim","$dim","splice","expandDimsConfig","ExpandDims","fill","value","wasmFlipLeftRight","fillConfig","Fill","wasmBatchNorm","flipLeftRightConfig","FlipLeftRight","imageId","batch","imageHeight","imageWidth","numChannels","floorConfig","Floor","floorDivConfig","FloorDiv","wasmFusedConv2d","fusedBatchNormConfig","FusedBatchNorm","varianceEpsilon","mean","variance","scale","meanId","varianceId","offsetId","scaleId","wasmFusedDepthwiseConv2d","fusedConv2DConfig","FusedConv2D","wasmGatherNd","fusedDepthwiseConv2DConfig","FusedDepthwiseConv2D","wasmGather","gatherNdConfig","GatherNd","params","indices","resultShape","numSlices","indicesShape","sliceRank","indicesId","stridesBytes","gatherV2Config","GatherV2","batchDims","parsedAxis","indicesVals","axisDim","index","shapeInfo","segment_util","collectGatherOpShapeInfo","flattenX","dimSize","indicesSize","flattenIndex","flattenOutputShape","stridesSize","greaterConfig","Greater","greaterEqualConfig","GreaterEqual","wasmMax","leakyReluConfig","LeakyRelu","alpha","lessConfig","Less","lessEqualConfig","LessEqual","logConfig","Log","logicalAndConfig","LogicalAnd","wasmMaxPool","maxConfig","Max","maximumConfig","Maximum","wasmMean","maxPoolConfig","MaxPool","wasmMin","meanConfig","Mean","reductionAxes","castedInput","MirrorPaddingMode","wasmMirrorPad","minConfig","Min","minimumConfig","Minimum","mirrorPadConfig","MirrorPad","paddings","mode","p","prePaddingsFlat","padTuple","postPaddingsFlat","prePaddingsBytes","postPaddingsBytes","multiplyConfig","Multiply","negConfig","Neg","parseResultStruct","resOffset","HEAPU8","pSelectedIndices","selectedSize","pSelectedScores","pValidOutputs","_free","nonMaxSuppressionV3Config","NonMaxSuppressionV3","iouThreshold","maxOutputSize","scoreThreshold","scores","scoresId","nonMaxSuppressionV4Config","NonMaxSuppressionV4","padToMaxOutputSize","wasmOneHot","nonMaxSuppressionV5Config","NonMaxSuppressionV5","softNmsSigma","notEqualConfig","NotEqual","oneHotConfig","OneHot","depth","onValue","offValue","onesLikeConfig","OnesLike","wasmPadV2","packConfig","Pack","assertShapesMatch","intermediateTensorInfos","expandedT","wasmPrelu","padV2Config","PadV2","constantValue","powConfig","Pow","wasmProd","preluConfig","Prelu","weightsId","wasmResizeBilinear","prodConfig","Prod","rangeConfig","Range","start","stop","step","makeZerosTypedArray","numElements","abs","ceil","rangeImplCPU","realDivConfig","RealDiv","reluConfig","Relu","relu6Config","Relu6","wasmReverse","resizeBilinearConfig","ResizeBilinear","images","alignCorners","halfPixelCenters","newHeight","newWidth","oldHeight","oldWidth","xData","wasmRotate","reverseConfig","Reverse","dims","axesBytes","outShapeBytes","wasmScatterNd","rotateWithOffsetConfig","RotateWithOffset","radians","fillValue","center","centerX","centerY","fillValues","fillBytes","roundConfig","Round","rsqrtConfig","Rsqrt","wasmSelect","scatterNdConfig","ScatterNd","updates","numUpdates","o

utputSize","updatesId","selectConfig","Select","condition","e","conditionId","tId","eId","cRank","tRank","sigmoid Config","Sigmoid","sinConfig","Sin","softmaxConfig","Softmax","logits","spaceToBatchNDConfig","SpaceToBat chND","completePaddings","paddedX","reshapedPaddedShape","permutedReshapedPaddedPermutation","flattenSh ape","paddedXReshaped","paddedXT","wasmStep","splitVConfig","SplitV","numOrSizeSplits","$axis","splitSizes" ,"prepareSplitSize","s","xSliceSize","xSlice","sqrtConfig","Sqrt","squareConfig","Square","squaredDifferenceConfi g","SquaredDifference","wasmStridedSlice","stepConfig","Step","wasmSum","stridedSliceConfig","StridedSlice","," end","beginMask","endMask","ellipsisMask","newAxisMask","shrinkAxisMask","finalShapeSparse","finalShape","," isIdentity","sliceDim0","isSimpleSlice","$begin","$end","$strides","sliced","beginBytes","endBytes","subConfig","," Sub","wasmTile","sumConfig","Sum","tanConfig","Tan","tanhConfig","Tanh","wasmTopK","tileConfig","Tile","re ps","newShapeBytes","wasmTransform","topKConfig","TopK","sorted","outValues","outValuesId","outIndices","o utIndicesId","transformConfig","Transform","fillModeId","transforms","interpolation","fillMode","transformsId","i nterpolationModeId","unpackConfig","Unpack","numOutputs","outIndex","outs","zerosLikeConfig","ZerosLike","," kernelConfigs_1","_i","kernelConfig","registerKernel","ENV","env","registerFlag","WebAssembly","validate","Me ssageChannel","port1","postMessage","SharedArrayBuffer","_scriptDir","WasmBackendModuleThreadedSimd","d ocument","currentScript","src","undefined","__filename","GROWABLE_HEAP_I8","wasmMemory","updateGloba lBufferAndViews","HEAP8","GROWABLE_HEAP_U8","GROWABLE_HEAP_I32","HEAP32","GROWABLE_ HEAP_U32","HEAPU32","GROWABLE_HEAP_F64","HEAPF64","readyPromiseResolve","readyPromiseReject" ,"Module","Promise","resolve","reject","key","moduleOverrides","hasOwnProperty","quit_","status","toThrow","E NVIRONMENT_IS_WEB","ENVIRONMENT_IS_WORKER","ENVIRONMENT_IS_NODE","ENVIRONMEN T_IS_SHELL","window","importScripts","process","versions","node","ENVIRONMENT_IS_PTHREAD","read_", "readAsync","readBinary","nodeFS","nodePath","scriptDirectory","locateFile","path","nodeWorkerThreads","requir e$$0","dirname","__dirname","filename","binary","require$$1","ret","replace","ex","ExitStatus","abort","require$$ 2","console","error","global","Worker","read","f","data","readbuffer","scriptArgs","quit","print","log","warn","print Err","self","location","href","indexOf","substr","lastIndexOf","url","xhr","XMLHttpRequest","open","send","respo nseText","responseType","response","onload","onerror","performance","require$$3","wasmBinary","bind","err","w arnOnce","text","shown","wasmModule","noExitRuntime","ABORT","getCFunc","ident","func","ccall","returnTyp e","argTypes","opts","toC","string","str","len","stringToUTF8","stackAlloc","array","arr","writeArrayToMemory","," cArgs","stack","converter","stackSave","apply","UTF8ToString","Boolean","convertReturnValue","stackRestore","," numericArgs","arguments","UTF8ArrayToString","heap","maxBytesToRead","endIdx","u0","u1","u2","String","fro mCharCode","ch","ptr","stringToUTF8Array","outIdx","maxBytesToWrite","startIdx","u","charCodeAt","outPtr","l engthBytesUTF8","alignUp","multiple","buf","Int8Array","Int16Array","Uint16Array","Uint32Array","Float32Arra y","Float64Array","wasmTable","INITIAL_MEMORY","Memory","initial","maximum","shared","byteLength","__ ATPRERUN__","__ATINIT__","__ATMAIN__","__ATPOSTRUN__","preRun","addOnPreRun","shift","callRunt imeCallbacks","initRuntime","preMain","postRun","addOnPostRun","cb","unshift","___wasm_call_ctors","runDep endencies","dependenciesFulfilled","addRunDependency","removeRunDependency","callback","what","RuntimeEr ror","hasPrefix","prefix","prototype","startsWith","dataURIPrefix","isDataURI","fileURIPrefix","isFileURI","wasm BinaryFile","getBinary","file","getBinaryPromise","fetch","credentials","then","catch","createWasm","info","asmLi braryArg","receiveInstance","instance","module","exports","numWorkersToLoad","PThread","unusedWorkers","w ","loadWasmModuleToWorker","receiveInstantiatedSource","output","instantiateArrayBuffer","receiver","instantiat e","reason","instantiateStreaming","ASM_CONSTS","10520","10538","$0","$1","setTimeout","__emscripten_do_d ispatch_to_thread","initPthreadsJS","callbacks","arg","ERRNO_CODES","EPERM","ENOENT","ESRCH","EINT R","EIO","ENXIO","E2BIG","ENOEXEC","EBADF","ECHILD","EAGAIN","EWOULDBLOCK","ENOMEM","," EACCES","EFAULT","ENOTBLK","EBUSY","EEXIST","EXDEV","ENODEV","ENOTDIR","EISDIR","EINV AL","ENFILE","EMFILE","ENOTTY","ETXTBSY","EFBIG","ENOSPC","ESPIPE","EROFS","EMLINK","EPIP E","EDOM","ERANGE","ENOMSG","EIDRM","ECHRNG","EL2NSYNC","EL3HLT","EL3RST","ELNRNG","," EUNATCH","ENOCSI","EL2HLT","EDEADLK","ENOLCK","EBADE","EBADR","EXFULL","ENOANO","EB ADRQC","EBADSLT","EDEADLOCK","EBFONT","ENOSTR","ENODATA","ETIME","ENOSR","ENONET","," ENOPKG","EREMOTE","ENOLINK","EADV","ESRMNT","ECOMM","EPROTO","EMULTIHOP","EDOTDOT

","EBADMSG","ENOTUNIQ","EBADFD","EREMCHG","ELIBACC","ELIBBAD","ELIBSCN","ELIBMAX","E
LIBEXEC","ENOSYS","ENOTEMPTY","ENAMETOOLONG","ELOOP","EOPNOTSUPP","EPFNOSUPPORT",
"ECONNRESET","ENOBUFS","EAFNOSUPPORT","EPROTOTYPE","ENOTSOCK","ENOPROTOOPT","ESH
UTDOWN","ECONNREFUSED","EADDRINUSE","ECONNABORTED","ENETUNREACH","ENETDOWN","
ETIMEDOUT","EHOSTDOWN","EHOSTUNREACH","EINPROGRESS","EALREADY","EDESTADDRREQ","
EMSGSIZE","EPROTONOSUPPORT","ESOCKTNOSUPPORT","EADDRNOTAVAIL","ENETRESET","EISCO
NN","ENOTCONN","ETOOMANYREFS","EUSERS","EDQUOT","ESTALE","ENOTSUP","ENOMEDIUM","E
ILSEQ","EOVERFLOW","ECANCELED","ENOTRECOVERABLE","EOWNERDEAD","ESTRPIPE","_emscript
en_futex_wake","addr","count","Infinity","mainThreadWaitAddress","Atomics","load","__emscripten_main_thread
_futex","mainThreadWoken","compareExchange","notify","killThread","pthread_ptr","pthread","pthreads","worker
","terminate","freeThreadData","runningWorkers","cancelThread","cmd","cleanupThread","returnWorkerToPool","
_emscripten_get_now","initMainThreadBlock","allocateUnusedWorker","tb","_malloc","headPtr","tlsMemory","sto
re","__emscripten_thread_init","_emscripten_register_main_browser_thread_id","initWorker","threadExitHandlers"
,"setThreadStatus","runExitHandlers","pop","_pthread_self","___pthread_tsd_run_dtors","runExitHandlersAndDein
itThread","exitCode","threadExit","threadCancel","terminateAllThreads","threadInfoStruct","allocatedOwnStack","
stackBase","runWithoutMainThreadQueuedCalls","__emscripten_allow_main_runtime_queued_calls","receiveObje
ctTransfer","onFinishedLoading","onmessage","d","currentProxiedOperationCallerThread","thread","targetThread",
"_emscripten_main_thread_process_queued_calls","spawnThread","loaded","runPthread","alert","exit","target","lin
eno","message","on","urlOrBlob","pthreadMainJs","getNewWorker","busySpinWait","msecs","now","establishStac
kSpace","stackTop","stackMax","_emscripten_stack_set_limits","getNoExitRuntime","invokeEntryPoint","___asser
t_fail","line","___call_main","argc","argv","_main","setErrNo","___errno_location","_atexit","_emscripten_proxy_
to_main_thread_js","__emscripten_notify_thread_queue","targetThreadId","mainThreadId","_abort","_emscripten_
asm_const_int","code","sigPtr","argbuf","readAsmConstArgs","_emscripten_conditional_set_current_thread_status
","expectedStatus","newStatus","_emscripten_futex_wait","val","timeout","tNow","tEnd","exchange","wait","_ems
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r","sync","numCallArgs","serializedNumCallArgs","_emscripten_run_in_main_runtime_thread_js","dateNow","_e
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*/\n\nimport {Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport
{TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function
cast(\n args: {inputs: CastInputs, attrs: CastAttrs, backend: BackendWasm}):\n TensorInfo {\n const {inputs:
{x}, attrs: {dtype}, backend} = args;\n const out = backend.makeOutput(x.shape, dtype);\n const inVals =
backend.typedArrayFromHeap(x);\n const outVals = backend.typedArrayFromHeap(out);\n
outVals.set(inVals);\n return out;\n}\n\nexport const castConfig: KernelConfig = {\n kernelName: Cast,\n
backendName: 'wasm',\n kernelFunc: cast as {} as KernelFunc,\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Cast.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Log.js","sourceRoot":"","sources":["../../src/kernels/Log.ts"],"names":[],"mappings":"AAAA;;;;;
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AC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed
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License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n
 * ==========\n
*/\nimport {KernelConfig, Log} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const logConfig: KernelConfig = createUnaryKernelConfig(Log);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Log.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"NonMaxSuppression_util.js","sourceRoot":"","sources":["../../src/kernels/NonMaxSuppression_
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CAAC,MAAM,EAAE,SAAS,,EAAE,CAAC,CAAC;IACxE,MAAM,gBAAgB,GAAG,MAAM,CAAC,MAAM,CAAC,CAAC,CAAC;IACnC,MAAM,YAAY,GAAG,MAAM,CAAC,MAAM,CAAC,CAAC,CAAC;IAC/B,MAAM,eAAe

*/\n\nimport {BackendWasm} from '../backend_wasm';\n\n// Analogous to `struct Result` in `non_max_suppression_impl.h`.\ninterface Result {\n pSelectedIndices: number;\n selectedSize: number;\n pSelectedScores: number;\n pValidOutputs: number;\n}\n\n/**\n * Parse the result of the c++ method, which has the shape equivalent to\n * `Result`.\n */\nexport function parseResultStruct(\n   backend: BackendWasm, resOffset: number): Result {\n const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);\n const pSelectedIndices
 = result[0];\n const selectedSize = result[1];\n const pSelectedScores = result[2];\n const pValidOutputs = result[3];\n // Since the result was allocated on the heap, we have to delete it.\n backend.wasm._free(resOffset);\n return {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs};\n}\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/NonMaxSuppression_util.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"LessEqual.js","sourceRoot":"","sources":["../../src/kernels/LessEqual.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAe,SAAS,EAAC,MAAM,uBAAuB,CAAC;AAE9D,OAAO,EAAC,wBAAwB,EAAC,MAAM,iBAAiB,CAAC;AACzD,MAAM,qBAAqB,GAAG,KAAK,CAAC;AACpC,MAAM,CAAC,MAAM,eAAe,GAAe,wBAAwB,CAAC,SAAS,EAAE,qBAAqB,EAAE,MAAM,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
 governing permissions and\n * limitations under the License.\n *
==\n*/\n\nimport {KernelConfig, LessEqual} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessEqualConfig: KernelConfig =\n createBinaryKernelConfig(LessEqual, supportsFullBroadcast, 'bool');\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/LessEqual.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Relu6.js","sourceRoot":"","sources":["../../src/kernels/Relu6.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAe,SAAS,EAAC,MAAM,uBAAuB,CAAC;AAE9D,OAAO,EAAC,wBAAwB,EAAC,MAAM,iBAAiB,CAAC;AACzD,MAAM,qBAAqB,GAAG,KAAK,CAAC;AACpC,MAAM,CAAC,MAAM,eAAe,GAAe,wBAAwB,CAAC,SAAS,EAAE,qBAAqB,EAAE,MAAM,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n
 * ==\n*/\nimport {KernelConfig, Relu6} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const relu6Config: KernelConfig = createUnaryKernelConfig(Relu6);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Relu6.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Floor.js","sourceRoot":"","sources":["../../src/kernels/Floor.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;GAeG;AACH,OAAO,EAAC,KAAK,EAAE,MAAM,uBAAuB,CAAC;AAE1D,OAAO,EAAC,uBAAuB,EAAC,MAAM,gBAAgB,CAAC;AACvD,MAAM,CAAC,MAAM,WAAW,GAAG,uBAAuB,CAAC,KAAK,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Floor.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"FlipLeftRight.js","sourceRoot":"","sources":["../../src/kernels/FlipLeftRight.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,KAAK,EAAE,MAAM,uBAAuB,CAAC;AAAC

imageHeight\n 'number', // imageWidth\n 'number', // numChannels\n 'number', // outId\n]);\n}\n\nexport function flipLeftRight(\n args: {inputs: FlipLeftRightInputs, backend: BackendWasm}): TensorInfo {\n const {inputs, backend} = args;\n const {image} = inputs;\n\n const out = backend.makeOutput(image.shape, image.dtype);\n const imageId = backend.dataIdMap.get(image.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n\n wasmFlipLeftRight(\n imageId, batch,
imageHeight, imageWidth, numChannels, outId);\n return out;\n}\n\nexport const flipLeftRightConfig: KernelConfig = {\n kernelName: FlipLeftRight,\n backendName: 'wasm',\n kernelFunc: flipLeftRight as {} as KernelFunc,\n setupFunc: setup\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/FlipLeftRight.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Rsqrt.js","sourceRoot":"","sources":["../../src/kernels/Rsqrt.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;GAeG;AACH,OAAO,EAAe,KAAK,EAAC,MAAM,uBAAuB,CAAC;AAE1D,OAAO,EAAC,uBAAuB,EAAC,MAAM,gBAAgB,CAAC;AACvD,MAAM,CAAC,MAAM,WAAW,GAAG,uBAAuB,CAAC,KAAK,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n
* ===\n */\nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Rsqrt.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"backend_wasm.js","sourceRoot":"","sources":["../src/backend_wasm.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;;GAeG;AACH,OAAO,cAAc,CAAC;AAEtB,OAAO,EAAkC,WAAW,EAAY,eAAe,EAAE,EAAE,MAAM,EAAE,GAAG,EAAE,aAAa,EAAE,IAAI,EAAE,MAAM,uBAAuB,CAAC;AAI5I,OAAO,EAAC,uBAAuB,EAAC,MAAM,gBAAgB,CAAC;AACvD,MAAM,CAAC,MAAM,WAAW,GAAG,uBAAuB,CAAC,KAAK,CAAC,CAAC;AAE1D,OAAO,EAAC,WAAW,EAAE,KAAK,EAAC,MAAM,uBAAuB,CAAC;AACzD,OAAO,EAAC,uBAAuB,EAAC,MAAM,gBAAgB,CAAC;AACvD,MAAM,CAAC,MAAM,WAAW,GAAG,uBAAuB,CAAC,KAAK,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n
* ===\n */\nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n"]}

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CH,CAAC;AAED,MAAM,eAAe,GAAG;IACtB,wBAAwB,EAAE,6BAA6B;IACvD,sCAAsC;CAC9B,CAAE;AAGZ,IAAI,QAAQ,GAAW,IAAI,CAAC;AAC5B,IAAI,cAAc,GAAW,IAAI,CAAC;AAClC,IAAI,WAAW,GAAAuC,EAAE,CAAC;AACzD,IAAI,WAAW,GAAG,KAAK,CAAC;AACxB,IAAI,WAAW,GAAG,KAAK,CAAC;AAExB;;;;;;;;;;GAWG;AACH,MAAM,UAAU,WAAW,CAAC,IAAY,EAAE,gBAAgB,GAAG,KAAK;IAChE,eAAe,CACX,8DAA8D;QAC9D,uCAAuC,CAAC,CAAC;IAC7C,IAAI,WAAW,EAAE;QACf,MAAM,IAAI,KAAK,CACX,+DAA+D;YAC/D,mEAAmE,CAAC,CAAC;KAC1E;IACD,QAAQ,GAAG,IAAI,CAAC;IAChB,IAAI,WAAW,GAAG,KAAK,CAAC;IACxB,IAAI,gBAAgB,EAAE;QACpB,IAAI,CAAC,SAAS,CAAC,IAAI,CAAC,CAAC;KACtB;IACD,IAAI,CAAC,IAAI,CAAC,CAAC;AACb,CAAC;AAED;;;;;;;;;;

```
memoryOffset: null, refCount});\n      return;\n    }\n\n    const size = util.sizeFromShape(shape);\n    const numBytes = size * util.bytesPerElement(dtype);\n    const memoryOffset = this.wasm._malloc(numBytes);\n\n this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount});\n\n    this.wasm.tfjs.registerTensor(id, size, memoryOffset);\n\n    if (values != null) {\n      this.wasm.HEAPU8.set(\n          new Uint8Array(\n              (values as backend_util.TypedArray).buffer,\n              (values as backend_util.TypedArray).byteOffset,
 numBytes),\n          memoryOffset);\n    }\n  }\n\n  async read(dataId: DataId): Promise<backend_util.BackendValues> {\n    return this.readSync(dataId);\n  }\n\n  readSync(dataId: DataId): backend_util.BackendValues {\n    const {memoryOffset, dtype, shape, stringBytes} =\n this.dataIdMap.get(dataId);\n    if (dtype === 'string') {\n      return stringBytes;\n    }\n    const bytes = this.wasm.HEAPU8.slice(\n        memoryOffset,\n        memoryOffset + util.sizeFromShape(shape) * util.bytesPerElement(dtype));\n    return typedArrayFromBuffer(bytes.buffer, dtype);\n  }\n\n  /**\n   * Dispose the memory if the dataId has 0 refCount. Return true if the memory\n   * is released, false otherwise.\n   * @param dataId\n   * @oaram force Optional, remove the data regardless of refCount\n   */\n  disposeData(dataId: DataId, force = false): boolean {\n    if (this.dataIdMap.has(dataId)) {\n      const data = this.dataIdMap.get(dataId);\n data.refCount--;\n
    if (!force && data.refCount > 0) {\n        return false;\n      }\n\n      this.wasm._free(data.memoryOffset);\n this.wasm.tfjs.disposeData(data.id);\n      this.dataIdMap.delete(dataId);\n    }\n    return true;\n  }\n\n  /** Return refCount of a `TensorData`. */\n  refCount(dataId: DataId): number {\n    if (this.dataIdMap.has(dataId)) {\n const tensorData = this.dataIdMap.get(dataId);\n      return tensorData.refCount;\n    }\n    return 0;\n  }\n\n incRef(dataId: DataId) {\n    const data = this.dataIdMap.get(dataId);\n    if (data != null) {\n      data.refCount++;\n }\n  }\n\n  floatPrecision(): 32 {\n    return 32;\n  }\n\n  // Returns the memory offset of a tensor. Useful for debugging and unit\n  // testing.\n  getMemoryOffset(dataId: DataId): number {\n    return this.dataIdMap.get(dataId).memoryOffset;\n  }\n\n  dispose() {\n    this.wasm.tfjs.dispose();\n    if ('PThread' in this.wasm) {\n      this.wasm.PThread.terminateAllThreads();\n    }\n    this.wasm
 = null;\n  }\n\n  memory() {\n    return {unreliable: false};\n  }\n\n  /**\n   * Make a tensor info for the output of an op. If `memoryOffset` is not\n   * present, this method allocates memory on the WASM heap. If `memoryOffset`\n * is present, the memory was allocated elsewhere (in c++) and we just record\n   * the pointer where that memory lives.\n   */\n  makeOutput(shape: number[], dtype: DataType, memoryOffset?: number):\n      TensorInfo {\n    let dataId: {};\n    if (memoryOffset == null) {\n      dataId = this.write(null /* values */, shape, dtype);\n    } else {\n const id = this.dataIdNextNumber++;\n      dataId = {id};\n      this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount: 1});\n      const size = util.sizeFromShape(shape);\n      this.wasm.tfjs.registerTensor(id, size, memoryOffset);\n    }\n    return {dataId, shape, dtype};\n  }\n\n  typedArrayFromHeap({shape, dtype, dataId}: TensorInfo):\n      backend_util.TypedArray {\n    const buffer
 = this.wasm.HEAPU8.buffer;\n    const {memoryOffset} = this.dataIdMap.get(dataId);\n    const size = util.sizeFromShape(shape);\n    switch (dtype) {\n      case 'float32':\n        return new Float32Array(buffer, memoryOffset, size);\n      case 'int32':\n        return new Int32Array(buffer, memoryOffset, size);\n      case 'bool':\n
    return new Uint8Array(buffer, memoryOffset, size);\n      default:\n        throw new Error(`Unknown dtype ${dtype}`);\n    }\n  }\n}\n\nfunction createInstantiateWasmFunc(path: string) {\n  // this will be replace by rollup plugin patchWechatWebAssembly in\n  // minprogram's output.\n  // tslint:disable-next-line:no-any\n  return (imports: any, callback: any) => {\n    util.fetch(path, {credentials: 'same-origin'}).then((response) => {\n      if (!response['ok']) {\n        imports.env.a(`failed to load wasm binary file at '${path}'`);\n      }\n response.arrayBuffer().then(binary => {\n        WebAssembly.instantiate(binary, imports).then(output
 => {\n          callback(output.instance, output.module);\n        });\n      });\n    });\n    return {};\n  };\n}\n\n/**\n * Returns the path of the WASM binary.\n * @param simdSupported whether SIMD is supported\n * @param threadsSupported whether multithreading is supported\n * @param wasmModuleFolder the directory containing the WASM binaries.\n */\nfunction getPathToWasmBinary(\n    simdSupported: boolean, threadsSupported: boolean,\n
 wasmModuleFolder: string) {\n  if (wasmPath != null) {\n    // If wasmPath is defined, the user has supplied a full path to\n    // the vanilla .wasm binary.\n    return wasmPath;\n  }\n\n  let path: WasmBinaryName = 'tfjs-backend-
```

wasm.wasm';\n if (simdSupported && threadsSupported) {\n   path = 'tfjs-backend-wasm-threaded-simd.wasm';\n } else if (simdSupported) {\n   path = 'tfjs-backend-wasm-simd.wasm';\n }\n\n if (wasmFileMap != null) {\n   if (wasmFileMap[path] != null) {\n   return wasmFileMap[path];\n   }\n }\n\n return wasmModuleFolder + path;\n}\n\n/**\n * Initializes the wasm module and creates the js <--> wasm bridge.\n *\n * NOTE: We wrap the wasm module in a object with property 'wasm' instead of\n * returning Promise<BackendWasmModule> to avoid freezing Chrome (last tested\n * in Chrome 76).\n */\nexport async function init(): Promise<{wasm: BackendWasmModule}> {\n const [simdSupported, threadsSupported] = await Promise.all([\n   env().getAsync('WASM_HAS_SIMD_SUPPORT'),\n   env().getAsync('WASM_HAS_MULTITHREAD_SUPPORT')\n]);\n\n return new Promise((resolve, reject) => {\n   const factoryConfig: WasmFactoryConfig = {};\n\n   /**\n   * This function overrides the Emscripten module locateFile utility.\n   * @param path The relative path to the file that needs to be loaded.\n   * @param prefix The path to the main JavaScript file's directory.\n   */\n   factoryConfig.locateFile = (path, prefix) => {\n   if (path.endsWith('.worker.js')) {\n   const response = wasmWorkerContents;\n   const blob = new Blob([response], {type: 'application/javascript'});\n   return URL.createObjectURL(blob);\n   }\n\n   if (path.endsWith('.wasm')) {\n   return getPathToWasmBinary(\n   simdSupported as boolean, threadsSupported as boolean,\n   wasmPathPrefix != null ? wasmPathPrefix : prefix);\n   }\n   return prefix + path;\n   };\n\n   // Use the instantiateWasm override when system fetch is not available.\n   // Reference:\n   // https://github.com/emscripten-core/emscripten/blob/2bca083cbbd5a4133db61fbd74d04f7feecfa907/tests/manual_wasm_instantiate.html#L170\n   if (customFetch) {\n   factoryConfig.instantiateWasm =\n   createInstantiateWasmFunc(getPathToWasmBinary(\n   simdSupported as boolean, threadsSupported as boolean,\n   wasmPathPrefix != null ? wasmPathPrefix : ''));\n   }\n\n   let initialized = false;\n   factoryConfig.onAbort = () => {\n   if (initialized) {\n   // Emscripten already called console.warn so no need to double log.\n   return;\n   }\n   if (initAborted) {\n   // Emscripten calls `onAbort` twice, resulting in double error\n   // messages.\n   return;\n   }\n   initAborted = true;\n   const rejectMsg =\n   'Make sure the server can serve the `.wasm` file relative to the ' +\n   'bundled js file. For more details see https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers';\n   reject({message: rejectMsg});\n   };\n\n   let wasm: Promise<BackendWasmModule>;\n   // If `wasmPath` has been defined we must initialize the vanilla module.\n   if (threadsSupported && simdSupported && wasmPath == null) {\n   factoryConfig.mainScriptUrlOrBlob = new Blob(\n   [`var WasmBackendModuleThreadedSimd = ` +\n   wasmFactoryThreadedSimd.toString()],\n   {type: 'text/javascript'});\n   wasm = wasmFactoryThreadedSimd(factoryConfig);\n   } else {\n   // The wasmFactory works for both vanilla and SIMD binaries.\n   wasm = wasmFactory(factoryConfig);\n   }\n\n   // The WASM module has been successfully created by the factory.\n   // Any error will be caught by the onAbort callback defined above.\n   wasm.then((module) => {\n   initialized = true;\n   initAborted = false;\n\n   const voidReturnType: string = null;\n   // Using the tfjs namespace to avoid conflict with emscripten's API.\n   module.tfjs = {\n   init: module.cwrap('init', null, []),\n   initWithThreadsCount:\n   module.cwrap('init_with_threads_count', null, ['number']),\n   getThreadsCount:\n   module.cwrap('get_threads_count', 'number', []),\n   registerTensor: module.cwrap(\n   'register_tensor', null,\n   [\n   'number', // id\n   'number', // size\n   'number', // memoryOffset\n   ]),\n   disposeData: module.cwrap('dispose_data', voidReturnType,\n   ['number']),\n   dispose: module.cwrap('dispose', voidReturnType, []),\n   };\n\n   resolve({wasm: module});\n   });\n });\n}\n\nfunction typedArrayFromBuffer(\n   buffer: ArrayBuffer, dtype: DataType): backend_util.TypedArray {\n switch (dtype) {\n   case 'float32':\n   return new Float32Array(buffer);\n   case 'int32':\n   return new Int32Array(buffer);\n   case 'bool':\n   return new Uint8Array(buffer);\n   default:\n   throw new Error(`Unknown dtype ${dtype}`);\n }\n}\n\nconst wasmBinaryNames = [\n 'tfjs-backend-wasm.wasm', 'tfjs-backend-wasm-simd.wasm',\n 'tfjs-backend-wasm-threaded-simd.wasm'\n] as const ;\ntype WasmBinaryName = typeof wasmBinaryNames[number];\n\nlet wasmPath: string = null;\nlet wasmPathPrefix:

string = null;\nlet wasmFileMap: {[key in WasmBinaryName]?: string} = {};\nlet initAborted = false;\nlet customFetch = false;\n\n/**\n * @deprecated Use `setWasmPaths` instead.\n * Sets the path to the `.wasm` file which will be fetched
when the wasm\n * backend is initialized. See\n * https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n * for more details.\n * @param path wasm file path or url\n * @param usePlatformFetch optional boolean to use platform fetch to download\n * the wasm file, default to false.\n *\n * @doc {heading: 'Environment', namespace: 'wasm'}\n */\nexport function setWasmPath(path: string, usePlatformFetch = false): void {\n deprecationWarn(\n 'setWasmPath has been deprecated in favor of setWasmPaths and' +\n ' will be removed in a future release.');\n if (initAborted) {\n throw new Error(\n 'The WASM backend was already initialized. Make sure you call ' +\n '`setWasmPath()` before you call `tf.setBackend()` or `tf.ready()`');\n }\n wasmPath = path;\n customFetch = usePlatformFetch;\n}\n\n/**\n * Configures the locations of the WASM binaries.\n *\n * ```js\n * setWasmPaths({\n * 'tfjs-backend-wasm.wasm': 'renamed.wasm',\n
* 'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n * 'tfjs-backend-wasm-threaded-simd.wasm': 'renamed-threaded-simd.wasm'\n * });\n * tf.setBackend('wasm');\n * ```\n *\n * @param prefixOrFileMap This can be either a string or object:\n * - (string) The path to the directory where the WASM binaries are located.\n * Note that this prefix will be used to load each binary (vanilla,\n * SIMD-enabled, threading-enabled, etc.).\n * - (object) Mapping from names of WASM binaries to custom\n * full paths specifying the locations of those binaries. This is useful if\n * your WASM binaries are not all located in the same directory, or if your\n * WASM binaries have been renamed.\n * @param usePlatformFetch optional boolean to use platform fetch to download\n * the wasm file, default to false.\n *\n * @doc {heading: 'Environment', namespace: 'wasm'}\n */\nexport function setWasmPaths(\n prefixOrFileMap: string|{[key in WasmBinaryName]?: string},\n usePlatformFetch
= false): void {\n if (initAborted) {\n throw new Error(\n 'The WASM backend was already initialized. Make sure you call ' +\n '`setWasmPaths()` before you call `tf.setBackend()` or ' +\n '`tf.ready()`');\n }\n\n if (typeof prefixOrFileMap === 'string') {\n wasmPathPrefix = prefixOrFileMap;\n } else {\n wasmFileMap = prefixOrFileMap;\n const missingPaths =\n wasmBinaryNames.filter(name => wasmFileMap[name] == null);\n if (missingPaths.length > 0) {\n throw new Error(\n `There were no entries found for the following binaries: ` +\n `${missingPaths.join(',')}. Please either call setWasmPaths with a ` +\n `map providing a path for each binary, or with a string indicating ` +\n `the directory where all the binaries can be found.`);\n }\n }\n\n customFetch = usePlatformFetch;\n}\n\n/** Used in unit tests. */\nexport function resetWasmPath(): void {\n wasmPath = null;\n wasmPathPrefix = null;\n
wasmFileMap = {};\n customFetch = false;\n initAborted = false;\n}\n\nlet threadsCount = -1;\nlet actualThreadsCount = -1;\n\n/**\n * Sets the number of threads that will be used by XNNPACK to create\n * threadpool (default to the number of logical CPU cores).\n *\n * This must be called before calling `tf.setBackend('wasm')`.\n */\nexport function setThreadsCount(numThreads: number) {\n threadsCount = numThreads;\n}\n\n/**\n * Gets the actual threads count that is used by XNNPACK.\n *\n * It is set after the backend is intialized.\n */\nexport function getThreadsCount(): number {\n if (actualThreadsCount === -1) {\n throw new Error(`WASM backend not initialized.`);\n }\n return actualThreadsCount;\n}\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/backend_wasm.js.map
No license file was found, but licenses were detected in source scan.

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License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the
specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\nimport {KernelConfig, SquaredDifference} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const squaredDifferenceConfig: KernelConfig =\n createBinaryKernelConfig(SquaredDifference, supportsFullBroadcast);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/SquaredDifference.js.map
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No license file was found, but licenses were detected in source scan.

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i++) {\n const xOffset = i * xStride + beginJ;\n outVals.set(xVals.subarray(xOffset, xOffset + size[1]), outOffset);\n outOffset += size[1];\n }\n}\n\nfunction slice3d(\n xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n outVals: backend_util.TypedArray, begin: [number, number, number],\n size: [number, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n for (let i = beginI; i < endI; i++) {\n for (let j = beginJ; j < endJ; j++) {\n const xOffset = i * xStride1 + j * xStride2 + beginK;\n outVals.set(xVals.subarray(xOffset, xOffset + size[2]), outOffset);\n outOffset += size[2];\n }\n }\n}\n\nfunction slice4d(\n xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n xStride3: number, outVals: backend_util.TypedArray,\n begin: [number, number, number, number],\n size: [number, number, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n const endK = beginK + size[2];\n const beginL = begin[3];\n\n for (let i = beginI; i < endI; i++) {\n for (let j = beginJ; j < endJ; j++) {\n for (let k = beginK; k < endK; k++) {\n const xOffset = i * xStride1 + j * xStride2 + k * xStride3 + beginL;\n outVals.set(xVals.subarray(xOffset, xOffset + size[3]), outOffset);\n outOffset += size[3];\n }\n }\n }\n}\n\nexport const sliceConfig: KernelConfig = {\n kernelName: Slice,\n backendName: 'wasm',\n kernelFunc: slice as {} as KernelFunc,\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Slice.js.map
No license file was found, but licenses were detected in source scan.

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'../backend_wasm';\nimport {transpose} from './Transpose';\n\n/**\n * Compute permutation axes and do a transpose if necessary.\n *\n * Used by reduction ops.\n * @param x input TensorInfo\n * @param axis reduction axes\n * @param backend wasm backend instance\n */\nexport function permuteAxesAndTranspose(\n x: TensorInfo, axis: number|number[], backend: BackendWasm): {\n transposed: TensorInfo|null,\n axes: number[],\n originalAxes: number[],\n inputWasTransposed: boolean\n} {\n const xShape = x.shape;\n const xRank = x.shape.length;\n\n const originalAxes = util.parseAxisParam(axis, xShape);\n let axes = originalAxes;\n const permutedAxes = backend_util.getAxesPermutation(axes,
xRank);\n let xTransposed = null;\n let inputWasTransposed = false;\n if (permutedAxes != null) {\n const newShape: number[] = new Array(xRank);\n for (let i = 0; i < newShape.length; i++) {\n newShape[i] = xShape[permutedAxes[i]];\n }\n\n axes = backend_util.getInnerMostAxes(axes.length, xRank);\n xTransposed =\n transpose({inputs: {x}, attrs: {perm: permutedAxes}, backend});\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const transposedId = backend.dataIdMap.get(xTransposed.dataId).id;\n if (transposedId !== xId) {\n inputWasTransposed = true;\n }\n }\n\n return {transposed: xTransposed, originalAxes, axes, inputWasTransposed};\n}\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/kernel_utils.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"TopK.js","sourceRoot":"","sources":["../../src/kernels/TopK.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAuC,IAAI,EAAwB,MAAM,uBAAuB,CAAC;AAGxG,OAAO,EAAC,QAAQ,EAAC,MAAM,SAAS,CAAC;AAEjC,OAAO,EAAC,QAAQ,EAAC,MAAM,SAAS,CAAC;AAElC,OAAO,EAAC,SAAS,EAAC,MAAM,SAAS,CAAC;AAElC,OAAO,EAAC,QAAQ,EAAC,MAAM,SAAS,CAAC;AAEj

/\n\nimport {KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {CppDType} from './types';\n\nlet wasmTopK: (\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number,\n xDtype: CppDType, k: number, sorted: boolean, outValuesId: number,\n outIndicesId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTopK = backend.wasm.cwrap(TopK, null / void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n 'number', // k\n 'bool',
// sorted\n 'number', // outValuesId\n 'number', // outIndicesId\n]);\n}\n\nexport const topk:\n (args: {inputs: TopKInputs, backend: BackendWasm, attrs: TopKAttrs}) =>\n TensorInfo[] | TensorInfo = ({inputs, backend, attrs}) => {\n const {x} = inputs;\n const {k, sorted} = attrs;\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n const outputShape = x.shape.slice();\n outputShape[outputShape.length - 1] = k;\n const outValues = backend.makeOutput(outputShape, x.dtype);\n const outValuesId = backend.dataIdMap.get(outValues.dataId).id;\n const outIndices = backend.makeOutput(outputShape, 'int32');\n const outIndicesId = backend.dataIdMap.get(outIndices.dataId).id;\n\n wasmTopK(\n xId, xShapeBytes, x.shape.length, CppDType[x.dtype], k, sorted,\n outValuesId, outIndicesId);\n\n return [outValues, outIndices];\n };\n\nexport const topKConfig: KernelConfig = {\n kernelName: TopK,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: topk as {} as KernelFunc,\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/TopK.js.map
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* /tfjs-backend-wasm-zip/tfjs-backend-wasm/starter/parcel/index.html
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= attrs;\n const aId = backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n\n let biasId = 0;\n if (bias != null) {\n   const biasData = backend.dataIdMap.get(bias.dataId);\n   if (biasData.shape.length !== 1) {\n   throw new Error(\n   `_FusedMatMul only supports rank-1 bias but got ` +\n   `rank ${biasData.shape.length}.`);\n   }\n   biasId = biasData.id;\n }\n const preluActivationWeightsId = preluActivationWeights == null ?\n   0 :\n   backend.dataIdMap.get(preluActivationWeights.dataId).id;\n const fusedActivation =\n   FusableActivation[activation as {} as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n   throw new Error(\n   `${activation} activation not yet supported for FusedConv2D ` +\n   `in the wasm backend.`);\n }\n\n const leftDim = transposeA ? a.shape[2] : a.shape[1];\n const rightDim = transposeB ? b.shape[1] : b.shape[2];\n const batchDim = a.shape[0];\n\n const out = backend.makeOutput([batchDim, leftDim, rightDim], a.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n\n wasmFusedMatMul(\n   aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n   transposeA, transposeB, fusedActivation, biasId, preluActivationWeightsId,\n   leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedMatMulConfig: KernelConfig = {\n kernelName: _FusedMatMul,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchMatMul as {} as KernelFunc\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/_FusedMatMul.js.map
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* limitations under the License.
* ===
*/

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/src/test_node.ts
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/test_node.d.ts
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No license file was found, but licenses were detected in source scan.

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 * ==\n
*/\nimport {KernelConfig, Relu} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const reluConfig: KernelConfig = createUnaryKernelConfig(Relu);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Relu.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Add.js","sourceRoot":"","sources":["../../src/kernels/Add.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,wBAAwB,EAAC,MAAM,uBAAuB,CAAC;AAExD,OAAO,EAAC,wBAAwB,EAAE,MAAM,iBAAiB,CAAC;AAEzD,MAAM,qBAAqB,GAAG,IAAI,CAAC;AAEnC,MAAM,CAAC,MAAM,SAAS,GAAG,wBAAwB,CAAC,GAAG,EAAE,qBAAqB,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions
 and\n * limitations under the License.\n *
 ==\n
*/\n\nimport {Add, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const addConfig: KernelConfig =\n createBinaryKernelConfig(Add, supportsFullBroadcast);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Add.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"MirrorPad.js","sourceRoot":"","sources":["../../src/kernels/MirrorPad.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,wBAAwB,EAAE,MAAM,iBAAiB,CAAC;AAE1D,MAAM,CAAC,MAAM,eAAe,GAAG,wBAAwB,CAAC,SAAS,EAAE,IAAI,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n
*/\n\nimport {KernelConfig, MirrorPad} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const mirrorPadConfig: KernelConfig = createUnaryKernelConfig(MirrorPad);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/MirrorPad.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Mul.js","sourceRoot":"","sources":["../../src/kernels/Mul.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,wBAAwB,EAAC,MAAM,uBAAuB,CAAC;AAE/D,MAAM,CAAC,MAAM,OAAO,GAAG,wBAAwB,CAAC,GAAG,EAAE,IAAI,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n
*/\n\nimport {KernelConfig, Mul} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nexport const mulConfig: KernelConfig = createBinaryKernelConfig(Mul, false);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Mul.js.map
No license file was found, but licenses were detected in source scan.

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 ==\n
*/\n\nimport {Neg, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const negConfig: KernelConfig = createUnaryKernelConfig(Neg);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Neg.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Pad.js","sourceRoot":"","sources":["../../src/kernels/Pad.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAAE,MAAM,uBAAuB,CAAC;AAEpD,MAAM,CAAC,MAAM,SAAS,GAAG,YAAY,CAAC,GAAG,EAAE,IAAI,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n
*/\n\nimport {Pad, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const padConfig: KernelConfig = createUnaryKernelConfig(Pad);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Pad.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Pad4D.js","sourceRoot":"","sources":["../../src/kernels/Pad4D.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAAE,MAAM,uBAAuB,CAAC;AAEpD,MAAM,CAAC,MAAM,WAAW,GAAG,YAAY,CAAC,KAAK,EAAE,IAAI,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n
*/\n\nimport {Pad4D, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const pad4DConfig: KernelConfig = createUnaryKernelConfig(Pad4D);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Pad4D.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Pow.js","sourceRoot":"","sources":["../../src/kernels/Pow.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,wBAAwB,EAAC,MAAM,uBAAuB,CAAC;AAE/D,MAAM,CAAC,MAAM,OAAO,GAAG,wBAAwB,CAAC,GAAG,EAAE,IAAI,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n
*/\n\nimport {KernelConfig, Pow} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nexport const powConfig: KernelConfig = createBinaryKernelConfig(Pow, false);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Pow.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Prelu.js","sourceRoot":"","sources":["../../src/kernels/Prelu.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,wBAAwB,EAAC,MAAM,uBAAuB,CAAC;AAE/D,MAAM,CAAC,MAAM,UAAU,GAAG,wBAAwB,CAAC,KAAK,EAAE,IAAI,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n
*/\n\nimport {KernelConfig, Prelu} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nexport const preluConfig: KernelConfig = createBinaryKernelConfig(Prelu, false);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Prelu.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Prod.js","sourceRoot":"","sources":["../../src/kernels/Prod.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAAE,MAAM,uBAAuB,CAAC;AAEpD,MAAM,CAAC,MAAM,UAAU,GAAG,YAAY,CAAC,IAAI,EAAE,IAAI,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n
*/\n\nimport {Prod, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const prodConfig: KernelConfig = createUnaryKernelConfig(Prod);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Prod.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Range.js","sourceRoot":"","sources":["../../src/kernels/Range.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,WAAW,EAAE,MAAM,uBAAuB,CAAC;AAEnD,MAAM,CAAC,MAAM,WAAW,GAAG,WAAW,CAAC,KAAK,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n
*/\n\nimport {KernelConfig, Range} from '@tensorflow/tfjs-core';\n\nimport {createRangeKernelConfig} from './range_kernel';\n\nexport const rangeConfig: KernelConfig = createRangeKernelConfig(Range);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Range.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Reciprocal.js","sourceRoot":"","sources":["../../src/kernels/Reciprocal.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAAE,MAAM,uBAAuB,CAAC;AAEpD,MAAM,CAAC,MAAM,YAAY,GAAG,YAAY,CAAC,SAAS,EAAE,IAAI,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n
*/\n\nimport {Reciprocal, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const reciprocalConfig: KernelConfig = createUnaryKernelConfig(Reciprocal);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Reciprocal.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Relu6.js","sourceRoot":"","sources":["../../src/kernels/Relu6.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAAE,MAAM,uBAAuB,CAAC;AAEpD,MAAM,CAAC,MAAM,WAAW,GAAG,YAAY,CAAC,KAAK,EAAE,IAAI,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n
*/\n\nimport {Relu6, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const relu6Config: KernelConfig = createUnaryKernelConfig(Relu6);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Relu6.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Reshape.js","sourceRoot":"","sources":["../../src/kernels/Reshape.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAAE,MAAM,uBAAuB,CAAC;AAEpD,MAAM,CAAC,MAAM,aAAa,GAAG,YAAY,CAAC,OAAO,EAAE,IAAI,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n
*/\n\nimport {Reshape, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const reshapeConfig: KernelConfig = createUnaryKernelConfig(Reshape);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Reshape.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"ResizeBilinear.js","sourceRoot":"","sources":["../../src/kernels/ResizeBilinear.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAAE,MAAM,uBAAuB,CAAC;AAEpD,MAAM,CAAC,MAAM,kBAAkB,GAAG,YAAY,CAAC,YAAY,EAAE,IAAI,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n
*/\n\nimport {ResizeBilinear, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const resizeBilinearConfig: KernelConfig = createUnaryKernelConfig(ResizeBilinear);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/ResizeBilinear.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"ResizeNearestNeighbor.js","sourceRoot":"","sources":["../../src/kernels/ResizeNearestNeighbor.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAAE,MAAM,uBAAuB,CAAC;AAEpD,MAAM,CAAC,MAAM,uBAAuB,GAAG,YAAY,CAAC,iBAAiB,EAAE,IAAI,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n
*/\n\nimport {ResizeNearestNeighbor, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const resizeNearestNeighborConfig: KernelConfig = createUnaryKernelConfig(ResizeNearestNeighbor);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/ResizeNearestNeighbor.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Reverse.js","sourceRoot":"","sources":["../../src/kernels/Reverse.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAAE,MAAM,uBAAuB,CAAC;AAEpD,MAAM,CAAC,MAAM,aAAa,GAAG,YAAY,CAAC,OAAO,EAAE,IAAI,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n
*/\n\nimport {Reverse, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const reverseConfig: KernelConfig = createUnaryKernelConfig(Reverse);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Reverse.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Rsqrt.js","sourceRoot":"","sources":["../../src/kernels/Rsqrt.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAAE,MAAM,uBAAuB,CAAC;AAEpD,MAAM,CAAC,MAAM,WAAW,GAAG,YAAY,CAAC,KAAK,EAAE,IAAI,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n
*/\n\nimport {Rsqrt, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Rsqrt.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Sigmoid.js","sourceRoot":"","sources":["../../src/kernels/Sigmoid.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAAE,MAAM,uBAAuB,CAAC;AAEpD,MAAM,CAAC,MAAM,aAAa,GAAG,YAAY,CAAC,OAAO,EAAE,IAAI,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n
*/\n\nimport {Sigmoid, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const sigmoidConfig: KernelConfig = createUnaryKernelConfig(Sigmoid);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Sigmoid.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Sin.js","sourceRoot":"","sources":["../../src/kernels/Sin.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAAE,MAAM,uBAAuB,CAAC;AAEpD,MAAM,CAAC,MAAM,SAAS,GAAG,YAAY,CAAC,GAAG,EAAE,IAAI,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n
*/\n\nimport {Sin, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Sin.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Slice.js","sourceRoot":"","sources":["../../src/kernels/Slice.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAAE,MAAM,uBAAuB,CAAC;AAEpD,MAAM,CAAC,MAAM,WAAW,GAAG,YAAY,CAAC,KAAK,EAAE,IAAI,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n
*/\n\nimport {Slice, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const sliceConfig: KernelConfig = createUnaryKernelConfig(Slice);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Slice.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Softmax.js","sourceRoot":"","sources":["../../src/kernels/Softmax.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAAE,MAAM,uBAAuB,CAAC;AAEpD,MAAM,CAAC,MAAM,aAAa,GAAG,YAAY,CAAC,OAAO,EAAE,IAAI,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n
*/\n\nimport {Softmax, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const softmaxConfig: KernelConfig = createUnaryKernelConfig(Softmax);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Softmax.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Split.js","sourceRoot":"","sources":["../../src/kernels/Split.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAAE,MAAM,uBAAuB,CAAC;AAEpD,MAAM,CAAC,MAAM,WAAW,GAAG,YAAY,CAAC,KAAK,EAAE,IAAI,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n
*/\n\nimport {Split, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const splitConfig: KernelConfig = createUnaryKernelConfig(Split);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Split.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Sqrt.js","sourceRoot":"","sources":["../../src/kernels/Sqrt.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAAE,MAAM,uBAAuB,CAAC;AAEpD,MAAM,CAAC,MAAM,UAAU,GAAG,YAAY,CAAC,IAAI,EAAE,IAAI,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n
*/\n\nimport {Sqrt, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const sqrtConfig: KernelConfig = createUnaryKernelConfig(Sqrt);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Sqrt.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Square.js","sourceRoot":"","sources":["../../src/kernels/Square.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAAE,MAAM,uBAAuB,CAAC;AAEpD,MAAM,CAAC,MAAM,YAAY,GAAG,YAAY,CAAC,SAAS,EAAE,IAAI,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or

AC,EAAE,CAAC;IACnD,MAAM,WAAW,GAAG,IAAI,UAAU,CAAC,IAAI,UAAU,CAAC,CAAC,CAAC,KAAA
K,CAAC,CAAC,MAAM,CAAC,CAAC;IAEnE,MAAM,eAAe,GAAG,QAAQ,CAAC,GAAG,CAAC,QAAQ,CAA
C,EAAE,CAAC,QAAQ,CAAC,CAAC,CAAC,CAAC,CAAC;IAC9D,MAAM,gBAAgB,GAAG,QAAQ,CAAC,GA
AG,CAAC,QAAQ,CAAC,EAAE,CAAC,QAAQ,CAAC,CAAC,CAAC,CAAC,CAAC;IAC/D,MAAM,gBAAgB,G
AClB,IAAI,UAAU,CAAC,IAAI,UAAU,CAAC,eAAe,CAAC,CAAC,MAAM,CAAC,CAAC;IAC3D,MAAM,iBA
AiB,GACnB,IAAI,UAAU,CAAC,IAAI,UAAU,CAAC,gBAAgB,CAAC,CAAC,MAAM,CAAC,CAAC;IAE5D,aA
Aa,CACT,GAAG,EAAE,WAAW,EAAE,CAAC,CAAC,KAAK,CAAC,MAAM,EAAE,QAAQ,CAAC,CAAC,CA
AC,KAAK,CAAC,EAAE,gBAAgB,EACrE,iBAAiB,EAAE,iBAAiB,CAAC,IAAI,CAAC,EAAE,KAAK,CAAC,C
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AAE,SAAS;IACrB,WAAW,EAAE,MAM;IACnB,UAAU,EAAE,SA6B;IACzC,SAAS,EAAE,KAAK;CACjB,C
AAC","sourcesContent":["/**\n
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law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\n// Must match
enum in MirrorPad.cc\nenum MirrorPaddingMode {\n reflect
 = 0,\n symmetric = 1\n}\n\nlet wasmMirrorPad: (\n   xId: number, xShapeBytes: Uint8Array, xShapeLength:
number, xDtype: number,\n   prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array, mode: number,\n
outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmMirrorPad =
backend.wasm.cwrap(MirrorPad, null /* void */, [\n   'number', // xId\n   'array',   // x.shape\n   'number', //
x.shape.length\n   'number', // x.dtype\n   'array',   // pre-paddings\n   'array',   // post-paddings\n   'number', //
mode\n   'number', // outId\n]);\n}\n\nfunction mirrorPad(args: {\n inputs: MirrorPadInputs,\n backend:
BackendWasm,\n attrs: MirrorPadAttrs\n}) {\n const {inputs: {x}, backend, attrs: {paddings, mode}} = args;\n\n
const outShape = paddings.map(\n   (p, i) => p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n const xId =
backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(outShape, x.dtype);\n const outId =
 backend.dataIdMap.get(out.dataId).id;\n const xShapeBytes = new Uint8Array(new
Int32Array(x.shape).buffer);\n\n const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);\n const
postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n const prePaddingsBytes =\n   new
Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const postPaddingsBytes =\n   new Uint8Array(new
Int32Array(postPaddingsFlat).buffer);\n\n wasmMirrorPad(\n   xId, xShapeBytes, x.shape.length,
CppDType[x.dtype], prePaddingsBytes,\n   postPaddingsBytes, MirrorPaddingMode[mode], outId);\n return
out;\n}\n\nexport const mirrorPadConfig: KernelConfig = {\n kernelName: MirrorPad,\n backendName: 'wasm',\n
kernelFunc: mirrorPad as {} as KernelFunc,\n setupFunc: setup\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/MirrorPad.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"OnesLike.js","sourceRoot":"","sources":["../../src/kernels/OnesLike.ts"],"names":[],"mappings":
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AA

OAAO,CAAC,IAAI,CAAC,CAAC,CAAC,CAAC;IAChB,OAAO,GAAG,CAAC;AACb,CAAC;AAED,MAAM,CAAC,MAAM,cAAc,GAAiB;IAC1C,UAAU,EAAE,QAAQ;IACpB,WAAW,EAAE,MAAM;IACnB,UAAU,EAAE,QAA4B;CACzC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {KernelConfig, KernelFunc, OnesLike, OnesLikeInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nfunction onesLike(args: {inputs: OnesLikeInputs, backend: BackendWasm}) {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(1);\n return out;\n}\n\nexport const onesLikeConfig: KernelConfig = {\n kernelName: OnesLike,\n backendName: 'wasm',\n kernelFunc: onesLike as {} as KernelFunc,\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/OnesLike.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"ClipByValue.js","sourceRoot":"","sources":["../../src/kernels/ClipByValue.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,WAAW,EAAE,MAAM,uBAAuB,CAAC;AAIjH,IAAI,QAAQE,CAAC,QAAQ,CAAC,QAAQ,CAAC,QAAQ

clip(args: {\n inputs: ClipByValueInputs,\n backend: BackendWasm,\n attrs: ClipByValueAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {clipValueMin, clipValueMax} = attrs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmClip(xId, clipValueMin, clipValueMax, outId);\n return out;\n}\n\nexport const clipByValueConfig: KernelConfig = {\n kernelName: ClipByValue,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: clip as {} as KernelFunc\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/ClipByValue.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Sigmoid.js","sourceRoot":"","sources":["../../src/kernels/Sigmoid.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAA2B,OAAO,EAA6B,IAAI,EAAC,MAAM,uBAAuB,CAAC;AAIzG,IAAI,QAAA8C,CAAC;AAEnD,SAAS,KAAK,CAAC,OAAoB;IACjC,QAAQ,GAAG,OAAO,CAAC,IAAI,EAAE,MAAM,EAAE,OAAO,EAAE,MAAM,EAAE,EAAE,CAAC,EAAE,OAAO,EAAE,EAAE,IAAI,EAAE,CAAC,EAAE,UAAU,EAAE,EAAE,CAAC,QAAQ,EAAE,EAAE,QAAQ,EAAE,CAAC,EAAE,CAAC,EAAE,CAAC;AAChF,CAAC;AAED,SAAS,KAAK,CAAC,OAAoB;IAAE,QAAQ,GAAG,OAAO,CAAC,IAAI,EAAE,MAAM,EAAE,OAAO,EAAE,MAAM,EAAE,EAAE,CAAC,EAAE,OAAO,EAAE,EAAE,IAAI,EAAE,CAAC,EAAE,UAAU,EAAE,EAAE,CAAC,QAAQ,EAAE,EAAE,QAAQ,EAAE,CAAC,EAAE,CAAC,EAAE,CAAC;AAAC,CAAC;AAEnK

AC;AAE3B,SAAS,KAAK,CAAC,OAAoB;IACjC,UAAU,GAAG,OAAO,CAAC,IAAI,CAAC,KAAK,CAAC,MAAM,EAAE,IAAI,CAAC,UAAU,EAAE;QACvD,QAAQ;QACR,QAAQ;QACR,QAAQ;QACR,QAAQ,CAAG,SAAS;KACrB,CAAC,CAAC;AACL,CAAC;AAED,SAAS,MAAM,CACX,IAAIsE;IACxE,IACxE,MAAM,EAAC,MAAM,EAAE,OAAO,EAAE,KAAK,EAAE,GAAG,IAAI,CAAC;IACtC,MAAM,EAAC,MAAM,EAAE,OAAO,EAAE,EAAC,GAAG,EAAE,GAAG,EAAC,EAAE,KAAK,EAAE,GAAG,EAAC,GAAG,MAAM,CAAC;IACzD,MAAM,CAAC,MAAM,EAAE,OAAO,EAAE,KAAK,EAAE,GAAG,IAAI,CAAC;IACvC

governing permissions and\n * limitations under the License.\n *
==========\n
*/\nimport {Greater, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterConfig: KernelConfig =\n
createBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Greater.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"FusedBatchNorm.js","sourceRoot":"","sources":["../../src/kernels/FusedBatchNorm.ts"],"names"
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CAAC,IAAIvB;IACC,MAAM,EAAC,OAAO,EAAE,MAAM,EAAE,KAAK,EAAC,GAAG,IAAI,CAAC;IACtC,MA
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hD,UAAU,EAAE,cAAc;CAC3B,CAAC","sourcesContent":["/**\n
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 may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc,
TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet
wasmBatchNorm: (\n   xId: number, meanId: number, varianceId: number, offsetId: number,\n   scaleId: number,
varianceEpsilon: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n
wasmBatchNorm = backend.wasm.cwrap(\n   FusedBatchNorm, null /* void */,\n   ['number',
 'number', 'number', 'number', 'number', 'number', 'number']);\n}\n\nfunction fusedBatchNorm(args: {\n backend:
BackendWasm,\n inputs: FusedBatchNormInputs,\n attrs: FusedBatchNormAttrs\n}): TensorInfo {\n const
{backend, inputs, attrs} = args;\n const {varianceEpsilon} = attrs;\n const {x, mean, variance, offset, scale} =
inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const meanId =

backend.dataIdMap.get(mean.dataId).id;\n const varianceId = backend.dataIdMap.get(variance.dataId).id;\n const offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n const scaleId = scale != null ? backend.dataIdMap.get(scale.dataId).id : 0;\n\n const out = backend.makeOutput(x.shape, x.dtype);\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(x.shape) === 0) {\n   return out;\n }\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmBatchNorm(\n   xId, meanId, varianceId, offsetId, scaleId, varianceEpsilon, outId);\n return
 out;\n}\n\nexport const fusedBatchNormConfig: KernelConfig = {\n kernelName: FusedBatchNorm,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchNorm as {} as KernelFunc\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/FusedBatchNorm.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"LogicalAnd.js","sourceRoot":"","sources":["../../src/kernels/LogicalAnd.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;GAeG;AACH,OAAO,EAAe,UAAU,EAAC,MAAM,uBAAuB,CAAC;AAE/D,OAAO,EAAC,wBAAwB,EAAC,MAAM,iBAAiB,CAAC;AACzD,MAAM,qBAAqB,GAAG,KAAK,CAAC;AACpC,MAAM,CAAC,MAAM,gBAAgB,GAAG,wBAAwB,CAAC,UAAU,EAAE,qBAAqB,EAAE,MAAM,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
 language governing permissions and\n * limitations under the License.\n *
==\n
*/\nimport {KernelConfig, LogicalAnd} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const logicalAndConfig: KernelConfig =\n createBinaryKernelConfig(LogicalAnd, supportsFullBroadcast, 'bool');\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/LogicalAnd.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Minimum.js","sourceRoot":"","sources":["../../src/kernels/Minimum.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;GAeG;AACH,OAAO,EAAe,OAAO,EAAC,MAAM,uBAAuB,CAAC;AAE5D,OAAO,EAAC,wBAAwB,EAAC,MAAM,iBAAiB,CAAC;AACzD,MAAM,qBAAqB,GAAG,KAAK,CAAC;AACpC,MAAM,CAAC,MAAM,cAAc,GAAG,wBAAwB,CAAC,OAAO,EAAE,qBAAqB,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing
 permissions and\n * limitations under the License.\n *
==\n
*/\nimport {KernelConfig, Minimum} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const minimumConfig: KernelConfig =\n createBinaryKernelConfig(Minimum, supportsFullBroadcast);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Minimum.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Step.js","sourceRoot":"","sources":["../../src/kernels/Step.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAA2B,IAAI,EAAoC,MAAM,uBAAuB,CAAC;AAIxG,OAAO,EAAC,QAAQ,EAAC,MAAM,SAAS,CAAC;AAEjC,IAAI,QAAC,CAAC;AAET,SAAS,KAAK,CAAC,OAAoB;IACjC,QAAQ,GAAG,OAAO,CAAC,IAAI,CAAC,KAAK,CAAC,OAAO,EAAE,IAAI,CAAC,CAAC,CAAC

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{FusableActivation} from './types';\n\nlet wasmFusedConv2d:\n (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number,\n biasId: number, padTop: number, padRight: number, padBottom: number,\n padLeft: number, isSamePad: number, dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels: number, activation: number,\n preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedConv2d = backend.wasm.cwrap(FusedConv2D, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // biasId\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // activation\n 'number', // preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number', // outId\n]);\n}\n\nfunction fusedConv2d(args: {\n inputs: FusedConv2DInputs,\n backend: BackendWasm,\n attrs: FusedConv2DAttrs\n}) {\n const {inputs, attrs, backend} = args;\n const {x, filter, bias, preluActivationWeights} = inputs;\n const {\n strides,\n pad,\n dilations,\n dataFormat,\n dimRoundingMode,\n activation,\n leakyreluAlpha\n } = attrs;\n\n const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode);\n\n const fusedActivation =\n FusableActivation[activation as {} as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n throw new Error(\n `${activation} activation not yet supported for FusedConv2D ` +\n `in the wasm backend.`);\n }\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n if (bias != null) {\n const biasData = backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n throw new Error(\n `FusedConv2D only supports rank-1 bias but got ` +\n `rank ${biasData.shape.length}.`);\n }\n if (biasData.shape[0] !== outputChannels) {\n throw new Error(\n `FusedConv2D bias shape (${biasData.shape}) does not ` +\n `match the number of output channels (${outputChannels})`);\n }\n biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize = convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n\n if (dataFormat !== 'NHWC') {\n throw new Error(\n `wasm backend FusedConv2D does not support dataFormat:'` +\n `${dataFormat}'. Please use 'NHWC'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const preluActivationWeightsId = preluActivationWeights == null ?\n 0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedConv2d(\n xId, batchSize, inHeight, inWidth, filterId, filterHeight, filterWidth,\n biasId, padTop, padRight, padBottom, padLeft, isSamePad, dilationHeight,\n dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedConv2DConfig: KernelConfig = {\n kernelName: FusedConv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedConv2d as {} as KernelFunc\n};\n"]}

Found in path(s):
*

/tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/FusedConv2D.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Range.js","sourceRoot":"","sources":["../../src/kernels/Range.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAA2B,KAAK,EAAyB,MAAM,uBAAuB,CAAC;AAG9F,OAAO,EAAC,YAAY,EAAC,MAAM,wBAAwB,CAAC;AAEpD,MAAM,CAAC,MAAM,KAAK,GAAiB;IACjC,YAAY,EAAE,KAAK;IACnB,WAAW,EAAE,KAAK;IAClB,UAAU,EAAE,KAAK;IACjB,aAAa,EAAE,KAAK;IACpB,UAAU,EAAE,KAAK;IACjB,UAAU,EAAE,KAAK;IACjB,UAAU,EAAE,KAAK;IACj

AAK,CAAC,KAAK,KAAK,SAAS,EAAE;QAC7B,UAAU,GAAG,IAAI,CAAC,EAAC,OAAO,EAAE,MAAM,EAAE,EAAC,CAAC,EAAE,KAAK,EAAC,EAAE,KAAK,EAAE,EAAC,KAAK,EAAE,SAAS,EAAC,EAAC,CAAC,CAAC;QAC5E,UAAU,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,UAAU,CAAC,MAAM,CAAC,CAAC;KCvD;IAED,MAAM,QAAQ,GAAG,UAAU,CAAC,EAAE,CAAC;IAC/B,MAAM,OAAO,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,UAAU,CAAC,MAAM,CAAC,CAAC;IACzD,MAAM,MAAM,GAAG,MAAM,CAAC,SAAS,CAAC,GAAG,CAAC,UAAU,CAAC,MAAM,CAAC,CAAC;IACv

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/CropAndResize.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Round.js","sourceRoot":"","sources":["../../src/kernels/Round.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;GAeG;AACH,OAAO,EAAAe,KAAK,EAAC,MAAM,uBAAAuB,CAAC;AAE1D,OAAO,EAAC,uBAAAuB,CAAC,EAAC,MAAM,gBAAAgB,CAAC;AAEvD,MAAM,CAAC,MAAM,WAAW,GAAiB,uBAAuB,CAAC,KAAK,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\nimport {KernelConfig, Round} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Round.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"flags_wasm.js","sourceRoot":"","sources":["../src/flags_wasm.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,uBAAAuB,CAAC,EAAC,MAAM,gBAAAgB,CAAC;AAAA

==========\n*/\n\nimport {env} from '@tensorflow/tfjs-core';\n\nconst ENV = env();\n\n/**\n * True if SIMD is supported.\n */\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag(\n   // This typed array passed in to WebAssembly.validate is WebAssembly binary\n   // code. In this case it is a small program that contains SIMD\n   // instructions.\n   'WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new Uint8Array([\n   0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1,   96, 0, 0, 3,\n   2, 1, 0,   10, 9, 1, 7, 0, 65, 0, 253, 15, 26, 11\n   ])));\n\n/**\n * True if threads are supported.\n */\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag('WASM_HAS_MULTITHREAD_SUPPORT',\n async () => {\n // TODO(annxingyuan): Enable node support once this is resolved:\n // https://github.com/tensorflow/tfjs/issues/3830\n if (ENV.get('IS_NODE')) {\n   return false;\n }\n\n try {\n   // Test for transferability of SABs (needed for Firefox)\n   // https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkBZlHETpA/dwsMNchWEQAJ\n   new MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n   // This typed array is a WebAssembly program containing threaded\n   // instructions.\n   return WebAssembly.validate(new Uint8Array([\n   0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0,   0, 3, 2, 1, 0, 5,\n   4, 1, 3,   1,   1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26, 11\n   ]));\n } catch (e) {\n   return false;\n }\n});\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/flags_wasm.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"index.js","sourceRoot":"","sources":["../src/index.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;GAeG;AAEH,OAAO,wBAAwB,CAAC;AAChC,cAAc,QAAQ,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\n\nimport './register_all_kernels';\nexport\n * from './base';\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/index.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Less.js","sourceRoot":"","sources":["../../src/kernels/Less.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;GAaG;AAEH,OAAO,wBAAwB,CAAC;AAChC,OAAO,EAAE,QAAQ,EAAE,MAAM,uBAAuB,CAAC;AAEjD,OAAO,EAAE,QAAQ,EAAE,MAAM,uBAAuB,CAAC;AAEjD,MAM="","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing

permissions and\n * limitations under the License.\n *
==========\n
*/\nimport {KernelConfig, Less} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessConfig: KernelConfig =\n
createBinaryKernelConfig(Less, supportsFullBroadcast, 'bool');\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Less.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Concat.js","sourceRoot":"","sources":["../../src/kernels/Concat.ts"],"names":[],"mappings":"AA
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batchDim; b++) {\n let outOffset = b * sumInnerDims;\n for (let i = 0; i < inVals.length; i++) {\n const innerDim = innerDims[i];\n const inOffset = b * innerDim;\n const vals = inVals[i].subarray(inOffset, inOffset + innerDim);\n outVals.set(vals, outOffset);\n outOffset += innerDim;\n }\n }\n return out;\n}\n\nexport const concatConfig: KernelConfig = {\n kernelName: Concat,\n backendName: 'wasm',\n kernelFunc: concat as {} as KernelFunc,\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Concat.js.map
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* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
* See the License for the specific language governing permissions and
* limitations under the License.
* ===
*/

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/kernel_utils.js
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/kernel_utils.d.ts
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/src/kernels/kernel_utils.ts
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"NonMaxSuppressionV4.js","sourceRoot":"","sources":["../../src/kernels/NonMaxSuppressionV4.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAA2B,mBAAmB,EAAkE,MAAM,uBAAuB,CAAC;AAIrJ,OAAO,EAAC,iBAAiB,EAAC,MAAM,0BAA0B,CAAC;AAE3D,OAAO,EAAC,mBAAmB,EAAC,MAAM,4BAA4B,CAAC;AAE/

,kBAAkB,GAAG,OAAO,CAAC,UAAU,CAAC,EAAE,EAAE,OAAO,EAAE,aAAa,CAAC,CAAC;IAE1E,OAAO,CAAC,qBAAqB,EAAE,kBAAkB,CAAC,CAAC;AACrD,CAAC;AAED,MAAM,CAAC,MAAM,yBAAyB,GAAiB;IACrD,UAAU,EAAE,mBAAmB;IAC/B,WAAW,EAAE,MAAM;IACnB,SAAS,EAAE,KAAK;IAChB,UAAU,EAAE,mBAAmC;CACpD,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs, NonMaxSuppressionV4Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number,\n padToMaxOutputSize: boolean) => number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n NonMaxSuppressionV4,\n 'number', // Result*\n [\n 'number', // boxesId\n 'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', // scoreThreshold\n 'bool', // padToMaxOutputSize\n]);\n}\n\nfunction nonMaxSuppressionV4(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV4Inputs,\n attrs: NonMaxSuppressionV4Attrs\n}): TensorInfo[] {\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold, padToMaxOutputSize} =\n attrs;\n const {boxes, scores} = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset = wasmFunc(\n boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n padToMaxOutputSize);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V4, we have to delete it from the heap.\n backend.wasm._free(pSelectedScores);\n\n const selectedIndicesTensor =\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n const validOutputsTensor = backend.makeOutput([], 'int32', pValidOutputs);\n\n return [selectedIndicesTensor, validOutputsTensor];\n}\n\nexport const nonMaxSuppressionV4Config: KernelConfig = {\n kernelName: NonMaxSuppressionV4,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: nonMaxSuppressionV4 as {} as KernelFunc,\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/NonMaxSuppressionV4.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"shared.js","sourceRoot":"","sources":["../../src/kernel_utils/shared.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;GAeG;AAEH,uEAAuE;AACvE,gBAAgB;AAChB,iDAAiD;AACjD,OAAO,EAAC,UAAU,EAAC,MAAM,eAAe,CAAC;AAEzC,OAAO,EAAC,aAAa,EAAC,MAAM,kBAAkB,CAAC;AAE/C,OAAO,EAAC,iBAAiB,EAAC,MAAM,sBAAsB,CAAC;AAEvD,OAAO,EAAC,mBAAmB,EAAC,MAAM,wBAAwB,CAAC;AAE3D,OAAO,EAAC,kBAAkB,EAAC,MAAM,uBAAuB,CAAC;AAEzD

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==========\n */\n\n// Import shared functionality from tfjs-backend-cpu without triggering\n// side effects.\n// tslint:disable-next-line: no-imports-from-dist\nimport {concatImpl as concatImplCPU} from '@tensorflow/tfjs-backend-cpu/dist/shared';\n// tslint:disable-next-line: no-imports-from-dist\nimport {sliceImpl as sliceImplCPU} from '@tensorflow/tfjs-backend-cpu/dist/shared';\n// tslint:disable-next-line: no-imports-from-dist\nimport {rangeImpl as rangeImplCPU} from '@tensorflow/tfjs-backend-cpu/dist/shared';\n\nexport {concatImplCPU, rangeImplCPU, sliceImplCPU};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernel_utils/shared.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Max.js","sourceRoot":"","sources":["../../src/kernels/Max.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAA4B,GAAG,EAAmC,IAAI,EAAC,MAAM,uBAAuB,CAAC;AAIzH,OAAO,EAAC,uBAAuB,EAAC,MAAM,gBAAgB,CAAC;AACvD,OAAO,EAAC,QAAQ,EAAC,MAAM,SAAS,CAAC;AAEjC,OAAO,EAAC,KAAK,EAAC,MAAM,SAAS,CAAC;AAE9B,OAAO,EAAC,SAAS,EAAC,MAAM,UAAU,CAAC;AAEnC,OAAO,EAAC,IAAI,EAAC,MAAM,QAAQ,CAAC;AAE5B

*/\n\nimport {backend_util, KernelConfig, KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmMax: (xId: number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMax = backend.wasm.cwrap(Max, null /*void*/, [\n   'number', // x_id\n   'number', // dtype\n   'number', // reduce_size\n   'number', // out_id\n]);\n}\n\nfunction max(args: {backend: BackendWasm, inputs: MaxInputs, attrs: MaxAttrs}):\n   TensorInfo {\n const {backend, inputs, attrs} = args;\n const {reductionIndices: axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n   const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   input = transposed;\n   inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('max', axes, inputRank);\n const [outShape, reduceShape] =\n   backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n   wasmMax(inputId, CppDType[x.dtype], reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n return out;\n}\n\nexport const maxConfig: KernelConfig = {\n kernelName: Max,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: max as {} as KernelFunc\n};\n"]}

Found
 in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Max.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"tf-backend-wasm.es2017.js","sources":["../src/kernels/types.ts","../src/kernels/_FusedMatMul.ts","../src/kernels/unary_kernel.ts","../src/kernels/Abs.ts","../src/kernels/binary_kernel.ts","../src/kernels/Add.ts","../src/kernels/AddN.ts","../src/kernels/Identity.ts","../src/kernels/Transpose.ts","../src/kernels/kernel_utils.ts","../src/kernels/All.ts","../src/kernels/Any.ts","../src/kernels/ArgMax.ts","../src/kernels/AvgPool.ts","../src/kernels/Reshape.ts","../src/kernels/BatchMatMul.ts","../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Concat_impl.js","../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Range_impl.js","../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Slice.js","../src/kernels/Slice.ts","../src/kernels/BatchToSpaceND.ts","../src/kernels/Cast.ts","../src/kernels/Ceil.ts","../src/kernels/ClipByValue.ts","../src/kernels/Concat.ts","../src/kernels/Conv2D.ts","../src/kernels/Conv2DBackpropInput.ts","../src/kernels/Cos.ts","../src/kernels/Cosh.ts","../src/kernels/CropAndResize.ts","../src/kernels/Cumsum.ts","../src/kernels/DepthToSpace.ts","../src/kernels/DepthwiseConv2dNative.ts","../src/kernels/Elu.ts","../src/kernels/Equal.ts","../src/kernels/Exp.ts","../src/kernels/ExpandDims.ts","../src/kernels/Fill.ts","../src/kernels/FlipLeftRight.ts","../src/kernels/Floor.ts","../src/kernels/FloorDiv.ts","../src/kernels/FusedBatchNorm.ts","../src/kernels/FusedConv2D.ts","../src/kernels/FusedDepthwiseConv2D.ts","../src/kernels/GatherNd.ts","../src/kernels/GatherV2.ts","../src/kernels/Greater.ts","../src/kernels/GreaterEqual.ts","../src/kernels/LeakyRelu.ts","../src/kernels/Less.ts","../src/kernels/LessEqual.ts","../src/kernels/Log.ts","../src/kernels/LogicalAnd.ts","../src/kernels/Max.ts","../src/kernels/Maximum.ts","../src/kernels/MaxPool.ts","../src/kernels/Mean.ts","../src/kernels/Min.ts","../src/kernels/Minimum.ts","../src/kernels/MirrorPad.ts","../src/kernels/Multiply.ts","../src/kernels/Neg.ts","../src/kernels/NonMaxSuppression_util.ts","../src/kernels/NonMaxSuppressionV3.ts","../src/kernels/NonMaxSuppressionV4.ts","../src/kernels/NonMaxSuppressionV5.ts","../src/kernels/NotEqual.ts","../src/kernels/OneHot.ts","../src/kernels/OnesLike.ts","../src/kernels/Pack.ts","../src/kernels/PadV2.ts","../src/kernels/Pow.ts","../src/kernels/Prelu.ts","../src/kernels/Prod.ts","../src/kernels/

Range.ts","../src/kernels/RealDiv.ts","../src/kernels/Relu.ts","../src/kernels/Relu6.ts","../src/kernels/ResizeBilinear.ts","../src/kernels/Reverse.ts","../src/kernels/RotateWithOffset.ts","../src/kernels/Round.ts","../src/kernels/Rsqrt.ts","../src/kernels/ScatterNd.ts","../src/kernels/Select.ts","../src/kernels/Sigmoid.ts","../src/kernels/Sin.ts","../src/kernels/Softmax.ts","../src/kernels/SpaceToBatchND.ts","../src/kernels/SplitV.ts","../src/kernels/Sqrt.ts","../src/kernels/Square.ts","../src/kernels/SquaredDifference.ts","../src/kernels/Step.ts","../src/kernels/StridedSlice.ts","../src/kernels/Sub.ts","../src/kernels/Sum.ts","../src/kernels/Tan.ts","../src/kernels/Tanh.ts","../src/kernels/Tile.ts","../src/kernels/TopK.ts","../src/kernels/Transform.ts","../src/kernels/Unpack.ts","../src/kernels/ZerosLike.ts","../src/register_all_kernels.ts","../src/flags_wasm.ts","../wasm-out/tfjs-backend-wasm-threaded-simd.js","../wasm-out/tfjs-backend-wasm-threaded-simd.worker.js","../wasm-out/tfjs-backend-wasm.js","../src/backend_wasm.ts","../src/version.ts","../src/base.ts"],"sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT
WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\n// This enum must align with the enum defined in cc/backend.h.\nexport enum CppDType {\n float32 = 0,\n int32 = 1,\n bool = 2,\n string = 3,\n complex64 = 4\n}\n\n// Must match enum in cc/fusable_activations.h.\nexport enum FusableActivation {\n linear = 0,\n relu = 1,\n relu6 = 2,\n prelu = 3,\n leakyrelu = 4,\n sigmoid = 5,\n elu = 6\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {_FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet wasmFusedMatMul:\n (aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n transposeB: boolean, activation: number, biasId: number,\n preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedMatMul = backend.wasm.cwrap(_FusedMatMul, null /* void */, [\n 'number', // a_id\n 'array', // a_shape\n 'number', // a_shape.length\n 'number', // b_id\n 'array', // b_shape\n 'number', // b_shape.length\n 'number', // transpose_a\n 'number', // transpose_b\n 'number', // activation\n 'number', // biasId\n 'number', // preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number' // out_id\n]);\n}\n\nfunction fusedBatchMatMul(args: {\n inputs: _FusedMatMulInputs,\n backend: BackendWasm,\n attrs: _FusedMatMulAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {a, b, bias, preluActivationWeights} = inputs;\n\n if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n throw new Error(\n `_FusedMatMul for non non-float32 tensors not yet supported.`);\n }\n\n const {transposeA, transposeB, activation, leakyreluAlpha} = attrs;\n const aId = backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n\n let biasId = 0;\n if (bias != null) {\n const biasData = backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n throw new Error(\n `_FusedMatMul only supports rank-1 bias but got ` +\n `rank ${biasData.shape.length}.`);\n }\n biasId = biasData.id;\n }\n const preluActivationWeightsId = preluActivationWeights == null ?\n 0 :

backend.dataIdMap.get(preluActivationWeights.dataId).id;\n const fusedActivation =\n FusableActivation[activation as {} as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n   throw new Error(\n   `${activation} activation not yet supported for FusedConv2D ` +\n   `in the wasm backend.`);\n }\n\n const leftDim = transposeA ? a.shape[2] : a.shape[1];\n const rightDim = transposeB ? b.shape[1] : b.shape[2];\n const batchDim = a.shape[0];\n\n const out = backend.makeOutput([batchDim, leftDim, rightDim], a.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n\n wasmFusedMatMul(\n   aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n   transposeA, transposeB, fusedActivation, biasId, preluActivationWeightsId,\n   leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedMatMulConfig: KernelConfig = {\n kernelName: _FusedMatMul,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchMatMul as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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/\n\nimport {DataType, KernelConfig, TensorInfo, UnaryInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nexport function createUnaryKernelConfig(\n   kernelName: string, outType?: DataType): KernelConfig {\n let wasmFunc: (xId: number, dtype: number, outId: number) => void;\n\n function setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(kernelName, null / void */, [\n   'number', // x_id\n   'number', // dtype\n   'number', // out_id\n   ]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: UnaryInputs}):\n TensorInfo {\n   const {backend, inputs: {x}} = args;\n   const xId = backend.dataIdMap.get(x.dataId).id;\n
    const out = backend.makeOutput(x.shape, outType || x.dtype);\n   const outId =
backend.dataIdMap.get(out.dataId).id;\n\n   // Short-circuit zero-sized tensors.\n   if (util.sizeFromShape(out.shape) === 0) {\n   return out;\n   }\n\n   wasmFunc(xId, CppDType[x.dtype], outId);\n   return out;\n }\n\n return {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions
 and\n * limitations under the License.\n *
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*/\nimport {Abs, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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/\n\nimport {backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nexport function createBinaryKernelConfig(\n kernelName: string, supportsFullBroadcast: boolean,\n dtype?: DataType): KernelConfig {\n let wasmFunc:\n (aId: number, aShape: Uint8Array, aShapeLen: number, bId: number,\n bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) =>\n void;\n\n function setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(kernelName, null / void */, [\n 'number', // a_id,\n 'array', // a_shape\n 'number', // a_shape.length\n 'number', // b_id\n 'array', // b_shape\n 'number', // b_shape.length\n 'number', // dtype\n 'number' // out_id\n]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: BinaryInputs}):\n TensorInfo {\n const {backend, inputs} = args;\n const {a, b} = inputs;\n const aId = backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n\n const outputType = dtype != null ? dtype : a.dtype;\n const newShape = backend_util.assertAndGetBroadcastShape(a.shape, b.shape);\n const out = backend.makeOutput(newShape, outputType);\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(newShape) === 0) {\n return out;\n }\n\n const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const kernelFunc = () => wasmFunc(\n aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n CppDType[a.dtype], outId);\n\n // Currently only some float operations support full broadcast.\n if (supportsFullBroadcast && a.dtype === 'float32') {\n kernelFunc();\n return out;\n }\n\n const aBroadcastDims = backend_util.getBroadcastDims(a.shape, newShape);\n const bBroadcastDims = backend_util.getBroadcastDims(b.shape, newShape);\n const loopsOverAllOfA = aBroadcastDims.every((v, i) => v === i);\n const loopsOverAllOfB = bBroadcastDims.every((v, i) => v === i);\n if (loopsOverAllOfA && loopsOverAllOfB) {\n kernelFunc();\n return out;\n } else {\n throw new Error(\n `Broadcasting along outer dims is not yet ` +\n `supported for ${a.dtype} ${kernelName}.`);\n }\n }\n\n return {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ===\n */\n\nimport {Add, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const addConfig: KernelConfig =\n createBinaryKernelConfig(Add, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ===\n */\n\nimport {AddN, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmFunc:\n (inputIds: Uint8Array, inputIdsLen: number, dtype: number, outId: number) =>\n void;\n\nfunction setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(AddN, null /* void */, [\n 'array', // input_ids\n 'number', // input_ids.length\n 'number', // dtype\n 'number', // out_id\n]);\n}\n\nfunction addn(args: {inputs: TensorInfo[], backend: BackendWasm}) {\n const {inputs,

backend} = args;\n const out = backend.makeOutput(inputs[0].shape, inputs[0].dtype);\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n   return out;\n }\n\n const inputIds = inputs.map(x => backend.dataIdMap.get(x.dataId).id);\n const inputIdsBytes = new Uint8Array(new Int32Array(inputIds).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(inputIdsBytes, inputIds.length, CppDType[out.dtype], outId);\n\n return out;\n}\n\nexport const addNConfig: KernelConfig = {\n kernelName: AddN,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: addn as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function identity(args: {inputs: IdentityInputs, backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const inVals = backend.typedArrayFromHeap(x);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const identityConfig: KernelConfig = {\n kernelName: Identity,\n backendName: 'wasm',\n
  kernelFunc: identity as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {identity} from './Identity';\nimport {CppDType}
 from './types';\n\nlet wasmTranspose: (\n   xId: number, xShape: Uint8Array, xShapeLength: number, dtype: CppDType,\n   outId: number, perm: Uint8Array, permLength: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTranspose = backend.wasm.cwrap(Transpose, null /* void */, [\n   'number', // xId\n   'array',   // x.shape\n   'number', // x.shape.length\n   'number', // dtype\n   'number', // outId\n   'array',   // perm\n   'number', // perm.length\n]);\n}\n\nexport function transpose(\n   args:\n   {inputs: TransposeInputs, backend: BackendWasm, attrs: TransposeAttrs}):\n   TensorInfo {\n const {inputs, backend, attrs} = args;\n // Reduce any dimensions with size one. Lower-rank transpose kernel performs\n // better due to simpler memory access pattern.\n const [reducedShape, perm] = removeOneSizeDims(inputs.x.shape, attrs.perm);\n\n let permIsNoOp = true;\n for (let i = 0; i < perm.length; i++) {\n   if (perm[i] !== i) {\n   permIsNoOp
 = false;\n   }\n }\n const outShape = computeOutShape(inputs.x.shape, attrs.perm);\n const x = {\n   dataId: inputs.x.dataId,\n   shape: reducedShape,\n   dtype: inputs.x.dtype\n };\n\n if (permIsNoOp) {\n   const cloned = identity({inputs, backend});\n   cloned.shape = outShape;\n   return cloned;\n }\n\n const out = backend.makeOutput(outShape, x.dtype);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n const permBytes = new Uint8Array(new Int32Array(perm).buffer);\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n wasmTranspose(\n   xId, xShapeBytes, x.shape.length, CppDType[x.dtype], outId, permBytes,\n   perm.length);\n return out;\n}\n\nfunction computeOutShape(inShape: number[], perm: number[]): number[] {\n const outShape = new

Array(inShape.length);\n for (let i = 0; i < outShape.length; i++) {\n   outShape[i] = inShape[perm[i]];\n }\n return outShape;\n}\n\nfunction
 removeOneSizeDims(\n   shape: number[], perm: number[]): [number[], number[]] {\n const newShape: number[] = [];\n const newPerm: number[] = [];\n for (let i = 0; i < shape.length; ++i) {\n   if (shape[i] !== 1) {\n   newShape.push(shape[i]);\n   }\n   if (shape[perm[i]] !== 1) {\n   newPerm.push(perm[i]);\n   }\n }\n for (let i = 0; i < newPerm.length; ++i) {\n   let minValIdx = -1;\n   for (let j = 0; j < newPerm.length; ++j) {\n   if (newPerm[j] >= i &&\n   (minValIdx === -1 || newPerm[minValIdx] > newPerm[j])) {\n   minValIdx = j;\n   }\n   }\n   newPerm[minValIdx] = i;\n }\n return [newShape, newPerm];\n}\n\nexport const transposeConfig: KernelConfig = {\n kernelName: Transpose,\n backendName: 'wasm',\n kernelFunc: transpose as {} as KernelFunc,\n setupFunc: setup,\n};\n","/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {backend_util, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {transpose} from './Transpose';\n\n/**\n * Compute permutation axes and do a transpose if necessary.\n *\n * Used by reduction ops.\n * @param x input TensorInfo\n * @param axis reduction axes\n * @param backend wasm backend instance\n */\nexport function permuteAxesAndTranspose(\n   x: TensorInfo, axis: number|number[],
 backend: BackendWasm): {\n transposed: TensorInfo|null,\n axes: number[],\n originalAxes: number[],\n inputWasTransposed: boolean\n} {\n const xShape = x.shape;\n const xRank = x.shape.length;\n\n const originalAxes = util.parseAxisParam(axis, xShape);\n let axes = originalAxes;\n const permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n let xTransposed = null;\n let inputWasTransposed = false;\n if (permutedAxes != null) {\n   const newShape: number[] = new Array(xRank);\n   for (let i = 0; i < newShape.length; i++) {\n   newShape[i] = xShape[permutedAxes[i]];\n   }\n\n   axes = backend_util.getInnerMostAxes(axes.length, xRank);\n   xTransposed =\n   transpose({inputs: {x}, attrs: {perm: permutedAxes}, backend});\n\n   const xId = backend.dataIdMap.get(x.dataId).id;\n   const transposedId = backend.dataIdMap.get(xTransposed.dataId).id;\n   if (transposedId !== xId) {\n   inputWasTransposed = true;\n   }\n }\n\n return {transposed:
 xTransposed, originalAxes, axes, inputWasTransposed};\n}\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from
 './kernel_utils';\n\nlet wasmAll: (xId: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmAll = backend.wasm.cwrap(All, null /*void*/, ['number, number, number']);\n}\n\nfunction all(args: {backend: BackendWasm, inputs: AllInputs, attrs: AllAttrs}):\n   TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes,

inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   input = transposed;\n   inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('all', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n wasmAll(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n return out;\n}\n\nexport const allConfig: KernelConfig = {\n kernelName: All,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: all as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmAny: (xId: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmAny = backend.wasm.cwrap(Any, null /*void*/, ['number, number, number']);\n}\n\nfunction any(args: {backend: BackendWasm, inputs: AnyInputs, attrs: AnyAttrs}):\n   TensorInfo {\n const {backend, inputs,\n attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   input = transposed;\n   inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('any', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n wasmAny(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n return out;\n}\n\nexport const anyConfig: KernelConfig = {\n kernelName: Any,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: any as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ===\n */\n\nimport {ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-

core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmFunc: (\n xId: number, dtype: number, outerSize: number, innerSize: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // outer_size\n 'number', // inner_size\n 'number' // out_id\n]);\n}\n\nfunction argmax(\n args: {inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs}) {\n const {backend, inputs, attrs} = args;\n const {axis} = attrs as {} as ArgMaxAttrs;\n const {x} = inputs as {} as ArgMaxInputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let
inputId = xId;\n let input = x;\n\n const {transposed, axes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was not a no-op. We will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n }\n }\n\n const outShape = input.shape.slice(0, -1);\n const out = backend.makeOutput(outShape, 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const outerSize = util.sizeFromShape(out.shape);\n const innerSize = input.shape[axes[0]];\n wasmFunc(inputId, CppDType[input.dtype], outerSize, innerSize, outId);\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n return out;\n}\n\nexport const argMaxConfig: KernelConfig = {\n kernelName: ArgMax,\n backendName: 'wasm',\n
kernelFunc: argmax as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmAvgPool: (\n xId:
number, batchSize: number, inputHeight: number, inputWidth: number,\n filterHeight: number, filterWidth: number, padTop: number, padRight: number,\n padBottom: number, padLeft: number, strideHeight: number,\n strideWidth: number, channels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmAvgPool = backend.wasm.cwrap(AvgPool, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // channels\n 'number', // outId\n]);\n}\n\nfunction avgPool(\n args: {inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs}) {\n const {inputs, attrs, backend} = args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n
const {filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo =
backend_util.computePool2DInfo(\n x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const channels = convInfo.inChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n
throw new Error(\n `wasm backend does not support dataFormat:` +\n `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n throw new Error(\n `was backend only supports average pooling with dilation = [1, 1], `
+\n `got [${convInfo.dilationHeight}, ${convInfo.dilationWidth}].`);\n }\n\n const out =
backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n

wasmAvgPool(\n xId, x.shape[0], x.shape[1], x.shape[2], filterHeight, filterWidth,\n padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels,\n outId);\n return out;\n}\n\nexport const avgPoolConfig: KernelConfig = {\n kernelName: AvgPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: avgPool as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function reshape(\n args: {inputs: ReshapeInputs, attrs: ReshapeAttrs, backend: BackendWasm}) {\n const {inputs, attrs} = args;\n const {x} = inputs;\n const {shape} = attrs;\n\n const xSize = util.sizeFromShape(x.shape);\n const $shape = util.inferFromImplicitShape(shape, xSize);\n\n util.assert(\n xSize === util.sizeFromShape($shape),\n () => `new shape: ${$shape}, old shape: ${x.shape}. New shape and old ` +\n `shape must have the same number of elements.`);\n\n // Backend needs to track refCount
for the dataId for reshape op\n args.backend.incRef(x.dataId);\n return {dataId: x.dataId, shape: $shape, dtype: x.dtype};\n}\n\nexport const reshapeConfig: KernelConfig = {\n kernelName: Reshape,\n backendName: 'wasm',\n kernelFunc: reshape as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport
{BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from './Reshape';\n\nlet wasmBatchMatMul: (\n aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n transposeB: boolean, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul, null /* void */, [\n 'number', // a_id\n 'array', // a_shape\n 'number', // a_shape.length\n 'number', // b_id\n 'array', // b_shape\n 'number', // b_shape.length\n 'number', // transpose_a\n 'number', // transpose_b\n 'number' // out_id\n]);\n}\n\nfunction batchMatMul(args: {\n inputs: BatchMatMulInputs,\n backend: BackendWasm,\n attrs: BatchMatMulAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {a, b} = inputs;\n const
{transposeA, transposeB} = attrs;\n\n if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n throw new Error(\n `BatchMatMul for non non-float32 tensors not yet supported.`);\n }\n\n const aRank = a.shape.length;\n const bRank = b.shape.length;\n\n const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];\n const innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];\n\n const outerShapeA = transposeA ? a.shape[aRank - 1] : a.shape[aRank - 2];\n const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank - 1];\n\n const outerDimsA = a.shape.slice(0, -2);\n const outerDimsB = b.shape.slice(0, -2);\n\n const batchDimA = util.sizeFromShape(outerDimsA);\n const batchDimB = util.sizeFromShape(outerDimsB);\n\n const batchDimsCompatible =\n batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;\n\n

util.assert(\n aRank >= 2 && bRank >= 2 && batchDimsCompatible,\n () => `Error in matMul: the input batch dimensions
must either be the ` +\n `same or at least one input batch dimension must be 1. Got input ` +\n `batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);\n\n const outShapeOuterDims =\n batchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);\n const outShape = outShapeOuterDims.concat([outerShapeA, outerShapeB]);\n\n util.assert(\n innerShapeA === innerShapeB,\n () => `Error in matMul: inner shapes (${innerShapeA}) and (` +\n `${innerShapeB}) of Tensors with shapes ${a.shape} and ` +\n `${b.shape} and transposeA=${transposeA}` +\n ` and transposeB=${transposeB} must match.`);\n\n const a3dShape = transposeA ? [batchDimA, innerShapeA, outerShapeA] :\n [batchDimA, outerShapeA, innerShapeA];\n const b3dShape = transposeB ? [batchDimB, outerShapeB, innerShapeB] :\n [batchDimB, innerShapeB, outerShapeB];\n\n // The rest of the implementation
is designed to operate on rank-3 tensors\n const a3d = reshape({inputs: {x: a}, backend, attrs: {shape: a3dShape}});\n const b3d = reshape({inputs: {x: b}, backend, attrs: {shape: b3dShape}});\n\n const a3dId = backend.dataIdMap.get(a3d.dataId).id;\n const b3dId = backend.dataIdMap.get(b3d.dataId).id;\n\n const leftDim = transposeA ? a3d.shape[2] : a3d.shape[1];\n const rightDim = transposeB ? b3d.shape[1] : b3d.shape[2];\n const batchDim = Math.max(batchDimA, batchDimB);\n\n const out = backend.makeOutput([batchDim, leftDim, rightDim], a3d.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new Uint8Array(new Int32Array(a3d.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b3d.shape).buffer);\n\n wasmBatchMatMul(\n a3dId, aShapeBytes, a3d.shape.length, b3dId, bShapeBytes,\n b3d.shape.length, transposeA, transposeB, outId);\n\n backend.disposeData(a3d.dataId);\n backend.disposeData(b3d.dataId);\n\n out.shape
= outShape;\n return out;\n}\n\nexport const batchMatMulConfig: KernelConfig = {\n kernelName: BatchMatMul,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: batchMatMul as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\nimport { backend_util, util } from '@tensorflow/tfjs-core';\nexport
function concatImpl(inputs, outShape, dtype, simplyConcat) {\n const outVals = util.getArrayFromDType(dtype, util.sizeFromShape(outShape));\n if (simplyConcat && dtype !== 'string') {\n // Use built-in TypedArray.set() method for speed.\n let offset = 0;\n inputs.forEach(input => {\n const size = util.sizeFromShape(input.shape);\n outVals.set(input.vals, offset);\n offset += size;\n });\n }\n else {\n let colOffset = 0;\n inputs.forEach(input => {\n const decodedData = dtype === 'string' ?\n backend_util.fromUint8ToStringArray(input.vals) :\n input.vals;\n let tIdx = 0;\n for (let row = 0; row < input.shape[0]; ++row) {\n const resIdx = row * outShape[1] + colOffset;\n for (let col = 0; col < input.shape[1]; ++col) {\n outVals[resIdx + col] = decodedData[tIdx++];\n }\n }\n colOffset += input.shape[1];\n });\n }\n return outVals;\n}\n//# sourceMappingURL=data:application/json; base64,eyJ2ZXJzaW9uIjozLCJmaWxlIjoiQ29uY2F0X2ltcGwuanMiLCJzb3VyY2VSb290IjoiIiwic291cmNlcyI6WyIuLi8uLi8uLi8uLi8uLi8uLi90ZmpzLWJhY2tlbmQtY3B1L3NyYy9rZXJuZWxzL0NvbmNhdF9pbXBsLnRzIl0sIm5hbWVzIjpbXSwibWFwcGluZ3MiOiJBQUFBOzs7Ozs7Ozs7Ozs7R0FlRztBQUVILE9BQU8sRUFBRSxZQUFZLEVBQUUsSUFBSSxFQUFFLE1BQU0sdUJBQXVCLENBQUM7QUFFM0QsTUFBTSxVQUFVLFVBQVUsQ0FBQyxNQUFNLEVBQUUsUUFBUSxFBBRTlsGLE1BQU0sVUFBVSxVBBVSxxVQUFVVLENBQ3RCQ3RCLE1BQU0sVUFBVUFBRTlsGLE1BQU0sVUFBVUFBRTlsGLE1BQU0sVUFBVUFBRTlsG

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size_);\n const xVals = backend.readSync(x.dataId);\n const out = backend.makeOutput(size_, x.dtype);\n const xStrides = util.computeStrides(x.shape);\n const outData = backend.dataIdMap.get(out.dataId);\n\n if (isContinous) {\n   const flatOffset = slice_util.computeFlatOffset(begin_, xStrides);\n\n   if (x.dtype === 'string') {\n   outData.stringBytes =\n   (xVals as Uint8Array[])\n   .slice(flatOffset, flatOffset + util.sizeFromShape(size_));\n   } else {\n   const outVals = backend.typedArrayFromHeap(out);\n   outVals.set(\n   (xVals as TypedArray)\n   .subarray(flatOffset, flatOffset + util.sizeFromShape(size_)));\n   }\n\n   return out;\n }\n\n if (x.dtype === 'string') {\n   const res = sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype);\n   outData.stringBytes = res as Uint8Array[];\n   return out;\n }\n\n const outVals = backend.typedArrayFromHeap(out);\n const rank = x.shape.length;\n if (rank === 2) {\n   slice2d(\n   xVals as TypedArray, xStrides[0], outVals, begin_ as [number, number],\n   size_ as [number, number]);\n } else if (rank === 3) {\n   slice3d(\n   xVals as TypedArray, xStrides[0], xStrides[1], outVals,\n   begin_ as [number, number, number], size_ as [number, number, number]);\n } else if (rank === 4) {\n   slice4d(\n   xVals as TypedArray, xStrides[0], xStrides[1], xStrides[2], outVals,\n   begin_ as [number, number, number, number],\n   size_ as [number, number, number, number]);\n } else {\n   const res =\n   sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype) as TypedArray;\n   outVals.set(res);\n }\n\n return out;\n}\n\nfunction slice2d(\n   xVals: backend_util.TypedArray, xStride: number,\n   outVals: backend_util.TypedArray, begin: [number, number],\n   size: [number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n const endI = beginI + size[0];\n for (let i = beginI; i < endI; i++) {\n   const xOffset = i * xStride + beginJ;\n   outVals.set(xVals.subarray(xOffset, xOffset + size[1]), outOffset);\n   outOffset += size[1];\n }\n}\n\nfunction slice3d(\n   xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n   outVals: backend_util.TypedArray, begin: [number, number, number],\n   size: [number, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n for (let i = beginI; i < endI; i++) {\n   for (let j = beginJ; j < endJ; j++) {\n   const xOffset = i * xStride1 + j * xStride2 + beginK;\n   outVals.set(xVals.subarray(xOffset, xOffset + size[2]), outOffset);\n   outOffset += size[2];\n   }\n }\n}\n\nfunction slice4d(\n   xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n   xStride3: number, outVals: backend_util.TypedArray,\n   begin: [number, number, number, number],\n   size: [number, number, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n const endK = beginK + size[2];\n const beginL = begin[3];\n\n for (let i = beginI; i < endI; i++) {\n   for (let j = beginJ; j < endJ; j++) {\n   for (let k = beginK; k < endK; k++) {\n   const xOffset = i * xStride1 + j * xStride2 + k * xStride3 + beginL;\n   outVals.set(xVals.subarray(xOffset, xOffset + size[3]), outOffset);\n   outOffset += size[3];\n   }\n   }\n }\n}\n\nexport const sliceConfig: KernelConfig = {\n kernelName: Slice,\n backendName: 'wasm',\n kernelFunc: slice as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed\n under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from './Reshape';\nimport {slice} from './Slice';\nimport {transpose} from './Transpose';\n\nfunction batchToSpaceND(args: {\n inputs: BatchToSpaceNDInputs,\n backend: BackendWasm,\n attrs:

BatchToSpaceNDAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {blockShape, crops} = attrs;\n\n const prod = blockShape.reduce((a, b) => a * b);\n\n const reshaped = backend_util.getReshaped(x.shape, blockShape, prod);\n const permuted = backend_util.getPermuted(reshaped.length, blockShape.length);\n const reshapedPermuted =\n backend_util.getReshapedPermuted(x.shape, blockShape, prod);\n const sliceBeginCoords =\n backend_util.getSliceBeginCoords(crops, blockShape.length);\n const sliceSize =\n backend_util.getSliceSize(reshapedPermuted, crops, blockShape.length);\n\n const xReshaped = reshape({inputs: {x}, backend, attrs: {shape: reshaped}});\n const xTransposed =\n   transpose({inputs: {x: xReshaped}, backend, attrs: {perm: permuted}});\n const xTransposedReshaped = reshape(\n   {inputs: {x: xTransposed}, backend, attrs: {shape: reshapedPermuted}});\n const result = slice({\n   inputs: {x: xTransposedReshaped},\n   backend,\n attrs: {begin: sliceBeginCoords, size: sliceSize}\n });\n\n backend.disposeData(xReshaped.dataId);\n backend.disposeData(xTransposed.dataId);\n backend.disposeData(xReshaped.dataId);\n\n return result;\n}\n\nexport const batchToSpaceNDConfig: KernelConfig = {\n kernelName: BatchToSpaceND,\n backendName: 'wasm',\n kernelFunc: batchToSpaceND as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==*/\n\nimport {Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function cast(\n   args: {inputs: CastInputs, attrs: CastAttrs, backend: BackendWasm}):\n   TensorInfo {\n const {inputs: {x}, attrs: {dtype}, backend} = args;\n const out = backend.makeOutput(x.shape, dtype);\n const inVals = backend.typedArrayFromHeap(x);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const castConfig: KernelConfig = {\n kernelName: Cast,\n backendName: 'wasm',\n kernelFunc: cast as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==*/\n\nimport {KernelConfig, Ceil} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==*/\n\nimport {ClipByValue, ClipByValueAttrs, ClipByValueInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmClip: (xId: number, min:

```
number, max: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmClip = backend.wasm.cwrap(ClipByValue, null /* void */, [\n    'number',  // x_id\n    'number',  // min\n    'number',  // max\n    'number'   // out_id\n  ]);\n}\n\nfunction clip(args: {\n  inputs: ClipByValueInputs,\n  backend: BackendWasm,\n  attrs: ClipByValueAttrs\n}) {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {clipValueMin, clipValueMax} = attrs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n
  wasmClip(xId, clipValueMin, clipValueMax, outId);\n  return out;\n}\n\nexport const clipByValueConfig: KernelConfig = {\n  kernelName: ClipByValue,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: clip as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
 */\n\nimport {backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {concatImplCPU} from '../kernel_utils/shared';\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\n\nexport function concat(\n    args: {inputs: ConcatInputs, backend: BackendWasm, attrs: ConcatAttrs}) {\n  const {inputs, backend} = args;\n\n  const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];\n\n  let outShape = backend_util.computeOutShape(inputs.map(t => t.shape), axis);\n\n  // Keep only non-empty tensors (ignore tensors with 0 in their shape).\n  const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);\n  if ($inputs.length === 1) {\n    return identity({inputs: {x: $inputs[0]}, backend});\n  }\n\n  const out = backend.makeOutput(outShape, inputs[0].dtype);\n\n  if (util.sizeFromShape(outShape) === 0) {\n    return out;\n  }\n\n  const shapes = $inputs.map(t
 => t.shape);\n  backend_util.assertParamsConsistent(shapes, axis);\n\n  if ($inputs[0].dtype === 'string') {\n    // Any concat of n-dimensional tensors across any axis can be reduced to\n    // a concatenation of two-dimensional tensors across the axis 1 by first\n    // partitioning the axes of the original tensors into those less than the\n    // axis to be concatenated and the rest. Then reshape the tensors\n    // into a two-dimensional tensor by collapsing these two sets of axes and\n    // concatenate the resulting matrices across the axis 1, finally reshaping\n    // the result to have the proper shape.\n    const inputs2D = $inputs.map(t => {\n      const innerSize = util.sizeFromShape(t.shape.slice(axis));\n      const shape = [-1, innerSize];\n      return reshape({inputs: {x: t}, backend, attrs: {shape}});\n    });\n\n    const inputsValShapes = inputs2D.map(t => {\n      return {vals: backend.readSync(t.dataId), shape: t.shape};\n    });\n\n    // Concats 2d tensors
 along axis=1.\n    outShape =\n        backend_util.computeOutShape(inputs2D.map(t => t.shape), 1 /* axis */);\n    const simplyConcat = inputs2D[0].shape[0] === 1;\n    const outVals = concatImplCPU(\n inputsValShapes, outShape, inputs[0].dtype,\n                                  simplyConcat) as string[];\n\n    const finalOutShape =\n        backend_util.computeOutShape($inputs.map(t => t.shape), axis);\n\n    out.shape = finalOutShape;\n    const outData = backend.dataIdMap.get(out.dataId);\n    outData.stringBytes = backend_util.fromStringArrayToUint8(outVals);\n\n    inputs2D.forEach(t => backend.disposeData(t.dataId));\n\n    return out;\n  }\n\n  const batchDim = util.sizeFromShape($inputs[0].shape.slice(0, axis));\n  let sumInnerDims = 0;\n  const innerDims = $inputs.map(input => {\n    const innerDim = util.sizeFromShape(input.shape.slice(axis));\n
  sumInnerDims += innerDim;\n    return innerDim;\n  });\n  const inVals = $inputs.map(input => backend.typedArrayFromHeap(input));\n
  const outVals = backend.typedArrayFromHeap(out);\n  for (let b = 0; b < batchDim; b++) {\n    let outOffset = b * sumInnerDims;\n    for (let i = 0; i < inVals.length; i++) {\n      const innerDim = innerDims[i];\n      const inOffset = b * innerDim;\n      const vals = inVals[i].subarray(inOffset, inOffset + innerDim);\n      outVals.set(vals,
```

outOffset);\n outOffset += innerDim;\n }\n }\n return out;\n}\n\nexport const concatConfig: KernelConfig = {\n kernelName: Concat,\n backendName: 'wasm',\n kernelFunc: concat as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License
is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {backend_util, Conv2D, Conv2DAttrs, Conv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmConv2d: (\n xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number, padTop: number,\n padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n dilationHeight: number, dilationWidth: number, strideHeight: number,\n strideWidth: number, inputChannels: number, outputChannels: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmConv2d = backend.wasm.cwrap(Conv2D,
null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n}\n\nfunction conv2d(\n args: {inputs: Conv2DInputs, backend: BackendWasm, attrs: Conv2DAttrs}) {\n const {inputs, attrs, backend} = args;\n\n const {x, filter} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const {strides, dilations, pad, dimRoundingMode, dataFormat} = attrs;\n const $dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n
const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode, false, $dataFormat);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend Conv2D does not support dataFormat:` +\n `${convInfo.dataFormat}'. Please
use 'channelsLast'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmConv2d(\n xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n dilationHeight, dilationWidth, strideHeight, strideWidth, inputChannels,\n outputChannels, outId);\n return out;\n}\n\nexport const conv2DConfig: KernelConfig = {\n kernelName: Conv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: conv2d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed

under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmConv2DBackpropInput: (\n dyId: number, filterId: number, batchSize: number, filterHeight: number,\n filterWidth: number, inHeight: number, inWidth: number, inChannels: number,\n outHeight: number, outWidth: number, outChannels: number,\n strideHeight: number, strideWidth: number, topPad: number, leftPad: number,\n fltS0: number, fltS1: number, fltS2: number, xBatchStride: number,\n xRowStride: number, xColStride: number,\n xChannelStride: number,\n yBatchStride: number, yRowStride: number, yColStride: number,\n yChannelStride: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmConv2DBackpropInput = backend.wasm.cwrap(Conv2DBackpropInput, null, [\n 'number', // dyId\n 'number', // filterId\n 'number', // batchSize\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // inHeight\n 'number', // inWidth\n 'number', // inChannels\n 'number', // outHeight\n 'number', // outWidth\n 'number', // outChannels\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // topPad\n 'number', // leftPad\n 'number', // fltS0\n 'number', // fltS1\n 'number', // fltS2\n 'number', // xBatchStride\n 'number', // xRowStride\n 'number', // xColStride\n 'number', // xChannelStride\n 'number', // yBatchStride\n 'number', // yRowStride\n 'number', // yColStride\n 'number', // yChannelStride\n 'number', // outId\n]);\n}\n\nfunction conv2DBackpropInput(args: {\n backend: BackendWasm,\n inputs: Conv2DBackpropInputInputs,\n attrs: Conv2DBackpropInputAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {dy, filter} = inputs;\n const {strides, pad, dataFormat, dimRoundingMode, inputShape} = attrs;\n\n const dilations = 1;\n\n const $dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n inputShape, filter.shape as [number, number, number, number], strides,\n dilations, pad, dimRoundingMode, false /* depthwise */, $dataFormat);\n const {\n batchSize,\n filterHeight,\n filterWidth,\n inChannels,\n inHeight,\n inWidth,\n outChannels,\n outHeight,\n outWidth,\n strideHeight,\n strideWidth\n } = convInfo;\n\n const topPad = filterHeight - 1 - convInfo.padInfo.top;\n const leftPad = filterWidth - 1 - convInfo.padInfo.left;\n\n const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n const dxStrides = util.computeStrides(convInfo.inShape);\n const dyStrides = util.computeStrides(dy.shape);\n const [fltS0, fltS1, fltS2] = util.computeStrides(filter.shape);\n const xBatchStride = dxStrides[0];\n const xRowStride = isChannelsLast ? dxStrides[1] : dxStrides[2];\n const xColStride = isChannelsLast ? dxStrides[2] : 1;\n const xChannelStride = isChannelsLast ? 1 : dxStrides[1];\n const yBatchStride = dyStrides[0];\n const yRowStride = isChannelsLast ? dyStrides[1] : dyStrides[2];\n const yColStride = isChannelsLast ? dyStrides[2] : 1;\n const yChannelStride = isChannelsLast ? 1 : dyStrides[1];\n\n const out = backend.makeOutput(convInfo.inShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const dyId = backend.dataIdMap.get(dy.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n wasmConv2DBackpropInput(\n dyId, filterId, batchSize,\n filterHeight, filterWidth, inHeight, inWidth,\n inChannels, outHeight, outWidth, outChannels, strideHeight,\n strideWidth,\n topPad, leftPad, fltS0, fltS1, fltS2, xBatchStride, xRowStride,\n xColStride, xChannelStride,\n yBatchStride, yRowStride, yColStride,\n yChannelStride, outId);\n return out;\n}\n\nexport const conv2DBackpropInputConfig: KernelConfig = {\n kernelName: Conv2DBackpropInput,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: conv2DBackpropInput as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or

agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {Cos, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const cosConfig: KernelConfig = createUnaryKernelConfig(Cos);\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the
specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {Cosh, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n
* ==========\n */\n\nimport {CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from './Cast';\n\n// Must match enum in CropAndResize.cc\nenum InterpolationMethod {\n bilinear = 0,\n nearest = 1\n}\n\nlet wasmCropAndResize: (\n   imagesId: number, boxesId: number, boxIndId: number, numBoxes: number,\n   imagesShape: Uint8Array, cropHeight: number, cropWidth: number,\n   method: number, extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n   'number', // imagesId\n   'number', // boxesId\n   'number', // boxIndId\n   'number', // numBoxes\n   'array',   // images shape\n   'number', // cropHeight\n   'number', // cropWidth\n   'number', // method\n
    'number', // extrapolation value\n   'number'   // out id\n]);\n}\n\nfunction cropAndResize(args: {\n backend: BackendWasm,\n inputs: CropAndResizeInputs,\n attrs: CropAndResizeAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {method, extrapolationValue, cropSize} = attrs;\n const {image, boxes, boxInd} = inputs;\n\n const numBoxes = boxes.shape[0];\n\n const [cropHeight, cropWidth] = cropSize as [number, number];\n const outShape = [numBoxes, cropHeight, cropWidth, image.shape[3]];\n\n let imagesData = backend.dataIdMap.get(image.dataId);\n let castedData;\n if (image.dtype !== 'float32') {\n   castedData = cast({backend, inputs: {x: image}, attrs: {dtype: 'float32'}});\n   imagesData = backend.dataIdMap.get(castedData.dataId);\n }\n\n const imagesId = imagesData.id;\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const boxIndId = backend.dataIdMap.get(boxInd.dataId).id;\n\n const out = backend.makeOutput(outShape, 'float32');\n
  const outId = backend.dataIdMap.get(out.dataId).id;\n\n const imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n\n wasmCropAndResize(\n   imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n   cropWidth,\n   InterpolationMethod[method as {} as keyof typeof InterpolationMethod],\n   extrapolationValue, outId);\n\n if (castedData != null) {\n backend.disposeData(castedData.dataId);\n }\n\n return out;\n}\n\nexport const cropAndResizeConfig:

KernelConfig = {\n kernelName: CropAndResize,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: cropAndResize as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n*/\n\nimport {backend_util, KernelConfig, KernelFunc, Cumsum, CumsumAttrs, CumsumInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nimport {transpose} from './Transpose';\n\nlet wasmCumsum: (xId: number, exclusive: number, reverse: number,\n   finalDim: number, outId: number, dtype: CppDType) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmCumsum = backend.wasm.cwrap(Cumsum, null /* void */, [\n   'number', // x_id\n   'number', // exclusive\n   'number', // reverse\n   'number', // final_dim\n   'number', // out_id\n   'number' // dtype\n]);\n}\n\nexport function cumsum(\n args: {inputs: CumsumInputs, backend: BackendWasm, attrs: CumsumAttrs}):\nTensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {axis, exclusive, reverse} = attrs;\n const xRank = x.shape.length;\n\n util.assert(x.dtype === 'float32' || x.dtype === 'int32',\n   () => `cumsum does not support ${x.dtype} tensors in the WASM backend`);\n // permute required axis to inner most axis\n const permutation = backend_util.getAxesPermutation([axis], xRank);\n let permutedX = x;\n if (permutation !== null) {\n   permutedX = transpose({inputs: {x}, attrs: {perm: permutation}, backend});\n }\n const permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];\n backend_util.assertAxesAreInnerMostDims('cumsum', [permutedAxis], xRank);\n\n const permutedOut = backend.makeOutput(permutedX.shape, permutedX.dtype);\n const finalDim = permutedX.shape[permutedAxis];\n const permutedXId = backend.dataIdMap.get(permutedX.dataId).id;\n const permutedOutId = backend.dataIdMap.get(permutedOut.dataId).id;\n wasmCumsum(permutedXId, exclusive ? 1 : 0, reverse ? 1 : 0, finalDim,\n   permutedOutId, CppDType[x.dtype]);\n\n // transpose data back if permuted\n let out = permutedOut;\n if (permutation !== null) {\n   const undoPermutation = backend_util.getUndoAxesPermutation(permutation);\n   out = transpose(\n   {inputs: {x: permutedOut}, attrs: {perm: undoPermutation}, backend});\n   backend.disposeData(permutedX.dataId);\n   backend.disposeData(permutedOut.dataId);\n }\n return out;\n}\n\nexport const cumsumConfig: KernelConfig = {\n kernelName: Cumsum,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: cumsum as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n*/\n\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthToSpace: (\n   xId: number, blockSize: number, channelsLast: number, xStrides: Uint8Array,\n   xStridesLength: number, outputShape: Uint8Array, outputStrides: Uint8Array,\n   outSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmDepthToSpace = backend.wasm.cwrap(DepthToSpace, null /*void*/, [\n   'number', // xId\n   'number', // blockSize\n   'number', // channelsLast\n   'array',   // xStrides\n   'number', // xStridesLength\n   'array',   // outputShape\n   'array',   //

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outputStrides\n    'number',  // outSize\n    'number',  // outId\n  ]);\n}\n\nexport function depthToSpace(args: {\n backend: BackendWasm,\n  inputs: DepthToSpaceInputs,\n  attrs: DepthToSpaceAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {x} = inputs;\n  const {blockSize, dataFormat} = attrs;\n\n  const batchSize = x.shape[0];\n  const inputHeight = (dataFormat === 'NHWC') ? x.shape[1] : x.shape[2];\n  const inputWidth = (dataFormat === 'NHWC') ? x.shape[2] : x.shape[3];\n  const inputDepth = (dataFormat === 'NHWC') ? x.shape[3] : x.shape[1];\n\n  const outputHeight = inputHeight * blockSize;\n  const outputWidth = inputWidth * blockSize;\n const outputDepth = inputDepth / (blockSize * blockSize);\n\n
  const outputShape = (dataFormat === 'NHWC') ?\n      [batchSize, outputHeight, outputWidth, outputDepth] :\n [batchSize, outputDepth, outputHeight, outputWidth];\n\n  const out = backend.makeOutput(outputShape, 'float32');\n\n  const xData = backend.dataIdMap.get(x.dataId);\n  const xId = xData.id;\n  const xStridesBytes =\n new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n\n  const outputShapeBytes = new Uint8Array(new Int32Array(outputShape).buffer);\n  const outStridesBytes =\n      new Uint8Array(new Int32Array(util.computeStrides(outputShape)).buffer);\n\n  const outId = backend.dataIdMap.get(out.dataId).id;\n const channelsLast = dataFormat === 'NHWC' ? 1 : 0;\n  wasmDepthToSpace(\n      xId, blockSize, channelsLast, xStridesBytes, x.shape.length - 1,\n      outputShapeBytes, outStridesBytes, outputShape.length, outId);\n\n  return out;\n}\n\nexport const depthToSpaceConfig: KernelConfig = {\n  kernelName: DepthToSpace,\n  backendName: 'wasm',\n
  setupFunc: setup,\n  kernelFunc: depthToSpace as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs, DepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
 '../backend_wasm';\n\nlet wasmDepthwiseConv2d: (\n    xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n    filterId: number, filterHeight: number, filterWidth: number, padTop: number,\n padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n    dilationHeight: number, dilationWidth: number, strideHeight: number,\n    strideWidth: number, inputChannels: number, outputChannels: number,\n    outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmDepthwiseConv2d =\n  backend.wasm.cwrap(DepthwiseConv2dNative, null /* void */, [\n      'number',  // xId\n      'number',  // batchSize\n      'number',  // inputHeight\n      'number',  // inputWidth\n      'number',  // filterId\n      'number',  // filterHeight\n      'number',  // filterWidth\n      'number',  // padTop\n      'number',  // padRight\n      'number',  // padBottom\n      'number',  // padLeft\n      'number',  // isSamePad\n
  'number',  // dilationHeight\n      'number',  // dilationWidth\n      'number',  // strideHeight\n      'number',  // strideWidth\n      'number',  // inputChannels\n      'number',  // outputChannels\n      'number',  // outId\n  ]);\n}\n\nfunction depthwiseConv2d(args: {\n  inputs: DepthwiseConv2dNativeInputs,\n  backend: BackendWasm,\n  attrs: DepthwiseConv2dNativeAttrs\n}) {\n  const {inputs, attrs, backend} = args;\n\n  const {x, filter} = inputs;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n  const {strides, dilations, pad, dimRoundingMode} = attrs;\n\n  const $dilations = dilations == null ? [1, 1] : dilations;\n\n  const convInfo = backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as Tensor4D).shape, strides,\n      ($dilations as number | [number, number]), pad, dimRoundingMode,\n      true /* depthwise */);\n\n  const filterHeight = convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n  const padLeft = convInfo.padInfo.left;\n  const dilationHeight =
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convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n   throw new Error(\n   `wasm backend DepthwiseConv2dNative does not support dataFormat:'` +\n   `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmDepthwiseConv2d(\n   xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n   filterWidth,
 padTop, padRight, padBottom, padLeft, isSamePad,\n   dilationHeight, dilationWidth, strideHeight, strideWidth, inputChannels,\n   outputChannels, outId);\n return out;\n}\n\nexport const depthwiseConv2dNativeConfig: KernelConfig = {\n kernelName: DepthwiseConv2dNative,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: depthwiseConv2d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations
 under the License.\n *
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*/\nimport {Elu, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const eluConfig: KernelConfig = createUnaryKernelConfig(Elu);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
 */\nimport {Equal, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const equalConfig: KernelConfig =\n createBinaryKernelConfig(Equal, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
 */\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const expConfig: KernelConfig = createUnaryKernelConfig(Exp, 'float32');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs,
KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'../backend_wasm';\nimport {reshape} from './Reshape';\n\nexport function expandDims(args: {\n inputs:
ExpandDimsInputs,\n attrs: ExpandDimsAttrs,\n backend: BackendWasm\n}) {\n const {inputs, attrs, backend} =
args;\n const {input} = inputs;\n const {dim} = attrs;\n\n const inputRank = input.shape.length;\n const newShape
= input.shape.slice();\n let $dim = dim;\n if (dim < 0) {\n   // Negative value is counted from the tail of rank.\n
util.assert(\n   -(inputRank + 1) <= dim,\n   () => `Axis must be in the interval [${- (inputRank + 1)}, ${\n
  inputRank}]`);\n $dim = inputRank + dim + 1;\n }\n newShape.splice($dim, 0, 1);\n\n return reshape({inputs:
{x: input}, backend, attrs: {shape: newShape}});\n}\n\nexport const expandDimsConfig: KernelConfig = {\n
kernelName: ExpandDims,\n backendName: 'wasm',\n kernelFunc: expandDims as {} as KernelFunc,\n};\n","/**\n
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law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {Fill, FillAttrs} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function fill(args: {attrs:
FillAttrs, backend: BackendWasm}) {\n const {attrs: {shape,
 value, dtype}, backend} = args;\n const out = backend.makeOutput(shape, dtype);\n const outVals =
backend.typedArrayFromHeap(out);\n outVals.fill(value as number);\n return out;\n}\n\nexport const fillConfig:
KernelConfig = {\n kernelName: Fill,\n backendName: 'wasm',\n kernelFunc: fill as {} as
KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
==\n
 */\n\nimport {FlipLeftRight, FlipLeftRightInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFlipLeftRight: (\n   xId: number, batch:
number, imageHeight: number, imageWidth: number,\n   numChannels: number, outId: number) =>
void;\n\nfunction setup(backend: BackendWasm) {\n wasmFlipLeftRight = backend.wasm.cwrap(FlipLeftRight,
null /* void */, [\n   'number', // xId\n   'number', // batch\n   'number', // imageHeight\n   'number', //
imageWidth\n   'number', // numChannels\n   'number', // outId\n]);\n}\n\nexport function flipLeftRight(\n
args: {inputs: FlipLeftRightInputs, backend: BackendWasm}): TensorInfo {\n const {inputs, backend} = args;\n
const {image} = inputs;\n\n const out = backend.makeOutput(image.shape, image.dtype);\n const imageId =
backend.dataIdMap.get(image.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n
  const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n\n wasmFlipLeftRight(\n   imageId,
batch, imageHeight, imageWidth, numChannels, outId);\n return out;\n}\n\nexport const flipLeftRightConfig:
KernelConfig = {\n kernelName: FlipLeftRight,\n backendName: 'wasm',\n kernelFunc: flipLeftRight as {} as
KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES

OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under
the License.\n *
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*/\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const floorDivConfig: KernelConfig =\n createBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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/\n\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmBatchNorm: (\n xId: number, meanId: number, varianceId: number, offsetId: number,\n scaleId: number, varianceEpsilon: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmBatchNorm = backend.wasm.cwrap(\n FusedBatchNorm, null / void */,\n ['number', 'number', 'number', 'number', 'number', 'number', 'number']);\n}\n\nfunction fusedBatchNorm(args: {\n backend: BackendWasm,\n inputs: FusedBatchNormInputs,\n attrs: FusedBatchNormAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {varianceEpsilon} = attrs;\n const {x, mean, variance, offset, scale} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const meanId = backend.dataIdMap.get(mean.dataId).id;\n const varianceId = backend.dataIdMap.get(variance.dataId).id;\n const offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n const scaleId = scale != null ? backend.dataIdMap.get(scale.dataId).id : 0;\n\n const out = backend.makeOutput(x.shape, x.dtype);\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(x.shape) === 0) {\n return out;\n }\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmBatchNorm(\n xId, meanId, varianceId, offsetId, scaleId, varianceEpsilon, outId);\n return out;\n}\n\nexport const fusedBatchNormConfig: KernelConfig = {\n kernelName: FusedBatchNorm,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchNorm as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {backend_util, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc,

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Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport
{FusableActivation} from './types';\n\nlet wasmFusedConv2d:\n    (xId: number, batchSize: number, inputHeight:
number, inputWidth: number,\n     filterId: number, filterHeight: number, filterWidth: number,\n     biasId: number,
padTop: number, padRight: number, padBottom: number,\n     padLeft: number, isSamePad: number,
dilationHeight: number,\n     dilationWidth:
 number, strideHeight: number, strideWidth: number,\n     inputChannels: number, outputChannels: number,
activation: number,\n     preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n
void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedConv2d = backend.wasm.cwrap(FusedConv2D,
null /* void */, [\n    'number',  // xId\n    'number',  // batchSize\n    'number',  // inputHeight\n    'number',  //
inputWidth\n    'number',  // filterId\n    'number',  // filterHeight\n    'number',  // filterWidth\n    'number',  // biasId\n
  'number',  // padTop\n    'number',  // padRight\n    'number',  // padBottom\n    'number',  // padLeft\n    'number',  //
isSamePad\n    'number',  // dilationHeight\n    'number',  // dilationWidth\n    'number',  // strideHeight\n    'number',
// strideWidth\n    'number',  // inputChannels\n    'number',  // outputChannels\n    'number',  // activation\n
'number',  // preluActivationWeightsId\n    'number',  //
 leakyreluAlpha\n    'number',  // outId\n  ]);\n}\n\nfunction fusedConv2d(args: {\n  inputs: FusedConv2DInputs,\n
backend: BackendWasm,\n  attrs: FusedConv2DAttrs\n}) {\n  const {inputs, attrs, backend} = args;\n  const {x,
filter, bias, preluActivationWeights} = inputs;\n  const {\n    strides,\n    pad,\n    dilations,\n    dataFormat,\n
dimRoundingMode,\n    activation,\n    leakyreluAlpha\n  } = attrs;\n\n  const convInfo =
backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n
pad, dimRoundingMode);\n\n  const fusedActivation =\n      FusableActivation[activation as {} as keyof typeof
FusableActivation];\n  if (fusedActivation == null) {\n    throw new Error(\n        `${activation} activation not yet
supported for FusedConv2D ` +\n        `in the wasm backend.`);\n  }\n\n  const xId =
backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n  const
outputChannels = convInfo.outChannels;\n\n
  let biasId = 0;\n  if (bias != null) {\n    const biasData = backend.dataIdMap.get(bias.dataId);\n    if
(biasData.shape.length !== 1) {\n      throw new Error(\n          `FusedConv2D only supports rank-1 bias but got ` +\n
+\n          `rank ${biasData.shape.length}.`);\n    }\n    if (biasData.shape[0] !== outputChannels) {\n      throw new
Error(\n          `FusedConv2D bias shape (${biasData.shape}) does not ` +\n          `match the number of output
channels (${outputChannels})`);\n    }\n    biasId = biasData.id;\n  }\n\n  const filterHeight =
convInfo.filterHeight;\n  const filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const
padRight = convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft =
convInfo.padInfo.left;\n  const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth =
convInfo.dilationWidth;\n  const strideHeight = convInfo.strideHeight;\n  const strideWidth =
convInfo.strideWidth;\n
  const inputChannels = convInfo.inChannels;\n  const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n
const batchSize = convInfo.batchSize;\n  const inHeight = convInfo.inHeight;\n  const inWidth =
convInfo.inWidth;\n\n  if (dataFormat !== 'NHWC') {\n    throw new Error(\n        `wasm backend FusedConv2D
does not support dataFormat:` +\n        `${dataFormat}'. Please use 'NHWC'.`);\n  }\n\n  const out =
backend.makeOutput(convInfo.outShape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const
preluActivationWeightsId = preluActivationWeightsId == null ?\n      0 :\n
backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n  wasmFusedConv2d(\n      xId, batchSize, inHeight,
inWidth, filterId, filterHeight, filterWidth,\n      biasId, padTop, padRight, padBottom, padLeft, isSamePad,
dilationHeight,\n      dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n      fusedActivation,
preluActivationWeightsId, leakyreluAlpha
 || 0, outId);\n\n  return out;\n}\n\nexport const fusedConv2DConfig: KernelConfig = {\n  kernelName:
FusedConv2D,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: fusedConv2d as {} as
KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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==========================================================================\n */\n\nimport {backend_util, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs, FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet wasmFusedDepthwiseConv2d:\n (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number,\n biasId: number, padTop: number, padRight: number, padBottom: number,\n padLeft: number, isSamePad: number, dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels: number, activation: number,\n preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedDepthwiseConv2d =\n backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // biasId\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // activation\n 'number', // preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number', // outId\n ]);\n}\n\nfunction fusedDepthwiseConv2d(args: {\n inputs: FusedDepthwiseConv2DInputs,\n backend: BackendWasm,\n attrs: FusedDepthwiseConv2DAttrs\n}) {\n const {inputs, attrs, backend} = args;\n const {x, filter, bias, preluActivationWeights} = inputs;\n const {\n strides,\n pad,\n dilations,\n dataFormat,\n dimRoundingMode,\n activation,\n leakyreluAlpha\n } = attrs;\n\n const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode, true /* depthwise */);\n\n const fusedActivation =\n FusableActivation[activation as {} as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n throw new Error(\n `${activation} activation not yet supported for FusedDepthwiseConv2D ` +\n `in the wasm backend.`);\n }\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n if (bias != null) {\n const biasData = backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n throw new Error(\n `FusedDepthwiseConv2D only supports rank-1 bias but got ` +\n `rank ${biasData.shape.length}.`);\n }\n if (biasData.shape[0] !== outputChannels) {\n throw new Error(\n `FusedDepthwiseConv2D bias shape (${biasData.shape}) does not ` +\n `match the number of output channels (${outputChannels})`);\n }\n biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize = convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if (dataFormat !== 'NHWC') {\n throw new Error(\n `wasm backend FusedDepthwiseConv2D does not support dataFormat:'` +\n `${dataFormat}'. Please use 'NHWC'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const preluActivationWeightsId = preluActivationWeights
```

== null ?\n 0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedDepthwiseConv2d(\n xId, batchSize, inHeight, inWidth, filterId, filterHeight, filterWidth,\n biasId, padTop, padRight, padBottom, padLeft, isSamePad, dilationHeight,\n dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedDepthwiseConv2DConfig: KernelConfig = {\n kernelName: FusedDepthwiseConv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedDepthwiseConv2d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmGatherNd: (\n xId: number, dtype: CppDType, indicesId: number, numSlices: number,\n sliceRank: number, sliceSize: number, strides: Uint8Array, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n 'number', // xId\n 'number', // dtype\n 'number', // indicesId\n 'number', // numSlices\n 'number', // sliceRank\n 'number', // sliceSize\n 'array', // strides\n 'number' // outId\n]);\n}\n\nfunction gatherNd(args: {backend: BackendWasm, inputs: GatherNdInputs}):\n TensorInfo {\n const {backend, inputs} = args;\n const {params, indices} = inputs;\n\n const [resultShape, numSlices, sliceSize, strides] =\n gather_util.prepareAndValidate(params, indices);\n\n const out = backend.makeOutput(resultShape, params.dtype);\n if (numSlices === 0) {\n return out;\n }\n\n const indicesShape = indices.shape;\n const sliceRank = indicesShape[indicesShape.length - 1];\n\n const xData = backend.dataIdMap.get(params.dataId);\n const xId = xData.id;\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const stridesBytes = new Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmGatherNd(\n xId, CppDType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n stridesBytes, outId);\n\n return out;\n}\n\nexport const gatherNdConfig: KernelConfig = {\n kernelName: GatherNd,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherNd\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig, KernelFunc, Tensor, TensorInfo, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from './Reshape';\nimport {CppDType} from './types';\n\nlet wasmGather: (\n xId: number, dtype: CppDType, xStrides: Uint8Array, stridesSize: number,\n indicesId: number, batchSize: number, outStrides: Uint8Array,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmGather = backend.wasm.cwrap('Gather', null /*void*/, [\n 'number', // xId\n 'number', // dtype\n 'array', // xStrides\n 'number', // stridesSize\n 'number', // indicesId\n 'number', // batchSize\n

'array', // outStrides\n 'number' // outId\n]);\n}\n\nfunction gatherV2(\n args: {backend: BackendWasm, inputs: GatherV2Inputs, attrs: GatherV2Attrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x, indices} = inputs;\n const {axis, batchDims} = attrs;\n\n // Throw error when any index is out of bound.\n const parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n const indicesVals = backend.readSync(indices.dataId) as TypedArray;\n const axisDim = x.shape[parsedAxis];\n for (let i = 0; i < indicesVals.length; ++i) {\n const index = indicesVals[i];\n util.assert(\n index <= axisDim - 1 && index >= 0,\n () =>\n `GatherV2: the index value ${index} is not in [0, ${axisDim - 1}]`);\n }\n\n const shapeInfo = backend_util.segment_util.collectGatherOpShapeInfo(\n x as Tensor, indices as Tensor, parsedAxis, batchDims);\n\n const flattenX = reshape({\n inputs: {x},\n attrs: {\n shape: [\n shapeInfo.batchSize, shapeInfo.outerSize, shapeInfo.dimSize,\n shapeInfo.sliceSize\n]\n },\n backend\n });\n const indicesSize = util.sizeFromShape(indices.shape);\n const flattenIndex = reshape({\n inputs: {x: indices},\n attrs: {shape: [shapeInfo.batchSize, indicesSize / shapeInfo.batchSize]},\n backend\n });\n const flattenOutputShape = [\n shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n shapeInfo.sliceSize\n];\n\n const out = backend.makeOutput(flattenOutputShape, x.dtype);\n if (util.sizeFromShape(x.shape) === 0) {\n return out;\n }\n const stridesSize = flattenX.shape.length - 1;\n\n const xData = backend.dataIdMap.get(flattenX.dataId);\n const xId = xData.id;\n\n const indicesData = backend.dataIdMap.get(flattenIndex.dataId);\n const indicesId = indicesData.id;\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const xStridesBytes = new Uint8Array(\n new Int32Array(util.computeStrides(flattenX.shape)).buffer);\n const outStridesBytes = new Uint8Array(\n new Int32Array(util.computeStrides(flattenOutputShape)).buffer);\n\n wasmGather(\n xId, CppDType[x.dtype], xStridesBytes, stridesSize, indicesId,\n shapeInfo.batchSize, outStridesBytes, outId);\n\n backend.disposeData(flattenX.dataId);\n backend.disposeData(flattenIndex.dataId);\n\n // reshape\n out.shape = shapeInfo.outputShape;\n return out;\n}\n\nexport const gatherV2Config: KernelConfig = {\n kernelName: GatherV2,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherV2 as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n *
distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n*/\nimport {Greater, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterConfig: KernelConfig =\n createBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n
* distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n*/\nimport {GreaterEqual, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterEqualConfig: KernelConfig =\n createBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you

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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {KernelConfig, LogicalAnd} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const logicalAndConfig: KernelConfig =\n createBinaryKernelConfig(LogicalAnd, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License
is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmMax: (xId: number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMax = backend.wasm.cwrap(Max, null /*void*/, [\n 'number', // x_id\n 'number', // dtype\n 'number', // reduce_size\n 'number', // out_id\n]);\n}\n\nfunction max(args: {backend: BackendWasm, inputs: MaxInputs, attrs: MaxAttrs}):\n TensorInfo {\n const
{backend, inputs, attrs} = args;\n const {reductionIndices: axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n input = transposed;\n inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('max', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize =
util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmMax(inputId, CppDType[x.dtype], reduceSize, outId);\n }\n\n if (inputWasTransposed)
{\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return out;\n}\n\nexport const maxConfig: KernelConfig = {\n kernelName: Max,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: max as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing
permissions and\n * limitations under the License.\n *
==========\n */\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from

'./binary_kernel';\nconst supportsFullBroadcast = false;\nexport const maximumConfig: KernelConfig =\n createBinaryKernelConfig(Maximum, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing
permissions and\n * limitations under the License.\n *
==\n */\n\nimport {backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmMaxPool: (\n xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterHeight: number, filterWidth: number, padTop: number, padRight: number,\n padBottom: number, padLeft: number, dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmMaxPool = backend.wasm.cwrap(MaxPool, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n}\n\nfunction maxPool(\n args: {inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n const {inputs, attrs, backend} = args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n // TF API supports int32 input. CPU and WebGL backend also support int32\n // input. WASM backend doesn't support it because it uses xnnpack which only\n // supports float32.\n //\n // Add the following assert only for the WASM backend instead of at core op\n // level.\n //\n // TODO: add support for int32 input.\n util.assert(\n x.dtype === 'float32',\n () =>\n `Error in MaxPool: only float32
input is supported. Got ${x.dtype}.`);\n\n const {filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend does not support dataFormat:'` +\n `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n const out
= backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmMaxPool(\n xId, x.shape[0], x.shape[1], x.shape[2], filterHeight, filterWidth,\n padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n strideHeight, strideWidth, inputChannels, outputChannels, outId);\n return out;\n}\n\nexport const maxPoolConfig: KernelConfig = {\n kernelName: MaxPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: maxPool as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES

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==========\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {cast} from './Cast';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmMean: (xId: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMean =\n backend.wasm.cwrap(Mean, null /*void*/, ['number, number, number']);\n}\n\nexport function mean(\n args: {backend: BackendWasm, inputs: MeanInputs, attrs: MeanAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n
let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was not a no-op. We will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n reductionAxes.length, input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'mean', reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize = util.sizeFromShape(reduceShape);\n let castedInput = input;\n if (input.dtype !== 'float32') {\n castedInput =\n cast({backend, inputs: {x: input}, attrs: {dtype: 'float32'}});\n inputId = backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(outShape, 'float32');\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmMean(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n if (input.dtype !== 'float32') {\n backend.disposeData(castedInput.dataId);\n }\n\n return out;\n}\n\nexport const meanConfig: KernelConfig = {\n kernelName: Mean,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: mean as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmMin: (xId: number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMin = backend.wasm.cwrap(Min,
null /*void*/, [\n 'number', // x_id\n 'number', // dtype\n 'number', // reduce_size\n 'number', // out_id\n]);\n}\n\nfunction min(args: {backend: BackendWasm, inputs: MinInputs, attrs: MinAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose

was not a no-op. We will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n }\n }\n\n const inputRank = input.shape.length;\n\n backend_util.assertAxesAreInnerMostDims('min', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmMin(inputId, CppDType[x.dtype], reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return out;\n}\n\nexport const minConfig: KernelConfig = {\n kernelName: Min,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: min as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ===\n */\nimport {KernelConfig, Minimum} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const minimumConfig: KernelConfig =\n createBinaryKernelConfig(Minimum, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ===\n */\n\nimport {KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\n// Must match enum in MirrorPad.cc\nenum MirrorPaddingMode {\n reflect = 0,\n symmetric = 1\n}\n\nlet wasmMirrorPad: (\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array, mode: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmMirrorPad = backend.wasm.cwrap(MirrorPad, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n 'array', // pre-paddings\n 'array', // post-paddings\n 'number', // mode\n 'number', // outId\n]);\n}\n\nfunction mirrorPad(args: {\n inputs: MirrorPadInputs,\n backend: BackendWasm,\n attrs: MirrorPadAttrs\n}) {\n const {inputs: {x}, backend, attrs: {paddings, mode}} = args;\n\n const outShape = paddings.map(\n (p, i) => p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(outShape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n const prePaddingsBytes =\n new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const postPaddingsBytes =\n new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmMirrorPad(\n xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n postPaddingsBytes, MirrorPaddingMode[mode], outId);\n return out;\n}\n\nexport const mirrorPadConfig: KernelConfig = {\n kernelName: MirrorPad,\n backendName: 'wasm',\n kernelFunc: mirrorPad as {} as

KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
 BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, Multiply} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = true;\nexport const multiplyConfig: KernelConfig =\n createBinaryKernelConfig(Multiply, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
 BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\nimport {KernelConfig, Neg} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const negConfig: KernelConfig = createUnaryKernelConfig(Neg);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n
 * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {BackendWasm} from '../backend_wasm';\n\n// Analogous to `struct Result` in `non_max_suppression_impl.h`.\ninterface Result {\n pSelectedIndices: number;\n selectedSize: number;\n pSelectedScores: number;\n pValidOutputs: number;\n}\n/**\n * Parse the result of the c++ method, which has the shape equivalent to\n * `Result`.\n */\nexport function parseResultStruct(\n   backend: BackendWasm, resOffset: number): Result {\n const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);\n const pSelectedIndices = result[0];\n const selectedSize = result[1];\n const pSelectedScores = result[2];\n const pValidOutputs = result[3];\n // Since the result was allocated on the heap, we have to delete it.\n backend.wasm._free(resOffset);\n return {pSelectedIndices, selectedSize,
 pSelectedScores, pValidOutputs};\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs, NonMaxSuppressionV3Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {parseResultStruct} from
 './NonMaxSuppression_util';\n\nlet wasmFunc: (\n   boxesId: number, scoresId: number, maxOutputSize: number,\n   iouThreshold: number, scoreThreshold: number) => number;\n\nfunction setup(backend:

BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n   NonMaxSuppressionV3,\n   'number', // Result*\n   [\n   'number', // boxesId\n   'number', // scoresId\n   'number', // maxOutputSize\n   'number', // iouThreshold\n   'number', // scoreThreshold\n   ]);\n}\n\nfunction kernelFunc(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV3Inputs,\n attrs: NonMaxSuppressionV3Attrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold} = attrs;\n const {boxes, scores} = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset =\n   wasmFunc(boxesId, scoresId, maxOutputSize, iouThreshold,
 scoreThreshold);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V3, we have to delete it from the heap.\n backend.wasm._free(pSelectedScores);\n backend.wasm._free(pValidOutputs);\n\n const selectedIndicesTensor =\n   backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n return selectedIndicesTensor;\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n kernelName: NonMaxSuppressionV3,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed
 to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
/\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs, NonMaxSuppressionV4Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n boxesId: number, scoresId: number, maxOutputSize: number,\n   iouThreshold: number, scoreThreshold: number,\n padToMaxOutputSize: boolean) => number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n   NonMaxSuppressionV4,\n   'number', // Result\n   [\n   'number', // boxesId\n

 'number', // scoresId\n   'number', // maxOutputSize\n   'number', // iouThreshold\n   'number', // scoreThreshold\n   'bool',   // padToMaxOutputSize\n   ]);\n}\n\nfunction nonMaxSuppressionV4(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV4Inputs,\n attrs: NonMaxSuppressionV4Attrs\n}): TensorInfo[] {\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold, padToMaxOutputSize} =\n   attrs;\n const {boxes, scores} = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset = wasmFunc(\n   boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n padToMaxOutputSize);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V4, we have to delete it from the heap.\n backend.wasm._free(pSelectedScores);\n\n
  const selectedIndicesTensor =\n   backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n const validOutputsTensor = backend.makeOutput([], 'int32', pValidOutputs);\n\n return [selectedIndicesTensor, validOutputsTensor];\n}\n\nexport const nonMaxSuppressionV4Config: KernelConfig = {\n kernelName: NonMaxSuppressionV4,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: nonMaxSuppressionV4 as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or

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the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs,
NonMaxSuppressionV5Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'../backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc:\n
(boxesId: number, scoresId: number, maxOutputSize: number,\n iouThreshold: number, scoreThreshold: number,
softNmsSigma: number) =>\n number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc =
backend.wasm.cwrap(\n NonMaxSuppressionV5,\n 'number', // Result*\n [\n 'number', // boxesId\n
'number', // scoresId\n 'number', // maxOutputSize\n 'number', // iouThreshold\n 'number', //
scoreThreshold\n 'number', // softNmsSigma\n]);\n}\n\nfunction
kernelFunc(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV5Inputs,\n attrs:
NonMaxSuppressionV5Attrs\n}): TensorInfo[] {\n const {backend, inputs, attrs} = args;\n const {iouThreshold,
maxOutputSize, scoreThreshold, softNmsSigma} = attrs;\n const {boxes, scores} = inputs;\n\n const boxesId =
backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const
resOffset = wasmFunc(\n boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n
softNmsSigma);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n
parseResultStruct(backend, resOffset);\n\n // Since we are not using validOutputs for V5, we have to delete it from
the\n // heap.\n backend.wasm._free(pValidOutputs);\n\n const selectedIndicesTensor =\n
backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n const selectedScoresTensor =\n
backend.makeOutput([selectedSize], 'float32', pSelectedScores);\n\n
return [selectedIndicesTensor, selectedScoresTensor];\n}\n\nexport const nonMaxSuppressionV5Config:
KernelConfig = {\n kernelName: NonMaxSuppressionV5,\n backendName: 'wasm',\n setupFunc: setup,\n
kernelFunc: kernelFunc as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==========\n
*/\nimport
{KernelConfig, NotEqual} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\nconst supportsFullBroadcast = false;\nexport const notEqualConfig: KernelConfig =\n
createBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2020
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport
{KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nlet wasmOneHot: (\n indicesId: number, depth: number, onValue:
number, offValue: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n
wasmOneHot = backend.wasm.cwrap(OneHot, null /* void */, [\n 'number', // indices_id\n 'number', // depth,\n
'number', // onValue\n 'number', // offValue\n 'number' // out_id\n]);\n}\n\nfunction oneHot(\n args:

{inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm}) {\n const {inputs, backend, attrs} = args;\n const {indices} = inputs;\n const {depth, onValue, offValue} = attrs;\n\n const out = backend.makeOutput([...indices.shape, depth], 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n wasmOneHot(indicesId, depth,
 onValue, offValue, outId);\n\n return out;\n}\n\nexport const oneHotConfig: KernelConfig = {\n kernelName: OneHot,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: oneHot as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, OnesLike, OnesLikeInputs}
 from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nfunction onesLike(args: {inputs: OnesLikeInputs, backend: BackendWasm}) {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(1);\n return out;\n}\n\nexport const onesLikeConfig: KernelConfig = {\n kernelName: OnesLike,\n backendName: 'wasm',\n kernelFunc: onesLike as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express
 or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nimport {concat} from './Concat';\nimport {expandDims} from './ExpandDims';\n\nexport function pack(\n   args: {inputs: PackInputs, backend: BackendWasm, attrs: PackAttrs}):\n   TensorInfo {\n const {inputs, backend, attrs} = args;\n const {axis} = attrs;\n\n if (inputs.length === 1) {\n   return expandDims(\n   {inputs: {input: inputs[0]}, backend, attrs: {dim: axis}});\n }\n\n const shape = inputs[0].shape;\n const dtype = inputs[0].dtype;\n\n inputs.forEach(t => {\n util.assertShapesMatch(\n   shape, t.shape,\n   'All tensors passed to stack must have matching shapes');\n util.assert(\n
        dtype === t.dtype,\n   () => 'All tensors passed to stack must have matching dtypes');\n });\n\n const intermediateTensorInfos: TensorInfo[] = [];\n const expandedTensors = inputs.map(t => {\n   const expandedT =\n
    expandDims({inputs: {input: t}, backend, attrs: {dim: axis}});\n   intermediateTensorInfos.push(expandedT);\n return expandedT;\n });\n\n const result = concat({inputs: expandedTensors, backend, attrs: {axis}});\n\n intermediateTensorInfos.forEach(t => backend.disposeData(t.dataId));\n\n return result;\n}\n\nexport const packConfig: KernelConfig = {\n kernelName: Pack,\n backendName: 'wasm',\n kernelFunc: pack as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n
 * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the

License.\n *
==========\n
/\n\nimport {KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {fill} from './Fill';\n\nimport {CppDType} from './types';\n\nlet wasmPadV2: (\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array,\n constantValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmPadV2 = backend.wasm.cwrap(PadV2, null / void */, [\n 'number', // xId\n 'array', //
x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n 'array', // pre-paddings\n 'array', // post-paddings\n 'number', // constantValue\n 'number', // outId\n]);\n}\n\nfunction pad(\n args: {inputs: PadV2Inputs, backend: BackendWasm, attrs: PadV2Attrs}) {\n const {inputs: {x}, backend, attrs: {paddings, constantValue}} = args;\n\n const outShape = paddings.map(\n (p, i) => p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n\n if (util.sizeFromShape(x.shape) === 0) {\n // Short-circuit the computation, since x doesn't have value, only\n // the shape is used to compute output shape to pad.\n return fill({\n backend,\n attrs: {shape: outShape, value: constantValue, dtype: x.dtype}\n });\n }\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(outShape, x.dtype);\n const outTensorData = backend.dataIdMap.get(out.dataId);\n const outId = outTensorData.id;\n\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n const prePaddingsBytes =\n new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const postPaddingsBytes =\n new Uint8Array(new Int32Array(postPaddingsFlat).buffer);\n\n wasmPadV2(\n xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n postPaddingsBytes, constantValue, outId);\n return out;\n}\n\nexport const padV2Config: KernelConfig = {\n kernelName: PadV2,\n backendName: 'wasm',\n kernelFunc: pad as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n
* Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\nimport {KernelConfig, Pow} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const powConfig: KernelConfig =\n createBinaryKernelConfig(Pow, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
/\n\nimport {KernelConfig, KernelFunc, Prelu, PreluInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from './Cast';\n\nlet wasmPrelu: (xId: number, weightsId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmPrelu = backend.wasm.cwrap(Prelu, null / void */, [\n 'number', // x_id\n 'number', // weights_id\n 'number' // out_id\n]);\n}\n\nfunction prelu(args: {inputs: PreluInputs, backend: BackendWasm}) {\n const {inputs, backend} = args;\n const {x, alpha} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n

const weightsId = backend.dataIdMap.get(alpha.dataId).id;\n\n let inputId = xId;\n const input = x;\n let castedInput = input;\n if (input.dtype !== 'float32') {\n castedInput = cast({backend, inputs: {x}, attrs: {dtype: 'float32'}});\n inputId = backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(x.shape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmPrelu(inputId, weightsId, outId);\n\n if (input.dtype !== 'float32') {\n backend.disposeData(castedInput.dataId);\n }\n return out;\n}\n\nexport const preluConfig: KernelConfig = {\n kernelName: Prelu,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prelu as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\n\nimport {CppDType} from './types';\n\nlet wasmProd: (\n xId: number, reduceSize: number,\n dtype: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmProd = backend.wasm.cwrap(Prod, null /*void*/, [\n 'number',\n 'number',\n 'number',\n 'number'\n]);\n}\n\nfunction prod(args: {\n backend: BackendWasm,\n inputs: ProdInputs,\n attrs: ProdAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was not a no-op. We will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n reductionAxes.length, input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'prod', reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmProd(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return out;\n}\n\nexport const prodConfig: KernelConfig = {\n kernelName: Prod,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prod as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in\n compliance with the License.\n * You may obtain a copy of the License at\n *\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport

{BackendWasm} from '../backend_wasm';\nimport {rangeImplCPU} from '../kernel_utils/shared';\n\nexport const range =\n (args: {backend: BackendWasm, attrs: RangeAttrs}): TensorInfo => {\n const {backend, attrs} = args;\n const {start, stop, step, dtype} = attrs;\n const values = rangeImplCPU(start, stop, step, dtype);\n\n const
out = backend.makeOutput([values.length], dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(values);\n return out;\n };\n\nexport const rangeConfig: KernelConfig = {\n kernelName: Range,\n backendName: 'wasm',\n kernelFunc: range as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, RealDiv} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = true;\nexport const realDivConfig: KernelConfig =\n createBinaryKernelConfig(RealDiv, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {KernelConfig, Relu} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const reluConfig: KernelConfig = createUnaryKernelConfig(Relu);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {KernelConfig, Relu6} from '@tensorflow/tfjs-core';\n\nimport
{createUnaryKernelConfig} from './unary_kernel';\nexport const relu6Config: KernelConfig =
createUnaryKernelConfig(Relu6);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nimport {cast} from './Cast';\n\nlet wasmResizeBilinear: (\n xId: number, batch: number, oldHeight: number, oldWidth: number,\n numChannels: number, newHeight: number, newWidth: number,\n alignCorners: number, halfPixelCenters: number, outId: number) => void;\n\nfunction

setup(backend: BackendWasm): void {\n wasmResizeBilinear = backend.wasm.cwrap(ResizeBilinear, null /*void*/, [\n   'number', // xId\n   'number', // batch\n   'number', // oldHeight\n   'number', // oldWidth\n   'number', // numChannels\n   'number', // newHeight\n   'number', // newWidth\n   'number', // alignCorners\n   'number', // halfPixelCenters\n   'number'   // outId\n]);\n}\n\nfunction resizeBilinear(args: {\n backend: BackendWasm,\n inputs: ResizeBilinearInputs,\n attrs: ResizeBilinearAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n\n const {images} = inputs;\n const {alignCorners, halfPixelCenters, size} = attrs;\n const [newHeight, newWidth] = size;\n\n const [batch, oldHeight, oldWidth, numChannels] = images.shape;\n const outShape = [batch, newHeight, newWidth, numChannels];\n\n let xData = backend.dataIdMap.get(images.dataId);\n let castedData;\n if (xData.dtype !== 'float32') {\n   castedData =\n cast({backend, inputs: {x: images}, attrs: {dtype: 'float32'}});\n   xData = backend.dataIdMap.get(castedData.dataId);\n }\n const xId = xData.id;\n\n const out = backend.makeOutput(outShape, 'float32');\n if (util.sizeFromShape(images.shape) === 0) {\n   return out;\n }\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmResizeBilinear(\n   xId, batch, oldHeight, oldWidth, numChannels, newHeight, newWidth,\n   alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId);\n\n if (castedData != null) {\n   backend.disposeData(castedData.dataId);\n }\n\n return out;\n}\n\nexport const resizeBilinearConfig: KernelConfig = {\n kernelName: ResizeBilinear,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: resizeBilinear as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\n\nlet wasmReverse: (\n   xId: number, axes: Uint8Array, axesLength: number, outShape: Uint8Array,\n   outShapeLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmReverse = backend.wasm.cwrap(Reverse, null, [\n   'number', // x_id\n   'array',   // axes\n   'number', // axes_length\n   'array',   // out_shape\n   'number', // out_shape_length\n   'number'   // out_id\n]);\n}\n\nexport function reverse(\n   args: {inputs: ReverseInputs, backend: BackendWasm, attrs: ReverseAttrs}):\n   TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {dims} = attrs;\n\n const axes = util.parseAxisParam(dims, x.shape);\n\n if (x.shape.length === 0) {\n   return identity({inputs: {x}, backend});\n }\n\n const out = backend.makeOutput(x.shape, x.dtype);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const axesBytes = new Uint8Array(new Int32Array(axes).buffer);\n const outShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n wasmReverse(\n   xId, axesBytes, axes.length, outShapeBytes, x.shape.length, outId);\n\n const reshaped =\n   reshape({inputs: {x: out}, attrs: {shape: x.shape}, backend});\n\n backend.disposeData(out.dataId);\n return reshaped;\n}\n\nexport const reverseConfig: KernelConfig = {\n kernelName: Reverse,\n backendName: 'wasm',\n kernelFunc: reverse as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n

/\n\nimport {KernelConfig, KernelFunc, RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmRotate: (\n xId: number, batch: number, imageHeight: number, imageWidth: number,\n numChannels: number, radians: number, centerX: number, centerY: number,\n fillBytes: Uint8Array, fillLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmRotate = backend.wasm.cwrap(RotateWithOffset, null / void */, [\n 'number', // xId\n 'number', // batch\n 'number', // imageHeight\n 'number', // imageWidth\n 'number', // numChannels\n 'number', // radians\n 'number', // centerX\n 'number', // centerY\n 'array', // fillBytes\n 'number', // fillLength\n 'number', // outId\n]);\n}\n\nexport function rotateWithOffset(args: {\n inputs: RotateWithOffsetInputs,\n backend: BackendWasm,\n attrs: RotateWithOffsetAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {image} = inputs;\n const {radians, fillValue, center} = attrs;\n\n const out = backend.makeOutput(image.shape, image.dtype);\n const imageId = backend.dataIdMap.get(image.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n\n const [centerX, centerY] =\n backend_util.getImageCenter(center, imageHeight, imageWidth);\n\n const fillIsBlack = fillValue === 0;\n const fullOpacityValue = 255;\n\n const fillValues = typeof fillValue === 'number' ?\n [fillValue, fillValue, fillValue, fillIsBlack ? 0 : fullOpacityValue] :\n [...fillValue, fullOpacityValue];\n const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);\n\n wasmRotate(\n imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX,\n centerY, fillBytes, fillValues.length, outId);\n return out;\n}\n\nexport const rotateWithOffsetConfig: KernelConfig = {\n kernelName: RotateWithOffset,\n backendName: 'wasm',\n kernelFunc: rotateWithOffset as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS
 OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\nimport {KernelConfig, Round} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
 language governing permissions and\n * limitations under the License.\n *
==\n
*/\nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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*/\n\nimport {KernelConfig, KernelFunc, scatter_util, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo, util}
from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from
'./types';\n\nlet wasmScatterNd: (\n    indicesId: number, updatesId: number, dtype: CppDType, sliceRank:
number,\n    numUpdates: number, sliceSize: number, strides: Uint8Array,\n    outputSize: number, outId: number)
=> void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmScatterNd = backend.wasm.cwrap(ScatterNd,
null /*void*/, [\n    'number',  // indicesId\n    'number',  // updatesId\n    'number',  // dtype\n    'number',  //
sliceRank\n    'number',  // numUpdates\n    'number',  // sliceSize\n    'array',   // strides\n    'number',  // outputSize\n
 'number'   // outId\n  ]);\n}\n\nfunction scatterNd(\n    args:\n        {backend: BackendWasm, inputs:
ScatterNdInputs, attrs:
 ScatterNdAttrs}):\n    TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {indices, updates} = inputs;\n
const {shape} = attrs;\n\n  const out = backend.makeOutput(shape, updates.dtype);\n  if (util.sizeFromShape(shape)
=== 0) {\n    return out;\n  }\n\n  const {sliceRank, numUpdates, sliceSize, strides, outputSize} =\n
scatter_util.calculateShapes(updates, indices, shape);\n\n  const indicesData =
backend.dataIdMap.get(indices.dataId);\n  const indicesId = indicesData.id;\n\n  const updatesData =
backend.dataIdMap.get(updates.dataId);\n  const updatesId = updatesData.id;\n\n  const stridesBytes = new
Uint8Array(new Int32Array(strides).buffer);\n\n  const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmScatterNd(\n      indicesId, updatesId, CppDType[updates.dtype], sliceRank, numUpdates,\n      sliceSize,
stridesBytes, outputSize, outId);\n\n  return out;\n}\n\nexport const scatterNdConfig: KernelConfig = {\n
kernelName: ScatterNd,\n  backendName: 'wasm',\n
  setupFunc: setup,\n  kernelFunc: scatterNd as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020
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============================================================================\n
*/\n\nimport {KernelConfig, KernelFunc, Select, SelectInputs, util} from '@tensorflow/tfjs-core';\n\nimport
{BackendWasm} from '../backend_wasm';\n\nlet wasmSelect: (\n    conditionId: number, tId: number, eId:
 number, offset: number,\n    outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n  wasmSelect
= backend.wasm.cwrap('SelectV2', null, [\n    'number',  // conditionId\n    'number',  // tId\n    'number',  // eId\n
'number',  // offset\n    'number',  // outId\n  ]);\n}\n\nfunction select(args: {inputs: SelectInputs, backend:
BackendWasm}) {\n  const {inputs, backend} = args;\n  const {condition, t, e} = inputs;\n\n  const conditionId =
backend.dataIdMap.get(condition.dataId).id;\n  const tId = backend.dataIdMap.get(t.dataId).id;\n  const eId =
backend.dataIdMap.get(e.dataId).id;\n  const out = backend.makeOutput(t.shape, t.dtype);\n  const outId =
backend.dataIdMap.get(out.dataId).id;\n\n  const cRank = condition.shape.length;\n  const tRank =
t.shape.length;\n\n  const offset = cRank === 0 || cRank > 1 || tRank === 1 ?\n      1 :\n
util.sizeFromShape(t.shape.slice(1));\n\n  wasmSelect(conditionId, tId, eId, offset, outId);\n  return out;\n}\n\nexport
const selectConfig:
 KernelConfig = {\n  kernelName: Select,\n  backendName: 'wasm',\n  kernelFunc: select as {} as KernelFunc,\n
setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed
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```

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==========\n */\n\nimport {KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm}
 from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n  wasmFunc = backend.wasm.cwrap(Sigmoid, null /* void */, ['number', 'number']);\n}\n\nfunction sigmoid(args: {backend: BackendWasm, inputs: SigmoidInputs}):\n    TensorInfo {\n const {backend, inputs: {x}} = args;\n  const xId = backend.dataIdMap.get(x.dataId).id;\n  const out = backend.makeOutput(x.shape, x.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  // Short-circuit zero-sized tensors.\n  if (util.sizeFromShape(out.shape) === 0) {\n    return out;\n  }\n\n  wasmFunc(xId, outId);\n return out;\n}\n\nexport const sigmoidConfig: KernelConfig = {\n  kernelName: 'Sigmoid',\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: sigmoid as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except
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==========\n */\nimport {KernelConfig, Sin} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n
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==========\n */\n\nimport {KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number, channels: number, batch: number) =>\n    void;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Softmax, null /* void */, [\n    'number',  // xId\n    'number',  // outId\n 'number',  // channels\n    'number'   // batch\n ]);\n}\n\nfunction softmax(\n    args: {backend: BackendWasm,
 inputs: SoftmaxInputs, attrs: SoftmaxAttrs}):\n    TensorInfo {\n  const {backend, inputs: {logits}, attrs: {dim}} = args;\n  const xId = backend.dataIdMap.get(logits.dataId).id;\n  const out = backend.makeOutput(logits.shape, logits.dtype);\n  const outId = backend.dataIdMap.get(out.dataId).id;\n\n  const channels = logits.shape[dim];\n const batch = util.sizeFromShape(logits.shape) / channels;\n\n  // Short-circuit zero-sized tensors.\n  if (util.sizeFromShape(out.shape) === 0) {\n    return out;\n  }\n\n  wasmFunc(xId, outId, channels, batch);\n  return out;\n}\n\nexport const softmaxConfig: KernelConfig = {\n  kernelName: Softmax,\n  backendName: 'wasm',\n setupFunc: setup,\n  kernelFunc: softmax as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n
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*/\n\nimport {backend_util, KernelConfig, KernelFunc, ReshapeAttrs, ReshapeInputs, SpaceToBatchND, SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, TransposeAttrs, TransposeInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {padV2Config} from './PadV2';\nimport {reshape} from './Reshape';\nimport {transpose} from './Transpose';\n\nfunction spaceToBatchND(args: {\n inputs: SpaceToBatchNDInputs,\n backend: BackendWasm,\n attrs: SpaceToBatchNDAttrs\n}) {\n const {inputs, backend,
 attrs} = args;\n const {x} = inputs;\n const {blockShape, paddings} = attrs;\n\n const prod = util.sizeFromShape(blockShape);\n\n const completePaddings: Array<[number, number]> = [[0, 0]];\n completePaddings.push(...(paddings as Array<[number, number]>));\n\n for (let i = 1 + blockShape.length; i < x.shape.length; ++i) {\n   completePaddings.push([0, 0]);\n }\n\n const paddedX = padV2Config.kernelFunc({\n inputs: {x},\n   backend,\n   attrs: {paddings: completePaddings, constantValue: 0}\n }) as TensorInfo;\n\n const reshapedPaddedShape =\n   backend_util.getReshaped(paddedX.shape, blockShape, prod, false);\n\n const permutedReshapedPaddedPermutation = backend_util.getPermuted(\n   reshapedPaddedShape.length, blockShape.length, false);\n\n const flattenShape =\n   backend_util.getReshapedPermuted(paddedX.shape, blockShape, prod, false);\n\n const reshapeInputs: ReshapeInputs = {x: paddedX};\n const reshapeAttrs: ReshapeAttrs = {shape: reshapedPaddedShape};\n
  const paddedXReshaped =\n   reshape({inputs: reshapeInputs, backend, attrs: reshapeAttrs});\n\n const transposeInputs: TransposeInputs = {x: paddedXReshaped};\n const transposeAttrs:\n   TransposeAttrs = {perm: permutedReshapedPaddedPermutation};\n const paddedXT =\n   transpose({inputs: transposeInputs, backend, attrs: transposeAttrs});\n\n const resultReshapeInputs: ReshapeInputs = {x: paddedXT};\n const resultReshapeAttrs: ReshapeAttrs = {shape: flattenShape};\n const result = reshape(\n   {inputs: resultReshapeInputs, backend, attrs: resultReshapeAttrs});\n\n backend.disposeData(paddedX.dataId);\n backend.disposeData(paddedXReshaped.dataId);\n backend.disposeData(paddedXT.dataId);\n\n return result;\n}\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n kernelName: SpaceToBatchND,\n backendName: 'wasm',\n kernelFunc: spaceToBatchND as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
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==\n */\n\nimport {KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, util} from '@tensorflow/tfjs-core';\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {slice} from './Slice';\n\nexport function splitV(\n   args: {inputs: SplitVInputs, attrs: SplitVAttrs, backend: BackendWasm}) {\n const {inputs,
 attrs, backend} = args;\n const {x} = inputs;\n const {numOrSizeSplits, axis} = attrs;\n\n const $axis = util.parseAxisParam(axis, x.shape)[0];\n\n const splitSizes = backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n const begin = new Array(x.shape.length).fill(0);\n const size = x.shape.slice();\n return splitSizes.map(s => {\n   const xSliceSize = [...size];\n   xSliceSize[$axis] = s;\n   const xSlice =\n   slice({inputs: {x}, attrs: {begin, size: xSliceSize}, backend});\n   begin[$axis] += s;\n   return xSlice;\n });\n}\n\nexport const splitVConfig: KernelConfig = {\n kernelName: SplitV,\n backendName: 'wasm',\n kernelFunc: splitV as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either

express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n===\n*/\n\nimport {KernelConfig, Sqrt} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const sqrtConfig: KernelConfig = createUnaryKernelConfig(Sqrt);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n===\n*/\nimport {KernelConfig, Square} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const squareConfig: KernelConfig = createUnaryKernelConfig(Square);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n===\n*/\nimport {KernelConfig, SquaredDifference} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const squaredDifferenceConfig: KernelConfig =\n   createBinaryKernelConfig(SquaredDifference, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n===\n*/\n\nimport {KernelConfig, KernelFunc, Step, StepAttrs, StepInputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmStep: (xId: number, alpha: number, dtype: number, outId: number) =>\n   void;\n\nfunction setup(backend: BackendWasm): void {\n wasmStep = backend.wasm.cwrap(Step, null /*void*/, [\n   'number', // x_id\n   'number', // alpha\n   'number', // dtype\n   'number', // out_id\n]);\n}\n\nfunction step(\n   args: {backend: BackendWasm, inputs: StepInputs, attrs: StepAttrs}):\n   TensorInfo {\n const {backend, inputs, attrs} = args;\n const {alpha} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmStep(xId, alpha, CppDType[x.dtype], outId);\n return out;\n}\n\nexport const stepConfig: KernelConfig = {\n kernelName: Step,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: step as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language

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License.\n *
==========\n
*/\n\nimport {KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from './Reshape';\nimport {slice} from './Slice';\n\nlet wasmStridedSlice: (\n xId: number, xStridesBytes: Uint8Array, xRank: number,\n beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n outShapeBytes: Uint8Array, outStridesBytes: Uint8Array,\n outShapeLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n 'number', // xId\n 'array', // xStrides\n 'number', // xRank\n 'array', // beginBytes\n 'array', // endBytes\n 'array', // stridesBytes\n 'array', // outShapeBytes\n 'array', // outStridesBytes\n 'number', // outShapeLength\n 'number', // outId\n]);\n}\n\nexport function stridedSlice(args: {\n backend: BackendWasm,\n inputs: StridedSliceInputs,\n attrs: StridedSliceAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x} = inputs;\n\n const {\n begin,\n end,\n strides,\n beginMask,\n endMask,\n ellipsisMask,\n newAxisMask,\n shrinkAxisMask\n } = attrs;\n\n const {\n finalShapeSparse,\n finalShape,\n isIdentity,\n sliceDim0,\n isSimpleSlice,\n begin: $begin,\n end: $end,\n strides: $strides\n } =\n slice_util.sliceInfo(\n x.shape, begin, end, strides, beginMask, endMask, ellipsisMask,\n newAxisMask, shrinkAxisMask);\n\n let result;\n\n if (isIdentity) {\n // Optimization #1, slice is a no-op plus reshape\n result = reshape({inputs: {x}, backend, attrs: {shape: finalShape}});\n } else if (sliceDim0 || isSimpleSlice) {\n // Optimization #2, slice is memory contiguous
(only occurs in dim 0)\n util.assert(\n x.shape.length >= 1,\n () => `Input must have rank at least 1, got: ${x.shape.length}`);\n\n const size = slice_util.computeOutShape($begin, $end, $strides);\n // To tolerate begin[0] > end[0] (a 0-output slice), we min(begin, end).\n const sliced = slice({inputs: {x}, backend, attrs: {begin: $begin, size}});\n result =\n reshape({inputs: {x: sliced}, backend, attrs: {shape: finalShape}});\n backend.disposeData(sliced.dataId);\n } else {\n const out = backend.makeOutput(finalShapeSparse, 'float32');\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const xStridesBytes =\n new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n const beginBytes = new Uint8Array(new Int32Array($begin).buffer);\n const endBytes = new Uint8Array(new Int32Array($end).buffer);\n const stridesBytes = new Uint8Array(new Int32Array($strides).buffer);\n\n const outputShapeBytes =\n new Uint8Array(new Int32Array(finalShapeSparse).buffer);\n const outStridesBytes = new Uint8Array(\n new Int32Array(util.computeStrides(finalShapeSparse)).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmStridedSlice(\n xId, xStridesBytes, x.shape.length, beginBytes, endBytes, stridesBytes,\n outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);\n\n result = reshape({inputs: {x: out}, backend, attrs: {shape: finalShape}});\n\n backend.disposeData(out.dataId);\n }\n\n return result;\n}\n\nexport const stridedSliceConfig: KernelConfig = {\n kernelName: StridedSlice,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: stridedSlice as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License
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==========\n
*/\nimport {KernelConfig, Sub} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const subConfig: KernelConfig =\n createBinaryKernelConfig(Sub, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this

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==========\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmSum: (xId: number, reduceSize: number, dtype: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmSum = backend.wasm.cwrap(Sum, null /*void*/, [\n   'number', // input_id\n   'number', // reduce_size\n   'number', // dtype\n
    'number', // out_id\n]);\n}\n\nfunction sum(args: {backend: BackendWasm, inputs: SumInputs, attrs: SumAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n   const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   if (transposedId !== xId) {\n   // transpose was not a no-op. We will need to dispose of this\n   // once we are done.\n   input = transposed;\n   inputId = transposedId;\n   reductionAxes = backend_util.getInnerMostAxes(\n   reductionAxes.length, input.shape.length);\n   }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n   'sum', reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n   backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n   wasmSum(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n return out;\n}\n\nexport const sumConfig: KernelConfig = {\n kernelName: Sum,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sum as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except
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==========\n */\nimport {KernelConfig, Tan} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const tanConfig: KernelConfig = createUnaryKernelConfig(Tan);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n
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*/\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n*/\n\nimport {KernelConfig, KernelFunc, Tile, TileAttrs, TileInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmTile: (\n xId: number, xShape: Uint8Array, xShapeSize: number, newShape: Uint8Array,\n newShapeSize: number, dtype: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTile = backend.wasm.cwrap(Tile, null /* void */, [\n 'number', // x_id\n 'array', // x_shape\n 'number', // x_shape.length\n 'array', // new_shape\n 'number', // new_shape.length\n 'number' // out_id\n]);\n}\n\nfunction tile(\n args: {inputs: TileInputs, backend: BackendWasm, attrs: TileAttrs}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const {reps} = attrs;\n\n const newShape: number[] = new Array(x.shape.length);\n for (let i = 0; i < newShape.length; i++) {\n newShape[i] = x.shape[i] * reps[i];\n }\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n const newShapeBytes = new Uint8Array(new Int32Array(newShape).buffer);\n\n const out = backend.makeOutput(newShape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmTile(\n xId, xShapeBytes, x.shape.length, newShapeBytes, newShape.length,\n CppDType[out.dtype], outId);\n return out;\n}\n\nexport const tileConfig: KernelConfig = {\n kernelName: Tile,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: tile as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n*/\n\nimport {KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {CppDType} from './types';\n\nlet wasmTopK: (\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number,\n xDtype: CppDType, k: number, sorted: boolean,\n outValuesId: number,\n outIndicesId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n 'number', // k\n 'bool', // sorted\n 'number', // outValuesId\n 'number', // outIndicesId\n]);\n}\n\nexport const topk:\n (args: {inputs: TopKInputs, backend: BackendWasm, attrs: TopKAttrs}) =>\n TensorInfo[] | TensorInfo = ({inputs, backend, attrs}) => {\n const {x} = inputs;\n const {k, sorted} = attrs;\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n const outputShape = x.shape.slice();\n outputShape[outputShape.length - 1] = k;\n const outValues = backend.makeOutput(outputShape, x.dtype);\n const outValuesId = backend.dataIdMap.get(outValues.dataId).id;\n\n const outIndices = backend.makeOutput(outputShape, 'int32');\n const outIndicesId = backend.dataIdMap.get(outIndices.dataId).id;\n\n wasmTopK(\n xId, xShapeBytes, x.shape.length, CppDType[x.dtype], k, sorted,\n outValuesId, outIndicesId);\n\n return [outValues, outIndices];\n};\n\nexport const topKConfig: KernelConfig = {\n kernelName: TopK,\n backendName: 'wasm',\n setupFunc:

setup,\n kernelFunc: topk as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR
 CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transform, TransformAttrs, TransformInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmTransform: (\n   imageId: number, transformsId: number, isBatchTransform: boolean,\n   batch: number, outHeight: number, outWidth: number, numChannels: number,\n   imageWidth: number, imageHeight: number, strides: Uint8Array,\n   stridesLength: number, interpolationModeId: number, fillModeId: number,\n   fillValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmTransform = backend.wasm.cwrap(Transform, null /*void*/, [\n   'number', // imageId\n   'number', // transformsId\n   'bool',   // isBatchTransform\n   'number', // batch\n   'number', // outHeight\n   'number', // outWidth\n   'number', // numChannels\n   'number', // imageWidth\n   'number', // imageHeight\n   'array',   // strides\n   'number', // stridesLength\n   'number', // interpolationModeId\n   'number', // fillModeId\n   'number', // fillValue\n   'number'   // outId\n]);\n}\n\nfunction transform(\n   args:\n   {backend: BackendWasm, inputs: TransformInputs, attrs: TransformAttrs}):\n   TensorInfo {\n const {backend, inputs, attrs} = args;\n const {image, transforms} = inputs;\n const {interpolation, fillMode, fillValue, outputShape} = attrs;\n\n const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n const [outHeight, outWidth] =\n   outputShape != null ? outputShape : [imageHeight, imageWidth];\n const outShape =\n   [batch, outHeight, outWidth,\n   numChannels] as [number, number, number, number];\n const strides =\n   new Uint8Array(new Int32Array(util.computeStrides(image.shape)).buffer);\n\n
  const out = backend.makeOutput(outShape, image.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const imageData = backend.dataIdMap.get(image.dataId);\n const imageId = imageData.id;\n\n const transformsData = backend.dataIdMap.get(transforms.dataId);\n const transformsId = transformsData.id;\n\n const interpolationModeId = interpolation === 'nearest' ? 1 : 2;\n let fillModeId;\n switch (fillMode) {\n   case 'constant':\n   fillModeId = 1;\n   break;\n   case 'reflect':\n   fillModeId = 2;\n   break;\n   case 'wrap':\n   fillModeId = 3;\n   break;\n   case 'nearest':\n   fillModeId = 4;\n   break;\n   default:\n   fillModeId = 1;\n   break;\n }\n\n wasmTransform(\n   imageId, transformsId, (transforms.shape[0] > 1), batch, outHeight,\n   outWidth, numChannels, imageWidth, imageHeight, strides,\n   image.shape.length - 1, interpolationModeId, fillModeId, fillValue,\n   outId);\n\n
  return out;\n}\n\nexport const transformConfig: KernelConfig = {\n kernelName: Transform,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: transform as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs}
 from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {slice} from './Slice';\n\nfunction unpack(\n   args: {inputs: UnpackInputs, backend: BackendWasm, attrs: UnpackAttrs}):\n   TensorInfo[] {\n const {inputs, backend, attrs} = args;\n const {value} = inputs;\n let {axis} = attrs;\n\n if (axis <

0) {\n axis += value.shape.length;\n }\n\n const numOutputs = value.shape[axis];\n const rank = value.shape.length;\n const outShape: number[] = new Array(rank - 1);\n let outIndex = 0;\n for (let i = 0; i < rank; i++) {\n if (i !== axis) {\n outShape[outIndex++] = value.shape[i];\n }\n }\n const outs: TensorInfo[] = new Array(numOutputs);\n const begin = new Array(rank).fill(0);\n const size = value.shape.slice();\n size[axis] = 1;\n for (let i = 0; i < outs.length; i++) {\n begin[axis] = i;\n outs[i] = slice({inputs: {x: value}, attrs: {begin, size}, backend});\n }\n return outs.map(({dataId, dtype}) => ({dataId, dtype, shape: outShape}));\n}\n\nexport const unpackConfig: KernelConfig = {\n kernelName: Unpack,\n backendName: 'wasm',\n kernelFunc: unpack as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, KernelFunc, ZerosLike, ZerosLikeInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nfunction zerosLike(args: {inputs: ZerosLikeInputs, backend: BackendWasm}) {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(0);\n return out;\n}\n\nexport const zerosLikeConfig: KernelConfig = {\n kernelName: ZerosLike,\n backendName: 'wasm',\n kernelFunc: zerosLike as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n// We explicitly import the modular kernels so they get registered in the\n// global registry when we compile the library. A modular build would replace\n// the contents of this file and import only the kernels that are needed.\nimport {KernelConfig, registerKernel} from '@tensorflow/tfjs-core';\n\nimport {fusedMatMulConfig} from './kernels/_FusedMatMul';\nimport {absConfig} from './kernels/Abs';\nimport {addConfig} from './kernels/Add';\nimport {addNConfig} from './kernels/AddN';\nimport {allConfig} from './kernels/All';\nimport {anyConfig} from './kernels/Any';\nimport {argMaxConfig} from './kernels/ArgMax';\nimport {avgPoolConfig} from './kernels/AvgPool';\nimport {batchMatMulConfig} from './kernels/BatchMatMul';\nimport {batchToSpaceNDConfig} from './kernels/BatchToSpaceND';\nimport {castConfig} from './kernels/Cast';\nimport {ceilConfig} from './kernels/Ceil';\nimport {clipByValueConfig} from './kernels/ClipByValue';\nimport {concatConfig} from './kernels/Concat';\nimport {conv2DConfig} from './kernels/Conv2D';\nimport {conv2DBackpropInputConfig} from './kernels/Conv2DBackpropInput';\nimport {cosConfig} from './kernels/Cos';\nimport {coshConfig} from './kernels/Cosh';\nimport {cropAndResizeConfig} from './kernels/CropAndResize';\nimport {cumsumConfig} from './kernels/Cumsum';\nimport {depthToSpaceConfig} from './kernels/DepthToSpace';\nimport {depthwiseConv2dNativeConfig} from './kernels/DepthwiseConv2dNative';\nimport {eluConfig} from './kernels/Elu';\nimport {equalConfig} from './kernels/Equal';\nimport {expConfig} from './kernels/Exp';\nimport {expandDimsConfig} from './kernels/ExpandDims';\nimport {fillConfig} from './kernels/Fill';\nimport {flipLeftRightConfig} from './kernels/FlipLeftRight';\nimport {floorConfig} from './kernels/Floor';\nimport {floorDivConfig} from './kernels/FloorDiv';\nimport

{fusedBatchNormConfig} from './kernels/FusedBatchNorm';\nimport {fusedConv2DConfig} from
'./kernels/FusedConv2D';\nimport {fusedDepthwiseConv2DConfig} from
'./kernels/FusedDepthwiseConv2D';\nimport {gatherNdConfig} from './kernels/GatherNd';\nimport
{gatherV2Config} from './kernels/GatherV2';\nimport {greaterConfig} from './kernels/Greater';\nimport
{greaterEqualConfig} from './kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport
{leakyReluConfig} from './kernels/LeakyRelu';\nimport {lessConfig} from './kernels/Less';\nimport
{lessEqualConfig} from './kernels/LessEqual';\nimport {logConfig} from './kernels/Log';\nimport
{logicalAndConfig} from './kernels/LogicalAnd';\nimport {maxConfig} from './kernels/Max';\nimport
{maximumConfig} from './kernels/Maximum';\nimport {maxPoolConfig} from './kernels/MaxPool';\nimport
{meanConfig} from './kernels/Mean';\nimport {minConfig} from './kernels/Min';\nimport {minimumConfig} from
'./kernels/Minimum';\nimport
{mirrorPadConfig} from './kernels/MirrorPad';\nimport {multiplyConfig} from './kernels/Multiply';\nimport
{negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from
'./kernels/NonMaxSuppressionV3';\nimport {nonMaxSuppressionV4Config} from
'./kernels/NonMaxSuppressionV4';\nimport {nonMaxSuppressionV5Config} from
'./kernels/NonMaxSuppressionV5';\nimport {notEqualConfig} from './kernels/NotEqual';\nimport {oneHotConfig}
from './kernels/OneHot';\nimport {onesLikeConfig} from './kernels/OnesLike';\nimport {packConfig} from
'./kernels/Pack';\nimport {padV2Config} from './kernels/PadV2';\nimport {powConfig} from
'./kernels/Pow';\nimport {preluConfig} from './kernels/Prelu';\nimport {prodConfig} from './kernels/Prod';\nimport
{rangeConfig} from './kernels/Range';\nimport {realDivConfig} from './kernels/RealDiv';\nimport {reluConfig}
from './kernels/Relu';\nimport {relu6Config} from './kernels/Relu6';\nimport {reshapeConfig} from
'./kernels/Reshape';\nimport {resizeBilinearConfig}
from './kernels/ResizeBilinear';\nimport {reverseConfig} from './kernels/Reverse';\nimport
{rotateWithOffsetConfig} from './kernels/RotateWithOffset';\nimport {roundConfig} from
'./kernels/Round';\nimport {rsqrtConfig} from './kernels/Rsqrt';\nimport {scatterNdConfig} from
'./kernels/ScatterNd';\nimport {selectConfig} from './kernels/Select';\nimport {sigmoidConfig} from
'./kernels/Sigmoid';\nimport {sinConfig} from './kernels/Sin';\nimport {sliceConfig} from './kernels/Slice';\nimport
{softmaxConfig} from './kernels/Softmax';\nimport {spaceToBatchNDConfig} from
'./kernels/SpaceToBatchND';\nimport {splitVConfig} from './kernels/SplitV';\nimport {sqrtConfig} from
'./kernels/Sqrt';\nimport {squareConfig} from './kernels/Square';\nimport {squaredDifferenceConfig} from
'./kernels/SquaredDifference';\nimport {stepConfig} from './kernels/Step';\nimport {stridedSliceConfig} from
'./kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig} from
'./kernels/Sum';\nimport
{tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport {tileConfig} from
'./kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transformConfig} from
'./kernels/Transform';\nimport {transposeConfig} from './kernels/Transpose';\nimport {unpackConfig} from
'./kernels/Unpack';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst
kernelConfigs: KernelConfig[] = [\n absConfig,\n addConfig,\n addNConfig,\n allConfig,\n anyConfig,\n
argMaxConfig,\n avgPoolConfig,\n batchMatMulConfig,\n batchToSpaceNDConfig,\n castConfig,\n
ceilConfig,\n clipByValueConfig,\n concatConfig,\n conv2DConfig,\n conv2DBackpropInputConfig,\n
cosConfig,\n coshConfig,\n cropAndResizeConfig,\n cumsumConfig,\n depthToSpaceConfig,\n
depthwiseConv2dNativeConfig,\n eluConfig,\n equalConfig,\n expConfig,\n expandDimsConfig,\n fillConfig,\n
flipLeftRightConfig,\n floorConfig,\n floorDivConfig,\n
fusedMatMulConfig,\n fusedBatchNormConfig,\n fusedConv2DConfig,\n fusedDepthwiseConv2DConfig,\n
gatherNdConfig,\n gatherV2Config,\n greaterConfig,\n greaterEqualConfig,\n identityConfig,\n
leakyReluConfig,\n lessConfig,\n lessEqualConfig,\n logConfig,\n logicalAndConfig,\n maxConfig,\n
maximumConfig,\n maxPoolConfig,\n meanConfig,\n minConfig,\n minimumConfig,\n mirrorPadConfig,\n
multiplyConfig,\n negConfig,\n nonMaxSuppressionV3Config,\n nonMaxSuppressionV4Config,\n

nonMaxSuppressionV5Config,\n notEqualConfig,\n oneHotConfig,\n onesLikeConfig,\n packConfig,\n padV2Config,\n powConfig,\n preluConfig,\n prodConfig,\n rangeConfig,\n realDivConfig,\n reluConfig,\n relu6Config,\n reshapeConfig,\n resizeBilinearConfig,\n reverseConfig,\n rotateWithOffsetConfig,\n rsqrtConfig,\n roundConfig,\n scatterNdConfig,\n selectConfig,\n sigmoidConfig,\n sinConfig,\n sliceConfig,\n softmaxConfig,\n spaceToBatchNDConfig,\n splitVConfig,\n sqrtConfig,\n squareConfig,\n squaredDifferenceConfig,\n stepConfig,\n stridedSliceConfig,\n subConfig,\n sumConfig,\n tanConfig,\n tanhConfig,\n tileConfig,\n topKConfig,\n transformConfig,\n transposeConfig,\n unpackConfig,\n zerosLikeConfig\n];\n\nfor (const kernelConfig of kernelConfigs) {\n registerKernel(kernelConfig);\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {env} from '@tensorflow/tfjs-core';\n\nconst ENV = env();\n\n/**\n * True if SIMD is supported.\n */\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag(\n // This typed array passed in to WebAssembly.validate is WebAssembly binary\n // code. In this case it is a small program that contains SIMD\n // instructions.\n 'WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new Uint8Array([\n 0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3,\n 2, 1, 0, 10, 9, 1, 7, 0, 65, 0, 253, 15, 26, 11\n])));\n\n/**\n * True if threads are supported.\n */\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag('WASM_HAS_MULTITHREAD_SUPPORT', async () => {\n // TODO(annxingyuan): Enable node support once this is resolved:\n // https://github.com/tensorflow/tfjs/issues/3830\n if (ENV.get('IS_NODE')) {\n return false;\n }\n\n try {\n // Test for transferability of SABs (needed for Firefox)\n // https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkBZlHETpA/dwsMNchWEQAJ\n new MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n // This typed array is a WebAssembly program containing threaded\n // instructions.\n return WebAssembly.validate(new Uint8Array([\n 0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0, 0, 3, 2, 1, 0, 5,\n 4, 1, 3, 1, 1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26, 11\n]));\n } catch (e) {\n return false;\n }\n});\n","\nvar WasmBackendModuleThreadedSimd = (function() {\n var _scriptDir = typeof document !== 'undefined' && document.currentScript ? document.currentScript.src : undefined;\n if (typeof __filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return (\nfunction(WasmBackendModuleThreadedSimd) {\n WasmBackendModuleThreadedSimd = WasmBackendModuleThreadedSimd || {};\n\nfunction GROWABLE_HEAP_I8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAP8}function GROWABLE_HEAP_U8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAPU8}function GROWABLE_HEAP_I32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAP32}function GROWABLE_HEAP_U32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAPU32}function GROWABLE_HEAP_F64(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAPF64}var Module=typeof WasmBackendModuleThreadedSimd!==\"undefined\"?WasmBackendModuleThreadedSimd:{};var readyPromiseResolve,readyPromiseReject;Module[\"ready\"]=new Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var

moduleOverrides={};var key;for(key in Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var thisProgram=\"./this.program\";var quit_=function(status,toThrow){throw toThrow};var ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof window===\"object\";ENVIRONMENT_IS_WORKER=typeof importScripts===\"function\";ENVIRONMENT_IS_NODE=typeof process===\"object\"&&typeof process.versions===\"object\"&&typeof process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONMENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var ENVIRONMENT_IS_PTHREAD=Module[\"ENVIRONMENT_IS_PTHREAD\"]||false;if(ENVIRONMENT_IS_PTHREAD){buffer=Module[\"buffer\"]}var scriptDirectory=\"\";function locateFile(path){if(Module[\"locateFile\"]){return Module[\"locateFile\"](path,scriptDirectory)}return scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\"path\").dirname(scriptDirectory)+\"/\"}else{scriptDirectory=__dirname+\"/\"}read_=function shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=nodePath[\"normalize\"](filename);return nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\")};readBinary=function readBinary(filename){var ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return ret};if(process[\"argv\"].length>1){thisProgram=process[\"argv\"][1].replace(/\\\\/g,\"/\")}arguments_=process[\"argv\"].slice(2);process[\"on\"](\"uncaughtException\",function(ex){if(!(ex instanceof ExitStatus)){throw ex}});process[\"on\"](\"unhandledRejection\",abort);quit_=function(status){process[\"exit\"](status)};Module[\"inspect\"]=function(){return\"[Emscripten Module object]\"};var nodeWorkerThreads;try{nodeWorkerThreads=require(\"worker_threads\")}catch(e){console.error('The \"worker_threads\" module is not supported in this node.js build - perhaps a newer version is needed?');throw e}global.Worker=nodeWorkerThreads.Worker}else if(ENVIRONMENT_IS_SHELL){if(typeof read!=\"undefined\"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var data;if(typeof readbuffer===\"function\"){return new Uint8Array(readbuffer(f))}data=read(f,\"binary\");assert(typeof data===\"object\");return data};if(typeof scriptArgs!=\"undefined\"){arguments_=scriptArgs}else if(typeof arguments!=\"undefined\"){arguments_=arguments}if(typeof quit===\"function\"){quit_=function(status){quit(status)}}if(typeof print!==\"undefined\"){if(typeof console===\"undefined\")console={};console.log=print;console.warn=console.error=typeof printErr!==\"undefined\"?printErr:print}}else if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDirectory=self.location.href}else if(typeof document!==\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(typeof _scriptDir !== \"undefined\" && _scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf(\"blob:\")!==0){scriptDirectory=scriptDirectory.substr(0,scriptDirectory.lastIndexOf(\"/\")+1)}else{scriptDirectory=\"\"}if(ENVIRONMENT_IS_NODE){read_=function shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=nodePath[\"normalize\"](filename);return nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\")};readBinary=function readBinary(filename){var ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return ret}}else{read_=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.send(null);return xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new

XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.responseType=\"arraybuffer\";xhr.send(null);return new Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,true);xhr.responseType=\"arraybuffer\";xhr.onload=function(){if(xhr.status==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror()};xhr.onerror=onerror;xhr.send(null)}}setWindowTitle=function(title){document.title=title}}else{}if(ENVIRONMENT_IS_NODE){if(typeof performance===\"undefined\"){global.performance=require(\"perf_hooks\").performance}}var out=Module[\"print\"]||console.log.bind(console);var err=Module[\"printErr\"]||console.warn.bind(console);for(key in moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverrides=null;if(Module[\"arguments\"])arguments_=Module[\"arguments\"];if(Module[\"thisProgram\"])thisProgram=Module[\"thisProgram\"];if(Module[\"quit\"])quit_=Module[\"quit\"];function warnOnce(text){if(!warnOnce.shown)warnOnce.shown={};if(!warnOnce.shown[text]){warnOnce.shown[text]=1;err(text)}}var Atomics_load=Atomics.load;var Atomics_store=Atomics.store;var Atomics_compareExchange=Atomics.compareExchange;var wasmBinary;if(Module[\"wasmBinary\"])wasmBinary=Module[\"wasmBinary\"];var noExitRuntime=Module[\"noExitRuntime\"]||true;if(typeof WebAssembly!==\"object\"){abort(\"no native wasm support detected\")}var wasmMemory;var wasmModule;var ABORT=false;var EXITSTATUS;function assert(condition,text){if(!condition){abort(\"Assertion failed: \"+text)}}function getCFunc(ident){var func=Module[\"_\"+ident];assert(func,\"Cannot call unknown function \"+ident+\", make sure it is exported\");return func}function ccall(ident,returnType,argTypes,args,opts){var toC={\"string\":function(str){var ret=0;if(str!==null&&str!==undefined&&str!==0){var len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\"array\":function(arr){var ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function convertReturnValue(ret){if(returnType===\"string\")return UTF8ToString(ret);if(returnType===\"boolean\")return Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var i=0;i<args.length;i++){var converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i]=args[i]}}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var numericArgs=argTypes.every(function(type){return type===\"number\"});var numericRet=returnType!==\"string\";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return function(){return ccall(ident,returnType,argTypes,arguments,opts)}}function UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var str=\"\";while(!(idx>=endIdx)){var u0=heap[idx++];if(!u0)return str;if(!(u0&128)){str+=String.fromCharCode(u0);continue}var u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[idx++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function UTF8ToString(ptr,maxBytesToRead){return ptr?UTF8ArrayToString(GROWABLE_HEAP_U8(),ptr,maxBytesToRead):\"\"}function stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var u=str.charCodeAt(i);if(u>=55296&&u<=57343){var u1=str.charCodeAt(++i);u=65536+((u&1023)<<10)|u1&1023}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx

++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function stringToUTF8(str,outPtr,maxBytesToWrite){return stringToUTF8Array(str,GROWABLE_HEAP_U8(),outPtr,maxBytesToWrite)}function lengthBytesUTF8(str){var len=0;for(var i=0;i<str.length;++i){var u=str.charCodeAt(i);if(u>=55296&&u<=57343)u=65536+((u&1023)<<10)|str.charCodeAt(++i)&1023;if(u<=127)++len;else if(u<=2047)len+=2;else if(u<=65535)len+=3;else len+=4}return len}function writeArrayToMemory(array,buffer){GROWABLE_HEAP_I8().set(array,buffer)}function alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function updateGlobalBufferAndViews(buf){buffer=buf;Module[\"HEAP8\"]=HEAP8=new Int8Array(buf);Module[\"HEAP16\"]=HEAP16=new Int16Array(buf);Module[\"HEAP32\"]=HEAP32=new Int32Array(buf);Module[\"HEAPU8\"]=HEAPU8=new Uint8Array(buf);Module[\"HEAPU16\"]=HEAPU16=new Uint16Array(buf);Module[\"HEAPU32\"]=HEAPU32=new Uint32Array(buf);Module[\"HEAPF32\"]=HEAPF32=new Float32Array(buf);Module[\"HEAPF64\"]=HEAPF64=new Float64Array(buf)}var INITIAL_MEMORY=Module[\"INITIAL_MEMORY\"]||16777216;if(ENVIRONMENT_IS_PTHREAD){wasmMemory=Module[\"wasmMemory\"];buffer=Module[\"buffer\"]}else{if(Module[\"wasmMemory\"]){wasmMemory=Module[\"wasmMemory\"]}else{wasmMemory=new WebAssembly.Memory({\"initial\":INITIAL_MEMORY/65536,\"maximum\":2147483648/65536,\"shared\":true});if(!(wasmMemory.buffer instanceof SharedArrayBuffer)){err(\"requested a shared WebAssembly.Memory but the returned buffer is not a SharedArrayBuffer, indicating that while the browser has SharedArrayBuffer it does not have WebAssembly threads support - you may need to set a flag\");if(ENVIRONMENT_IS_NODE){console.log(\"(on node you may need: --experimental-wasm-threads --experimental-wasm-bulk-memory and also use a recent version)\")}throw Error(\"bad memory\")}}}if(wasmMemory){buffer=wasmMemory.buffer}INITIAL_MEMORY=buffer.byteLength;updateGlobalBufferAndViews(buffer);var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var __ATEXIT__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;var runtimeExited=false;if(!ENVIRONMENT_IS_PTHREAD)__ATINIT__.push({func:function(){___wasm_call_ctors()}});function preRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module[\"preRun\"]){if(typeof Module[\"preRun\"]==\"function\")Module[\"preRun\"]=[Module[\"preRun\"]];while(Module[\"preRun\"].length){addOnPreRun(Module[\"preRun\"].shift())}}callRuntimeCallbacks(__ATPRERUN__)}function initRuntime(){runtimeInitialized=true;if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATINIT__)}function preMain(){if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATMAIN__)}function exitRuntime(){if(ENVIRONMENT_IS_PTHREAD)return;runtimeExited=true}function postRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module[\"postRun\"]){if(typeof Module[\"postRun\"]==\"function\")Module[\"postRun\"]=[Module[\"postRun\"]];while(Module[\"postRun\"].length){addOnPostRun(Module[\"postRun\"].shift())}}callRuntimeCallbacks(__ATPOSTRUN__)}function addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function addRunDependency(id){assert(!ENVIRONMENT_IS_PTHREAD,\"addRunDependency cannot be used in a pthread worker\");runDependencies++;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}}function removeRunDependency(id){runDependencies--;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}if(runDependencies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=nul

l}if(dependenciesFulfilled){var
callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}}Module[\"preloadedImages\"]={};Module
[\"preloadedAudios\"]={};function
abort(what){if(Module[\"onAbort\"]){Module[\"onAbort\"](what)}if(ENVIRONMENT_IS_PTHREAD)console.err
or(\"Pthread aborting at \"+(new
Error).stack);what+=\"\";err(what);ABORT=true;EXITSTATUS=1;what=\"abort(\"+what+\"). Build with -s
ASSERTIONS=1 for more info.\";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw
e}function hasPrefix(str,prefix){return
String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var
dataURIPrefix=\"data:application/octet-stream; base64,\";function isDataURI(filename){return
hasPrefix(filename,dataURIPrefix)}var fileURIPrefix=\"file://\";function isFileURI(filename){return
hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile=\"tfjs-backend-wasm-threaded-
simd.wasm\";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function
getBinary(file){try{if(file==wasmBinaryFile&&wasmBinary){return new
Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw\"both async and sync fetching of the
wasm failed\"}}catch(err){abort(err)}}function
getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof
fetch===\"function\"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:\"same-
origin\"}).then(function(response){if(!response[\"ok\"]){throw\"failed to load wasm binary file at
'\"+wasmBinaryFile+\"'\"}return
response[\"arrayBuffer\"]()}).catch(function(){return getBinary(wasmBinaryFile)})}else{if(readAsync){return new
Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new
Uint8Array(response))},reject)})}}}return Promise.resolve().then(function(){return
getBinary(wasmBinaryFile)})}function createWasm(){var info={\"a\":asmLibraryArg};function
receiveInstance(instance,module){var
exports=instance.exports;Module[\"asm\"]=exports;wasmTable=Module[\"asm\"][\"I\"];wasmModule=module;if(!E
NVIRONMENT_IS_PTHREAD){var
numWorkersToLoad=PThread.unusedWorkers.length;PThread.unusedWorkers.forEach(function(w){PThread.load
WasmModuleToWorker(w,function(){if(!--numWorkersToLoad)removeRunDependency(\"wasm-
instantiate\")})})}if(!ENVIRONMENT_IS_PTHREAD){addRunDependency(\"wasm-instantiate\")}function
receiveInstantiatedSource(output){receiveInstance(output[\"instance\"],output[\"module\"])}function
instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return
WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err(\"failed to asynchronously prepare
wasm: \"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof
WebAssembly.instantiateStreaming===\"function\"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFil
e)&&typeof fetch===\"function\"){return fetch(wasmBinaryFile,{credentials:\"same-
origin\"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return
result.then(receiveInstantiatedSource,function(reason){err(\"wasm streaming compile failed: \"+reason);err(\"falling
back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)})})}else{return
instantiateArrayBuffer(receiveInstantiatedSource)}}if(Module[\"instantiateWasm\"]){try{var
exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports}catch(e){err(\"Module.instantiateWasm
callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}var
ASM_CONSTS={10520:function(){throw\"Canceled!\"},10538:function($0,$1){setTimeout(function(){__emscript
en_do_dispatch_to_thread($0,$1)},0)}};function initPthreadsJS(){PThread.initRuntime()}function
callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof
callback==\"function\"){callback(Module);continue}var func=callback.func;if(typeof
func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)()}else{wasmTable.get(func)(callback.arg)
}}else{func(callback.arg===undefined?null:callback.arg)}}}var

ERRNO_CODES={EPERM:63,ENOENT:44,ESRCH:71,EINTR:27,EIO:29,ENXIO:60,E2BIG:1,ENOEXEC:45,EBADF:8,ECHILD:12,EAGAIN:6,EWOULDBLOCK:6,ENOMEM:48,EACCES:2,EFAULT:21,ENOTBLK:105,EBUSY:10,EEXIST:20,EXDEV:75,ENODEV:43,ENOTDIR:54,EISDIR:31,EINVAL:28,ENFILE:41,EMFILE:33,ENOTTY:59,ETXTBSY:74,EFBIG:22,ENOSPC:51,ESPIPE:70,EROFS:69,EMLINK:34,EPIPE:64,EDOM:18,ERANGE:68,ENOMSG:49,EIDRM:24,ECHRNG:106,EL2NSYNC:156,EL3HLT:107,EL3RST:108,ELNRNG:109,EUNATCH:110,ENOCSI:111,EL2HLT:112,EDEADLK:16,ENOLCK:46,EBADE:113,EBADR:114,EXFULL:115,ENOANO:104,EBADRQC:103,EBADSLT:102,EDEADLOCK:16,EBFONT:101,ENOSTR:100,ENODATA:116,ETIME:117,ENOSR:118,ENONET:119,ENOPKG:120,EREMOTE:121,ENOLINK:47,EADV:122,ESRMNT:123,ECOMM:124,EPROTO:65,EMULTIHOP:36,EDOTDOT:125,EBADMSG:9,ENOTUNIQ:126,EBADFD:127,EREMCHG:128,ELIBACC:129,ELIBBAD:130,ELIBSCN:131,ELIBMAX:132,ELIBEXEC:133,ENOSYS:52,ENOTEMPTY:55,ENAMETOOLONG:37,ELOOP:32,EOPNOTSUPP:138,EPFNOSUPPORT:139,ECONNRESET:15,ENOBUFS:42,EAFNOSUPPORT:5,EPROTOTYPE:67,ENOTSOCK:57,ENOPROTOOPT:50,ESHUTDOWN:140,ECONNREFUSED:14,EADDRINUSE:3,ECONNABORTED:13,ENETUNREACH:40,ENETDOWN:38,ETIMEDOUT:73,EHOSTDOWN:142,EHOSTUNREACH:23,EINPROGRESS:26,EALREADY:7,EDESTADDRREQ:17,EMSGSIZE:35,EPROTONOSUPPORT:66,ESOCKTNOSUPPORT:137,EADDRNOTAVAIL:4,ENETRESET:39,EISCONN:30,ENOTCONN:53,ETOOMANYREFS:141,EUSERS:136,EDQUOT:19,ESTALE:72,ENOTSUP:138,ENOMEDIUM:148,EILSEQ:25,EOVERFLOW:61,ECANCELED:11,ENOTRECOVERABLE:56,EOWNERDEAD:62,ESTRPIPE:135};function
_emscripten_futex_wake(addr,count){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0||count<0)return-28;if(count==0)return 0;if(count>=2147483647)count=Infinity;var
mainThreadWaitAddress=Atomics.load(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2);var
mainThreadWoken=0;if(mainThreadWaitAddress==addr){var
loadedAddr=Atomics.compareExchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,mainThreadWaitAddress,0);if(loadedAddr==mainThreadWaitAddress){--count;mainThreadWoken=1;if(count<=0)return 1}}var ret=Atomics.notify(GROWABLE_HEAP_I32(),addr>>2,count);if(ret>=0)return
ret+mainThreadWoken;throw\"Atomics.notify returned an unexpected value
\"+ret}Module[\"_emscripten_futex_wake\"]=_emscripten_futex_wake;function
killThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! killThread() can only ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in killThread!\";GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
pthread=PThread.pthreads[pthread_ptr];pthread.worker.terminate();PThread.freeThreadData(pthread);PThread.runningWorkers.splice(PThread.runningWorkers.indexOf(pthread.worker),1);pthread.worker.pthread=undefined}function cancelThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cancelThread() can only ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in cancelThread!\";var
pthread=PThread.pthreads[pthread_ptr];pthread.worker.postMessage({\"cmd\":\"cancel\"})}function
cleanupThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cleanupThread() can only ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in cleanupThread!\";var
pthread=PThread.pthreads[pthread_ptr];if(pthread){GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
worker=pthread.worker;PThread.returnWorkerToPool(worker)}}var
PThread={unusedWorkers:[],runningWorkers:[],initMainThreadBlock:function(){var
pthreadPoolSize=8;for(var
i=0;i<pthreadPoolSize;++i){PThread.allocateUnusedWorker()}},initRuntime:function(){var
tb=_malloc(228);for(var
i=0;i<228/4;++i)GROWABLE_HEAP_U32()[tb/4+i]=0;GROWABLE_HEAP_I32()[tb+12>>2]=tb;var
headPtr=tb+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var tlsMemory=_malloc(512);for(var
i=0;i<128;++i)GROWABLE_HEAP_U32()[tlsMemory/4+i]=0;Atomics.store(GROWABLE_HEAP_U32(),tb+100

>>2,tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tb+40>>2,tb);__emscripten_thread_init(tb,!ENVIRONMENT_IS_WORKER,1);_emscripten_register_main_browser_thread_id(tb)},initWorker:function(){},pthreads:{},threadExitHandlers:[],setThreadStatus:function(){},runExitHandlers:function(){while(PThread.threadExitHandlers.length>0){PThread.threadExitHandlers.pop()()}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self())___pthread_tsd_run_dtors()},runExitHandlersAndDeinitThread:function(tb,exitCode){Atomics.store(GROWABLE_HEAP_U32(),tb+56>>2,1);Atomics.store(GROWABLE_HEAP_U32(),tb+60>>2,0);PThread.runExitHandlers();Atomics.store(GROWABLE_HEAP_U32(),tb+4>>2,exitCode);Atomics.store(GROWABLE_HEAP_U32(),tb+0>>2,1);_emscripten_futex_wake(tb+0,2147483647);__emscripten_thread_init(0,0,0)},threadExit:function(exitCode){var tb=_pthread_self();if(tb){PThread.runExitHandlersAndDeinitThread(tb,exitCode);if(ENVIRONMENT_IS_PTHREAD){postMessage({\"cmd\":\"exit\"})}}},threadCancel:function(){PThread.runExitHandlersAndDeinitThread(_pthread_self(),-1);postMessage({\"cmd\":\"cancelDone\"})},terminateAllThreads:function(){for(var t in PThread.pthreads){var pthread=PThread.pthreads[t];if(pthread&&pthread.worker){PThread.returnWorkerToPool(pthread.worker)}}PThread.pthreads={};for(var i=0;i<PThread.unusedWorkers.length;++i){var worker=PThread.unusedWorkers[i];worker.terminate()}PThread.unusedWorkers=[];for(var i=0;i<PThread.runningWorkers.length;++i){var worker=PThread.runningWorkers[i];var pthread=worker.pthread;PThread.freeThreadData(pthread);worker.terminate()}PThread.runningWorkers=[]},freeThreadData:function(pthread){if(!pthread)return;if(pthread.threadInfoStruct){var tlsMemory=GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2];GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2]=0;_free(tlsMemory);_free(pthread.threadInfoStruct)}pthread.threadInfoStruct=0;if(pthread.allocatedOwnStack&&pthread.stackBase)_free(pthread.stackBase);pthread.stackBase=0;if(pthread.worker)pthread.worker.pthread=null},returnWorkerToPool:function(worker){PThread.runWithoutMainThreadQueuedCalls(function(){delete PThread.pthreads[worker.pthread.threadInfoStruct];PThread.unusedWorkers.push(worker);PThread.runningWorkers.splice(PThread.runningWorkers.indexOf(worker),1);PThread.freeThreadData(worker.pthread);worker.pthread=undefined})},runWithoutMainThreadQueuedCalls:function(func){GROWABLE_HEAP_I32()[__emscripten_allow_main_runtime_queued_calls>>2]=0;try{func()}finally{GROWABLE_HEAP_I32()[__emscripten_allow_main_runtime_queued_calls>>2]=1}},receiveObjectTransfer:function(data){},loadWasmModuleToWorker:function(worker,onFinishedLoading){worker.onmessage=function(e){var d=e[\"data\"];var cmd=d[\"cmd\"];if(worker.pthread)PThread.currentProxiedOperationCallerThread=worker.pthread.threadInfoStruct;if(d[\"targetThread\"]&&d[\"targetThread\"]!=_pthread_self()){var thread=PThread.pthreads[d.targetThread];if(thread){thread.worker.postMessage(e.data,d[\"transferList\"])}else{console.error('Internal error! Worker sent a message \"'+cmd+'\" to target pthread '+d[\"targetThread\"]+\", but that thread no longer exists!\")}PThread.currentProxiedOperationCallerThread=undefined;return}if(cmd===\"processQueuedMainThreadWork\"){_emscripten_main_thread_process_queued_calls()}else if(cmd===\"spawnThread\"){spawnThread(e.data)}else if(cmd===\"cleanupThread\"){cleanupThread(d[\"thread\"])}else if(cmd===\"killThread\"){killThread(d[\"thread\"])}else if(cmd===\"cancelThread\"){cancelThread(d[\"thread\"])}else if(cmd===\"loaded\"){worker.loaded=true;if(onFinishedLoading)onFinishedLoading(worker);if(worker.runPthread){worker.runPthread();delete worker.runPthread}}else if(cmd===\"print\"){out(\"Thread \"+d[\"threadId\"]+\": \"+d[\"text\"])}else if(cmd===\"printErr\"){err(\"Thread \"+d[\"threadId\"]+\": \"+d[\"text\"])}else if(cmd===\"alert\"){alert(\"Thread \"+d[\"threadId\"]+\": \"+d[\"text\"])}else if(cmd===\"exit\"){var detached=worker.pthread&&Atomics.load(GROWABLE_HEAP_U32(),worker.pthread.threadInfoStruct+64>>2);if(detached){PThread.returnWorkerToPool(worker)}}else

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if(cmd===\"exitProcess\"){try{exit(d[\"returnCode\"])}catch(e){if(e instanceof ExitStatus)return;throw e}}else
if(cmd===\"cancelDone\"){PThread.returnWorkerToPool(worker)}else
if(cmd===\"objectTransfer\"){PThread.receiveObjectTransfer(e.data)}else
if(e.data.target===\"setimmediate\"){worker.postMessage(e.data)}else{err(\"worker sent an unknown command
\"+cmd)}PThread.currentProxiedOperationCallerThread=undefined};worker.onerror=function(e){err(\"pthread sent
an error! \"+e.filename+\":\"+e.lineno+\":
\"+e.message)};if(ENVIRONMENT_IS_NODE){worker.on(\"message\",function(data){worker.onmessage({data:d
ata})});worker.on(\"error\",function(data){worker.onerror(data)});worker.on(\"exit\",function(data){})}worker.post
Message({\"cmd\":\"load\",\"urlOrBlob\":Module[\"mainScriptUrlOrBlob\"]||_scriptDir,\"wasmMemory\":wasmMe
mory,\"wasmModule\":wasmModule})},allocateUnusedWorker:function(){var
pthreadMainJs=locateFile(\"tfjs-backend-wasm-threaded-simd.worker.js\");PThread.unusedWorkers.push(new
Worker(pthreadMainJs))},getNewWorker:function(){if(PThread.unusedWorkers.length==0){PThread.allocateUnus
edWorker();PThread.loadWasmModuleToWorker(PThread.unusedWorkers[0])}if(PThread.unusedWorkers.length>
0)return PThread.unusedWorkers.pop();else return null},busySpinWait:function(msecs){var
t=performance.now()+msecs;while(performance.now()<t){}}};function
establishStackSpace(stackTop,stackMax){_emscripten_stack_set_limits(stackTop,stackMax);stackRestore(stackTop
)}Module[\"establishStackSpace\"]=establishStackSpace;function
getNoExitRuntime(){return noExitRuntime}Module[\"getNoExitRuntime\"]=getNoExitRuntime;function
invokeEntryPoint(ptr,arg){return
wasmTable.get(ptr)(arg)}Module[\"invokeEntryPoint\"]=invokeEntryPoint;function
___assert_fail(condition,filename,line,func){abort(\"Assertion failed: \"+UTF8ToString(condition)+\", at:
\"+[filename?UTF8ToString(filename):\"unknown filename\",line,func?UTF8ToString(func):\"unknown
function\"])}function ___call_main(argc,argv){var returnCode=_main(argc,argv)}var
_emscripten_get_now;if(ENVIRONMENT_IS_NODE){_emscripten_get_now=function(){var
t=process[\"hrtime\"]();return t[0]*1e3+t[1]/1e6}}else
if(ENVIRONMENT_IS_PTHREAD){_emscripten_get_now=function(){return performance.now()-
Module[\"__performance_now_clock_drift\"]}}else if(typeof
dateNow!==\"undefined\"){_emscripten_get_now=dateNow}else _emscripten_get_now=function(){return
performance.now()};function setErrNo(value){GROWABLE_HEAP_I32()[___errno_location()>>2]=value;return
value}function _atexit(func,arg){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(1,1,func,arg)}function
__emscripten_notify_thread_queue(targetThreadId,mainThreadId){if(targetThreadId==mainThreadId){postMessag
e({\"cmd\":\"processQueuedMainThreadWork\"})}else
if(ENVIRONMENT_IS_PTHREAD){postMessage({\"targetThread\":targetThreadId,\"cmd\":\"processThreadQueu
e\"})}else{var pthread=PThread.pthreads[targetThreadId];var
worker=pthread&&pthread.worker;if(!worker){return}worker.postMessage({\"cmd\":\"processThreadQueue\"})}ret
urn 1}function _abort(){abort()}function _emscripten_asm_const_int(code,sigPtr,argbuf){var
args=readAsmConstArgs(sigPtr,argbuf);return ASM_CONSTS[code].apply(null,args)}function
_emscripten_conditional_set_current_thread_status(expectedStatus,newStatus){}function
_emscripten_futex_wait(addr,val,timeout){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0)return-
28;if(!ENVIRONMENT_IS_WEB){var
ret=Atomics.wait(GROWABLE_HEAP_I32(),addr>>2,val,timeout);if(ret===\"timed-out\")return-
73;if(ret===\"not-equal\")return-6;if(ret===\"ok\")return
0;throw\"Atomics.wait returned an unexpected value
\"+ret}else{if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}var
tNow=performance.now();var tEnd=tNow+timeout;var
lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr);while(1){tNo
w=performance.now();if(tNow>tEnd){lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_mai
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n_thread_futex>>2,0);return-
73}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,0);if(lastAddr==
0){break}_emscripten_main_thread_process_queued_calls();if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!
=val){return-
6}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr)}return
0}}function
_emscripten_memcpy_big(dest,src,num){GROWABLE_HEAP_U8().copyWithin(dest,src,src+num)}function
_emscripten_num_logical_cores(){if(ENVIRONMENT_IS_NODE)return require(\"os\").cpus().length;return
navigator[\"hardwareConcurrency\"]}function
_emscripten_proxy_to_main_thread_js(index,sync){var numCallArgs=arguments.length-2;var
stack=stackSave();var serializedNumCallArgs=numCallArgs;var args=stackAlloc(serializedNumCallArgs*8);var
b=args>>3;for(var i=0;i<numCallArgs;i++){var arg=arguments[2+i];GROWABLE_HEAP_F64()[b+i]=arg}var
ret=_emscripten_run_in_main_runtime_thread_js(index,serializedNumCallArgs,args,sync);stackRestore(stack);retur
n ret}var _emscripten_receive_on_main_thread_js_callArgs=[];var readAsmConstArgsArray=[];function
readAsmConstArgs(sigPtr,buf){readAsmConstArgsArray.length=0;var
ch;buf>>=2;while(ch=GROWABLE_HEAP_U8()[sigPtr++]){var
double=ch<105;if(double&&buf&1)buf++;readAsmConstArgsArray.push(double?GROWABLE_HEAP_F64()[buf
++>>1]:GROWABLE_HEAP_I32()[buf]);++buf}return readAsmConstArgsArray}function
_emscripten_receive_on_main_thread_js(index,numCallArgs,args){_emscripten_receive_on_main_thread_js_callA
rgs.length=numCallArgs;var b=args>>3;for(var
i=0;i<numCallArgs;i++){_emscripten_receive_on_main_thread_js_callArgs[i]=GROWABLE_HEAP_F64()[b+i]}v
ar
isEmAsmConst=index<0;var func=!isEmAsmConst?proxiedFunctionTable[index]:ASM_CONSTS[-index-
1];return func.apply(null,_emscripten_receive_on_main_thread_js_callArgs)}function
_emscripten_get_heap_size(){return GROWABLE_HEAP_U8().length}function
emscripten_realloc_buffer(size){try{wasmMemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return
1}catch(e){}}function _emscripten_resize_heap(requestedSize){var
oldSize=_emscripten_get_heap_size();if(requestedSize<=oldSize){return false}var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
JSEvents={inEventHandler:0,removeAllEventListeners:function(){for(var
i=JSEvents.eventHandlers.length-1;i>=0;--
i){JSEvents._removeHandler(i)}JSEvents.eventHandlers=[];JSEvents.deferredCalls=[]},registerRemoveEventListen
ers:function(){if(!JSEvents.removeEventListenersRegistered){__ATEXIT__.push(JSEvents.removeAllEventListene
rs);JSEvents.removeEventListenersRegistered=true}},deferredCalls:[],deferCall:function(targetFunction,precedence
,argsList){function arraysHaveEqualContent(arrA,arrB){if(arrA.length!=arrB.length)return false;for(var i in
arrA){if(arrA[i]!=arrB[i])return false}return true}for(var i in JSEvents.deferredCalls){var
call=JSEvents.deferredCalls[i];if(call.targetFunction==targetFunction&&arraysHaveEqualContent(call.argsList,args
List)){return}}JSEvents.deferredCalls.push({targetFunction:targetFunction,precedence:precedence,argsList:argsList
});JSEvents.deferredCalls.sort(function(x,y){return
x.precedence<y.precedence})},removeDeferredCalls:function(targetFunction){for(var
i=0;i<JSEvents.deferredCalls.length;++i){if(JSEvents.deferredCalls[i].targetFunction==targetFunction){JSEvents.d
eferredCalls.splice(i,1);--i}}},canPerformEventHandlerRequests:function(){return

JSEvents.inEventHandler&&JSEvents.currentEventHandler.allowsDeferredCalls},runDeferredCalls:function(){if(!JSEvents.canPerformEventHandlerRequests()){return}for(var i=0;i<JSEvents.deferredCalls.length;++i){var call=JSEvents.deferredCalls[i];JSEvents.deferredCalls.splice(i,1);--i;call.targetFunction.apply(null,call.argsList)}},eventHandlers:[],removeAllHandlersOnTarget:function(target,eventTypeString){for(var i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==target&&(!eventTypeString||eventTypeString==JSEvents.eventHandlers[i].eventTypeString)){JSEvents._removeHandler(i--)}}},_removeHandler:function(i){var h=JSEvents.eventHandlers[i];h.target.removeEventListener(h.eventTypeString,h.eventListenerFunc,h.useCapture);JSEvents.eventHandlers.splice(i,1)},registerOrRemoveHandler:function(eventHandler){var jsEventHandler=function jsEventHandler(event){++JSEvents.inEventHandler;JSEvents.currentEventHandler=eventHandler;JSEvents.runDeferredCalls();eventHandler.handlerFunc(event);JSEvents.runDeferredCalls();--JSEvents.inEventHandler};if(eventHandler.callbackfunc){eventHandler.eventListenerFunc=jsEventHandler;eventHandler.target.addEventListener(eventHandler.eventTypeString,jsEventHandler,eventHandler.useCapture);JSEvents.eventHandlers.push(eventHandler);JSEvents.registerRemoveEventListeners()}else{for(var i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==eventHandler.target&&JSEvents.eventHandlers[i].eventTypeString==eventHandler.eventTypeString){JSEvents._removeHandler(i--)}}}},queueEventHandlerOnThread_iiii:function(targetThread,eventHandlerFunc,eventTypeId,eventData,userData){var stackTop=stackSave();var varargs=stackAlloc(12);GROWABLE_HEAP_I32()[varargs>>2]=eventTypeId;GROWABLE_HEAP_I32()[varargs+4>>2]=eventData;GROWABLE_HEAP_I32()[varargs+8>>2]=userData;__emscripten_call_on_thread(0,targetThread,637534208,eventHandlerFunc,eventData,varargs);stackRestore(stackTop)},getTargetThreadForEventCallback:function(targetThread){switch(targetThread){case 1:return 0;case 2:return PThread.currentProxiedOperationCallerThread;default:return targetThread}},getNodeNameForTarget:function(target){if(!target)return\"\";if(target==window)return\"#window\";if(target==screen)return\"#screen\";return target&&target.nodeName?target.nodeName:\"\"},fullscreenEnabled:function(){return document.fullscreenEnabled||document.webkitFullscreenEnabled}};function stringToNewUTF8(jsString){var length=lengthBytesUTF8(jsString)+1;var cString=_malloc(length);stringToUTF8(jsString,cString,length);return cString}function _emscripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height){var stackTop=stackSave();var varargs=stackAlloc(12);var targetCanvasPtr=0;if(targetCanvas){targetCanvasPtr=stringToNewUTF8(targetCanvas)}GROWABLE_HEAP_I32()[varargs>>2]=targetCanvasPtr;GROWABLE_HEAP_I32()[varargs+4>>2]=width;GROWABLE_HEAP_I32()[varargs+8>>2]=height;__emscripten_call_on_thread(0,targetThread,657457152,0,targetCanvasPtr,varargs);stackRestore(stackTop)}function _emscripten_set_offscreencanvas_size_on_target_thread(targetThread,targetCanvas,width,height){targetCanvas=targetCanvas?UTF8ToString(targetCanvas):\"\";_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height)}function maybeCStringToJsString(cString){return cString>2?UTF8ToString(cString):cString}var specialHTMLTargets=[0,typeof document!==\"undefined\"?document:0,typeof window!==\"undefined\"?window:0];function findEventTarget(target){target=maybeCStringToJsString(target);var domElement=specialHTMLTargets[target]||(typeof document!==\"undefined\"?document.querySelector(target):undefined);return domElement}function findCanvasEventTarget(target){return findEventTarget(target)}function _emscripten_set_canvas_element_size_calling_thread(target,width,height){var

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canvas=findCanvasEventTarget(target);if(!canvas)return-
4;if(canvas.canvasSharedPtr){GROWABLE_HEAP_I32()[canvas.canvasSharedPtr>>2]=width;GROWABLE_HEA
P_I32()[canvas.canvasSharedPtr+4>>2]=height}if(canvas.offscreenCanvas||!canvas.controlTransferredOffscreen){if
(canvas.offscreenCanvas)canvas=canvas.offscreenCanvas;var
autoResizeViewport=false;if(canvas.GLctxObject&&canvas.GLctxObject.GLctx){var
prevViewport=canvas.GLctxObject.GLctx.getParameter(2978);autoResizeViewport=prevViewport[0]===0&&prev
Viewport[1]===0&&prevViewport[2]===canvas.width&&prevViewport[3]===canvas.height}canvas.width=width;
canvas.height=height;if(autoResizeViewport){canvas.GLctxObject.GLctx.viewport(0,0,width,height)}}else
if(canvas.canvasSharedPtr){var
targetThread=GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+8>>2];_emscripten_set_offscreencanvas_size_o
n_target_thread(targetThread,target,width,height);return 1}else{return-4}return 0}function
_emscripten_set_canvas_element_size_main_thread(target,width,height){if(ENVIRONMENT_IS_PTHREAD)retur
n
 _emscripten_proxy_to_main_thread_js(2,1,target,width,height);return
_emscripten_set_canvas_element_size_calling_thread(target,width,height)}function
_emscripten_set_canvas_element_size(target,width,height){var
canvas=findCanvasEventTarget(target);if(canvas){return
_emscripten_set_canvas_element_size_calling_thread(target,width,height)}else{return
_emscripten_set_canvas_element_size_main_thread(target,width,height)}}function
_emscripten_set_current_thread_status(newStatus){}function
_emscripten_set_thread_name(threadId,name){}function __webgl_enable_ANGLE_instanced_arrays(ctx){var
ext=ctx.getExtension(\"ANGLE_instanced_arrays\");if(ext){ctx[\"vertexAttribDivisor\"]=function(index,divisor){ex
t[\"vertexAttribDivisorANGLE\"](index,divisor)};ctx[\"drawArraysInstanced\"]=function(mode,first,count,primcou
nt){ext[\"drawArraysInstancedANGLE\"](mode,first,count,primcount)};ctx[\"drawElementsInstanced\"]=function(
mode,count,type,indices,primcount){ext[\"drawElementsInstancedANGLE\"](mode,count,type,indices,primcount)};
return
 1}}function __webgl_enable_OES_vertex_array_object(ctx){var
ext=ctx.getExtension(\"OES_vertex_array_object\");if(ext){ctx[\"createVertexArray\"]=function(){return
ext[\"createVertexArrayOES\"]()};ctx[\"deleteVertexArray\"]=function(vao){ext[\"deleteVertexArrayOES\"](vao)};
ctx[\"bindVertexArray\"]=function(vao){ext[\"bindVertexArrayOES\"](vao)};ctx[\"isVertexArray\"]=function(vao)
{return ext[\"isVertexArrayOES\"](vao)};return 1}}function __webgl_enable_WEBGL_draw_buffers(ctx){var
ext=ctx.getExtension(\"WEBGL_draw_buffers\");if(ext){ctx[\"drawBuffers\"]=function(n,bufs){ext[\"drawBuffers
WEBGL\"](n,bufs)};return 1}}function
__webgl_enable_WEBGL_multi_draw(ctx){return!!(ctx.multiDrawWebgl=ctx.getExtension(\"WEBGL_multi_dra
w\"))}var
GL={counter:1,buffers:[],programs:[],framebuffers:[],renderbuffers:[],textures:[],uniforms:[],shaders:[],vaos:[],cont
exts:{},offscreenCanvases:{},timerQueriesEXT:[],programInfos:{},stringCache:{},unpackAlignment:4,recordError:
function
 recordError(errorCode){if(!GL.lastError){GL.lastError=errorCode}},getNewId:function(table){var
ret=GL.counter++;for(var i=table.length;i<ret;i++){table[i]=null}return
ret},getSource:function(shader,count,string,length){var source=\"\";for(var i=0;i<count;++i){var
len=length?GROWABLE_HEAP_I32()[length+i*4>>2]:-
1;source+=UTF8ToString(GROWABLE_HEAP_I32()[string+i*4>>2],len<0?undefined:len)}return
source},createContext:function(canvas,webGLContextAttributes){var
ctx=canvas.getContext(\"webgl\",webGLContextAttributes);if(!ctx)return 0;var
handle=GL.registerContext(ctx,webGLContextAttributes);return
handle},registerContext:function(ctx,webGLContextAttributes){var
handle=_malloc(8);GROWABLE_HEAP_I32()[handle+4>>2]=_pthread_self();var
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context={handle:handle,attributes:webGLContextAttributes,version:webGLContextAttributes.majorVersion,GLctx:ctx};if(ctx.canvas)ctx.canvas.GLctxObject=context;GL.contexts[handle]=context;if(typeof webGLContextAttributes.enableExtensionsByDefault===\"undefined\"||webGLContextAttributes.enableExtensionsByDefault){GL.initExtensions(context)}return handle},makeContextCurrent:function(contextHandle){GL.currentContext=GL.contexts[contextHandle];Module.ctx=GLctx=GL.currentContext&&GL.currentContext.GLctx;return!(contextHandle&&!GLctx)},getContext:function(contextHandle){return GL.contexts[contextHandle]},deleteContext:function(contextHandle){if(GL.currentContext===GL.contexts[contextHandle])GL.currentContext=null;if(typeof JSEvents===\"object\")JSEvents.removeAllHandlersOnTarget(GL.contexts[contextHandle].GLctx.canvas);if(GL.contexts[contextHandle]&&GL.contexts[contextHandle].GLctx.canvas)GL.contexts[contextHandle].GLctx.canvas.GLctxObject=undefined;_free(GL.contexts[contextHandle].handle);GL.contexts[contextHandle]=null},initExtensions:function(context){if(!context)context=GL.currentContext;if(context.initExtensionsDone)return;context.initExtensionsDone=true;var GLctx=context.GLctx;__webgl_enable_ANGLE_instanced_arrays(GLctx);__webgl_enable_OES_vertex_array_object(GLctx);__webgl_enable_WEBGL_draw_buffers(GLctx);GLctx.disjointTimerQueryExt=GLctx.getExtension(\"EXT_disjoint_timer_query\");__webgl_enable_WEBGL_multi_draw(GLctx);var exts=GLctx.getSupportedExtensions()||[];exts.forEach(function(ext){if(ext.indexOf(\"lose_context\")<0&&ext.indexOf(\"debug\")<0){GLctx.getExtension(ext)}})},populateUniformTable:function(program){var p=GL.programs[program];var ptable=GL.programInfos[program]={uniforms:{},maxUniformLength:0,maxAttributeLength:-1,maxUniformBlockNameLength:-1};var utable=ptable.uniforms;var numUniforms=GLctx.getProgramParameter(p,35718);for(var i=0;i<numUniforms;++i){var u=GLctx.getActiveUniform(p,i);var name=u.name;ptable.maxUniformLength=Math.max(ptable.maxUniformLength,name.length+1);if(name.slice(-1)==\"]\"){name=name.slice(0,name.lastIndexOf(\"[\"))}var loc=GLctx.getUniformLocation(p,name);if(loc){var id=GL.getNewId(GL.uniforms);utable[name]=[u.size,id];GL.uniforms[id]=loc;for(var j=1;j<u.size;++j){var n=name+\"[\"+j+\"]\";loc=GLctx.getUniformLocation(p,n);id=GL.getNewId(GL.uniforms);GL.uniforms[id]=loc}}}};var __emscripten_webgl_power_preferences=[\"default\",\"low-power\",\"high-performance\"];function _emscripten_webgl_do_create_context(target,attributes){var a=attributes>>2;var powerPreference=GROWABLE_HEAP_I32()[a+(24>>2)];var contextAttributes={\"alpha\":!!GROWABLE_HEAP_I32()[a+(0>>2)],\"depth\":!!GROWABLE_HEAP_I32()[a+(4>>2)],\"stencil\":!!GROWABLE_HEAP_I32()[a+(8>>2)],\"antialias\":!!GROWABLE_HEAP_I32()[a+(12>>2)],\"premultipliedAlpha\":!!GROWABLE_HEAP_I32()[a+(16>>2)],\"preserveDrawingBuffer\":!!GROWABLE_HEAP_I32()[a+(20>>2)],\"powerPreference\":__emscripten_webgl_power_preferences[powerPreference],\"failIfMajorPerformanceCaveat\":!!GROWABLE_HEAP_I32()[a+(28>>2)],majorVersion:GROWABLE_HEAP_I32()[a+(32>>2)],minorVersion:GROWABLE_HEAP_I32()[a+(36>>2)],enableExtensionsByDefault:GROWABLE_HEAP_I32()[a+(40>>2)],explicitSwapControl:GROWABLE_HEAP_I32()[a+(44>>2)],proxyContextToMainThread:GROWABLE_HEAP_I32()[a+(48>>2)],renderViaOffscreenBackBuffer:GROWABLE_HEAP_I32()[a+(52>>2)]};var canvas=findCanvasEventTarget(target);if(!canvas){return 0}if(contextAttributes.explicitSwapControl){return 0}var contextHandle=GL.createContext(canvas,contextAttributes);return contextHandle}function _emscripten_webgl_create_context(a0,a1){return _emscripten_webgl_do_create_context(a0,a1)}var SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var ret=GROWABLE_HEAP_I32()[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function

_fd_close(fd){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(3,1,fd);return 0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(4,1,fd,offset_low,offset_high,whence,newOffset)}function _fd_write(fd,iov,iovcnt,pnum){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(5,1,fd,iov,iovcnt,pnum);var num=0;for(var i=0;i<iovcnt;i++){var ptr=GROWABLE_HEAP_I32()[iov+i*8>>2];var len=GROWABLE_HEAP_I32()[iov+(i*8+4)>>2];for(var j=0;j<len;j++){SYSCALLS.printChar(fd,GROWABLE_HEAP_U8()[ptr+j])}num+=len}GROWABLE_HEAP_I32()[pnum>>2]=num;return 0}function _pthread_cleanup_pop(execute){var routine=PThread.threadExitHandlers.pop();if(execute)routine()}function _pthread_cleanup_push(routine,arg){PThread.threadExitHandlers.push(function(){wasmTable.get(routine)(arg)})}function spawnThread(threadParams){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! spawnThread() can only ever be called from main application thread!\";var worker=PThread.getNewWorker();if(worker.pthread!==undefined)throw\"Internal error!\";if(!threadParams.pthread_ptr)throw\"Internal error, no pthread ptr!\";PThread.runningWorkers.push(worker);var tlsMemory=_malloc(128*4);for(var i=0;i<128;++i){GROWABLE_HEAP_I32()[tlsMemory+i*4>>2]=0}var stackHigh=threadParams.stackBase+threadParams.stackSize;var pthread=PThread.pthreads[threadParams.pthread_ptr]={worker:worker,stackBase:threadParams.stackBase,stackSize:threadParams.stackSize,allocatedOwnStack:threadParams.allocatedOwnStack,threadInfoStruct:threadParams.pthread_ptr};var tis=pthread.threadInfoStruct>>2;Atomics.store(GROWABLE_HEAP_U32(),tis+(64>>2),threadParams.detached);Atomics.store(GROWABLE_HEAP_U32(),tis+(100>>2),tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tis+(40>>2),pthread.threadInfoStruct);Atomics.store(GROWABLE_HEAP_U32(),tis+(80>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(76>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),tis+(104>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+8>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+12>>2),threadParams.detached);var global_libc=_emscripten_get_global_libc();var global_locale=global_libc+40;Atomics.store(GROWABLE_HEAP_U32(),tis+(172>>2),global_locale);worker.pthread=pthread;var msg={\"cmd\":\"run\",\"start_routine\":threadParams.startRoutine,\"arg\":threadParams.arg,\"threadInfoStruct\":threadParams.pthread_ptr,\"stackBase\":threadParams.stackBase,\"stackSize\":threadParams.stackSize};worker.runPthread=function(){msg.time=performance.now();worker.postMessage(msg,threadParams.transferList)};if(worker.loaded){worker.runPthread();delete worker.runPthread}}function _pthread_create(pthread_ptr,attr,start_routine,arg){if(typeof SharedArrayBuffer===\"undefined\"){err(\"Current environment does not support SharedArrayBuffer, pthreads are not available!\");return 6}if(!pthread_ptr){err(\"pthread_create called with a null thread pointer!\");return 28}var transferList=[];var error=0;if(ENVIRONMENT_IS_PTHREAD&&(transferList.length===0||error)){return _emscripten_sync_run_in_main_thread_4(687865856,pthread_ptr,attr,start_routine,arg)}if(error)return error;var stackSize=0;var stackBase=0;var detached=0;if(attr&&attr!=-1){stackSize=GROWABLE_HEAP_I32()[attr>>2];stackSize+=81920;stackBase=GROWABLE_HEAP_I32()[attr+8>>2];detached=GROWABLE_HEAP_I32()[attr+12>>2]!==0}else{stackSize=2097152}var allocatedOwnStack=stackBase==0;if(allocatedOwnStack){stackBase=_memalign(16,stackSize)}else{stackBase-=stackSize;assert(stackBase>0)}var threadInfoStruct=_malloc(228);for(var i=0;i<228>>2;++i)GROWABLE_HEAP_U32()[(threadInfoStruct>>2)+i]=0;GROWABLE_HEAP_I32()[pthread_ptr>>2]=threadInfoStruct;GROWABLE_HEAP_I32()[threadInfoStruct+12>>2]=threadInfoStruct;var headPtr=threadInfoStruct+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var threadParams={stackBase:stackBase,stackSize:stackSize,allocatedOwnStack:allocatedOwnStack,detached:detached,startRoutine:start_routine,pthread_ptr:threadInfoStruct,arg:arg,transferList:transferList};if(ENVIRONMENT_IS_P

THREAD){threadParams.cmd=\"spawnThread\";postMessage(threadParams,transferList)}else{spawnThread(threadParams)}return
0}function __pthread_testcancel_js(){if(!ENVIRONMENT_IS_PTHREAD)return;var tb=_pthread_self();if(!tb)return;var cancelDisabled=Atomics.load(GROWABLE_HEAP_U32(),tb+56>>2);if(cancelDisabled)return;var canceled=Atomics.load(GROWABLE_HEAP_U32(),tb+0>>2);if(canceled==2)throw\"Canceled!\"}function _emscripten_check_blocking_allowed(){if(ENVIRONMENT_IS_NODE)return;if(ENVIRONMENT_IS_WORKER)return;warnOnce(\"Blocking on the main thread is very dangerous, see https://emscripten.org/docs/porting/pthreads.html#blocking-on-the-main-browser-thread\")}function __emscripten_do_pthread_join(thread,status,block){if(!thread){err(\"pthread_join attempted on a null thread pointer!\");return ERRNO_CODES.ESRCH}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self()==thread){err(\"PThread \"+thread+\" is attempting to join to itself!\");return ERRNO_CODES.EDEADLK}else if(!ENVIRONMENT_IS_PTHREAD&&_emscripten_main_browser_thread_id()==thread){err(\"Main thread \"+thread+\" is attempting to join to itself!\");return ERRNO_CODES.EDEADLK}var self=GROWABLE_HEAP_I32()[thread+12>>2];if(self!==thread){err(\"pthread_join attempted on thread \"+thread+\", which does not point to a valid thread, or does not exist anymore!\");return ERRNO_CODES.ESRCH}var detached=Atomics.load(GROWABLE_HEAP_U32(),thread+64>>2);if(detached){err(\"Attempted to join thread \"+thread+\", which was already detached!\");return ERRNO_CODES.EINVAL}if(block){_emscripten_check_blocking_allowed()}for(;;){var threadStatus=Atomics.load(GROWABLE_HEAP_U32(),thread+0>>2);if(threadStatus==1){var threadExitCode=Atomics.load(GROWABLE_HEAP_U32(),thread+4>>2);if(status)GROWABLE_HEAP_I32()[status>>2]=threadExitCode;Atomics.store(GROWABLE_HEAP_U32(),thread+64>>2,1);if(!ENVIRONMENT_IS_PTHREAD)cleanupThread(thread);else postMessage({\"cmd\":\"cleanupThread\",\"thread\":thread});return 0}if(!block){return ERRNO_CODES.EBUSY}__pthread_testcancel_js();if(!ENVIRONMENT_IS_PTHREAD)_emscripten_main_thread_process_queued_calls();_emscripten_futex_wait(thread+0,threadStatus,ENVIRONMENT_IS_PTHREAD?100:1)}}function _pthread_join(thread,status){return __emscripten_do_pthread_join(thread,status,true)}function _sysconf(name){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(6,1,name);switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-1}if(!ENVIRONMENT_IS_PTHREAD)PThread.initMainThreadBlock();var GLctx;var proxiedFunctionTable=[null,_atexit,_emscripten_set_canvas_element_size_main_thread,_fd_close,_fd_seek,_fd_wr

ite,_sysconf];var
asmLibraryArg={\"e\":___assert_fail,\"r\":___call_main,\"x\":__emscripten_notify_thread_queue,\"b\":_abort,\"y\":_emscripten_asm_const_int,\"j\":_emscripten_conditional_set_current_thread_status,\"d\":_emscripten_futex_wait,\"c\":_emscripten_futex_wake,\"f\":_emscripten_get_now,\"p\":_emscripten_memcpy_big,\"A\":_emscripten_num_logical_cores,\"u\":_emscripten_receive_on_main_thread_js,\"q\":_emscripten_resize_heap,\"v\":_emscripten_set_canvas_element_size,\"i\":_emscripten_set_current_thread_status,\"s\":_emscripten_set_thread_name,\"w\":_emscripten_webgl_create_context,\"l\":_fd_close,\"n\":_fd_seek,\"g\":_fd_write,\"o\":initPthreadsJS,\"a\":wasmMemory||Module[\"wasmMemory\"],\"z\":_pthread_cleanup_pop,\"k\":_pthread_cleanup_push,\"h\":_pthread_create,\"m\":_pthread_join,\"t\":_sysconf};var asm=createWasm();var
___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=function(){return(___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=Module[\"asm\"][\"B\"]).apply(null,arguments)};var
_init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"C\"]).apply(null,arguments)};var
_init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Module[\"_init_with_threads_count\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads_count\"]=Module[\"asm\"][\"E\"]).apply(null,arguments)};var
_register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=Module[\"asm\"][\"F\"]).apply(null,arguments)};var
_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"asm\"][\"G\"]).apply(null,arguments)};var
_dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"H\"]).apply(null,arguments)};var
_Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"J\"]).apply(null,arguments)};var
_Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"K\"]).apply(null,arguments)};var
_AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"L\"]).apply(null,arguments)};var
_All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"M\"]).apply(null,arguments)};var
_Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"N\"]).apply(null,arguments)};var
_ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"O\"]).apply(null,arguments)};var
_AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"P\"]).apply(null,arguments)};var
_BatchMatMul=Module[\"_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\"_BatchMatMul\"]=Module[\"asm\"][\"Q\"]).apply(null,arguments)};var
_Ceil=Module[\"_Ceil\"]=function(){return(_Ceil=Module[\"_Ceil\"]=Module[\"asm\"][\"R\"]).apply(null,arguments)};var
_ClipByValue=Module[\"_ClipByValue\"]=function(){return(_ClipByValue=Module[\"_ClipByValue\"]=Module[\"asm\"][\"S\"]).apply(null,arguments)};var
_Conv2D=Module[\"_Conv2D\"]=function(){return(_Conv2D=Module[\"_Conv2D\"]=Module[\"asm\"][\"T\"]).apply(null,arguments)};var
_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=function(){return(_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=Module[\"asm\"][\"U\"]).apply(null,arguments)};var
_Cos=Module[\"_Cos\"]=function(){return(_Cos=Module[\"_Cos\"]=Module[\"asm\"][\"V\"]).apply(null,arguments

)};var
_Cosh=Module[\"_Cosh\"]=function(){return(_Cosh=Module[\"_Cosh\"]=Module[\"asm\"][\"W\"]).apply(null,arguments)};var
_CropAndResize=Module[\"_CropAndResize\"]=function(){return(_CropAndResize=Module[\"_CropAndResize\"]=Module[\"asm\"][\"X\"]).apply(null,arguments)};var
_Cumsum=Module[\"_Cumsum\"]=function(){return(_Cumsum=Module[\"_Cumsum\"]=Module[\"asm\"][\"Y\"]).apply(null,arguments)};var
_DepthToSpace=Module[\"_DepthToSpace\"]=function(){return(_DepthToSpace=Module[\"_DepthToSpace\"]=Module[\"asm\"][\"Z\"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=function(){return(_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=Module[\"asm\"][\"_\"]).apply(null,arguments)};var
_Elu=Module[\"_Elu\"]=function(){return(_Elu=Module[\"_Elu\"]=Module[\"asm\"][\"$\"]).apply(null,arguments)};var
_Equal=Module[\"_Equal\"]=function(){return(_Equal=Module[\"_Equal\"]=Module[\"asm\"][\"aa\"]).apply(null,arguments)};var
_Exp=Module[\"_Exp\"]=function(){return(_Exp=Module[\"_Exp\"]=Module[\"asm\"][\"ba\"]).apply(null,arguments)};var
_FlipLeftRight=Module[\"_FlipLeftRight\"]=function(){return(_FlipLeftRight=Module[\"_FlipLeftRight\"]=Module[\"asm\"][\"ca\"]).apply(null,arguments)};var
_Floor=Module[\"_Floor\"]=function(){return(_Floor=Module[\"_Floor\"]=Module[\"asm\"][\"da\"]).apply(null,arguments)};var
_FloorDiv=Module[\"_FloorDiv\"]=function(){return(_FloorDiv=Module[\"_FloorDiv\"]=Module[\"asm\"][\"ea\"]).apply(null,arguments)};var
_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=function(){return(_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=Module[\"asm\"][\"fa\"]).apply(null,arguments)};var
_FusedConv2D=Module[\"_FusedConv2D\"]=function(){return(_FusedConv2D=Module[\"_FusedConv2D\"]=Module[\"asm\"][\"ga\"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=function(){return(_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=Module[\"asm\"][\"ha\"]).apply(null,arguments)};var
_Gather=Module[\"_Gather\"]=function(){return(_Gather=Module[\"_Gather\"]=Module[\"asm\"][\"ia\"]).apply(null,arguments)};var
_GatherNd=Module[\"_GatherNd\"]=function(){return(_GatherNd=Module[\"_GatherNd\"]=Module[\"asm\"][\"ja\"]).apply(null,arguments)};var
_Greater=Module[\"_Greater\"]=function(){return(_Greater=Module[\"_Greater\"]=Module[\"asm\"][\"ka\"]).apply(null,arguments)};var
_GreaterEqual=Module[\"_GreaterEqual\"]=function(){return(_GreaterEqual=Module[\"_GreaterEqual\"]=Module[\"asm\"][\"la\"]).apply(null,arguments)};var
_LeakyRelu=Module[\"_LeakyRelu\"]=function(){return(_LeakyRelu=Module[\"_LeakyRelu\"]=Module[\"asm\"][\"ma\"]).apply(null,arguments)};var
_Less=Module[\"_Less\"]=function(){return(_Less=Module[\"_Less\"]=Module[\"asm\"][\"na\"]).apply(null,arguments)};var
_LessEqual=Module[\"_LessEqual\"]=function(){return(_LessEqual=Module[\"_LessEqual\"]=Module[\"asm\"][\"oa\"]).apply(null,arguments)};var
_Log=Module[\"_Log\"]=function(){return(_Log=Module[\"_Log\"]=Module[\"asm\"][\"pa\"]).apply(null,arguments)};var
_LogicalAnd=Module[\"_LogicalAnd\"]=function(){return(_LogicalAnd=Module[\"_LogicalAnd\"]=Module[\"asm\"][\"qa\"]).apply(null,arguments)};var
_Max=Module[\"_Max\"]=function(){return(_Max=Module[\"_Max\"]=Module[\"asm\"][\"ra\"]).apply(null,argume

nts)};var
_MaxPool=Module[\"_MaxPool\"]=function(){return(_MaxPool=Module[\"_MaxPool\"]=Module[\"asm\"][\"sa\"]).apply(null,arguments)};var
_Maximum=Module[\"_Maximum\"]=function(){return(_Maximum=Module[\"_Maximum\"]=Module[\"asm\"][\"ta\"]).apply(null,arguments)};var
_Mean=Module[\"_Mean\"]=function(){return(_Mean=Module[\"_Mean\"]=Module[\"asm\"][\"ua\"]).apply(null,arguments)};var
_Min=Module[\"_Min\"]=function(){return(_Min=Module[\"_Min\"]=Module[\"asm\"][\"va\"]).apply(null,arguments)};var
_Minimum=Module[\"_Minimum\"]=function(){return(_Minimum=Module[\"_Minimum\"]=Module[\"asm\"][\"wa\"]).apply(null,arguments)};var
_MirrorPad=Module[\"_MirrorPad\"]=function(){return(_MirrorPad=Module[\"_MirrorPad\"]=Module[\"asm\"][\"xa\"]).apply(null,arguments)};var
_Multiply=Module[\"_Multiply\"]=function(){return(_Multiply=Module[\"_Multiply\"]=Module[\"asm\"][\"ya\"]).apply(null,arguments)};var
_Neg=Module[\"_Neg\"]=function(){return(_Neg=Module[\"_Neg\"]=Module[\"asm\"][\"za\"]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module[\"_NonMaxSuppressionV3\"]=function(){return(_NonMaxSuppressionV3=Module[\"_NonMaxSuppressionV3\"]=Module[\"asm\"][\"Aa\"]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module[\"_NonMaxSuppressionV4\"]=function(){return(_NonMaxSuppressionV4=Module[\"_NonMaxSuppressionV4\"]=Module[\"asm\"][\"Ba\"]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module[\"_NonMaxSuppressionV5\"]=function(){return(_NonMaxSuppressionV5=Module[\"_NonMaxSuppressionV5\"]=Module[\"asm\"][\"Ca\"]).apply(null,arguments)};var
_NotEqual=Module[\"_NotEqual\"]=function(){return(_NotEqual=Module[\"_NotEqual\"]=Module[\"asm\"][\"Da\"]).apply(null,arguments)};var
_OneHot=Module[\"_OneHot\"]=function(){return(_OneHot=Module[\"_OneHot\"]=Module[\"asm\"][\"Ea\"]).apply(null,arguments)};var
_PadV2=Module[\"_PadV2\"]=function(){return(_PadV2=Module[\"_PadV2\"]=Module[\"asm\"][\"Fa\"]).apply(null,arguments)};var
_Pow=Module[\"_Pow\"]=function(){return(_Pow=Module[\"_Pow\"]=Module[\"asm\"][\"Ga\"]).apply(null,arguments)};var
_Prelu=Module[\"_Prelu\"]=function(){return(_Prelu=Module[\"_Prelu\"]=Module[\"asm\"][\"Ha\"]).apply(null,arguments)};var
_Prod=Module[\"_Prod\"]=function(){return(_Prod=Module[\"_Prod\"]=Module[\"asm\"][\"Ia\"]).apply(null,arguments)};var
_RealDiv=Module[\"_RealDiv\"]=function(){return(_RealDiv=Module[\"_RealDiv\"]=Module[\"asm\"][\"Ja\"]).apply(null,arguments)};var
_Relu=Module[\"_Relu\"]=function(){return(_Relu=Module[\"_Relu\"]=Module[\"asm\"][\"Ka\"]).apply(null,arguments)};var
_Relu6=Module[\"_Relu6\"]=function(){return(_Relu6=Module[\"_Relu6\"]=Module[\"asm\"][\"La\"]).apply(null,arguments)};var
_ResizeBilinear=Module[\"_ResizeBilinear\"]=function(){return(_ResizeBilinear=Module[\"_ResizeBilinear\"]=Module[\"asm\"][\"Ma\"]).apply(null,arguments)};var
_Reverse=Module[\"_Reverse\"]=function(){return(_Reverse=Module[\"_Reverse\"]=Module[\"asm\"][\"Na\"]).apply(null,arguments)};var
_RotateWithOffset=Module[\"_RotateWithOffset\"]=function(){return(_RotateWithOffset=Module[\"_RotateWithOffset\"]=Module[\"asm\"][\"Oa\"]).apply(null,arguments)};var
_Round=Module[\"_Round\"]=function(){return(_Round=Module[\"_Round\"]=Module[\"asm\"][\"Pa\"]).apply(nul

l,arguments)};var
_Rsqrt=Module[\"_Rsqrt\"]=function(){return(_Rsqrt=Module[\"_Rsqrt\"]=Module[\"asm\"][\"Qa\"]).apply(null,arguments)};var
_ScatterNd=Module[\"_ScatterNd\"]=function(){return(_ScatterNd=Module[\"_ScatterNd\"]=Module[\"asm\"][\"Ra\"]).apply(null,arguments)};var
_SelectV2=Module[\"_SelectV2\"]=function(){return(_SelectV2=Module[\"_SelectV2\"]=Module[\"asm\"][\"Sa\"]).apply(null,arguments)};var
_Sigmoid=Module[\"_Sigmoid\"]=function(){return(_Sigmoid=Module[\"_Sigmoid\"]=Module[\"asm\"][\"Ta\"]).apply(null,arguments)};var
_Sin=Module[\"_Sin\"]=function(){return(_Sin=Module[\"_Sin\"]=Module[\"asm\"][\"Ua\"]).apply(null,arguments)};var
_Softmax=Module[\"_Softmax\"]=function(){return(_Softmax=Module[\"_Softmax\"]=Module[\"asm\"][\"Va\"]).apply(null,arguments)};var
_Sqrt=Module[\"_Sqrt\"]=function(){return(_Sqrt=Module[\"_Sqrt\"]=Module[\"asm\"][\"Wa\"]).apply(null,arguments)};var
_Square=Module[\"_Square\"]=function(){return(_Square=Module[\"_Square\"]=Module[\"asm\"][\"Xa\"]).apply(null,arguments)};var
_SquaredDifference=Module[\"_SquaredDifference\"]=function(){return(_SquaredDifference=Module[\"_SquaredDifference\"]=Module[\"asm\"][\"Ya\"]).apply(null,arguments)};var
_Step=Module[\"_Step\"]=function(){return(_Step=Module[\"_Step\"]=Module[\"asm\"][\"Za\"]).apply(null,arguments)};var
_StridedSlice=Module[\"_StridedSlice\"]=function(){return(_StridedSlice=Module[\"_StridedSlice\"]=Module[\"asm\"][\"_a\"]).apply(null,arguments)};var
_Sub=Module[\"_Sub\"]=function(){return(_Sub=Module[\"_Sub\"]=Module[\"asm\"][\"$a\"]).apply(null,arguments)};var
_Sum=Module[\"_Sum\"]=function(){return(_Sum=Module[\"_Sum\"]=Module[\"asm\"][\"ab\"]).apply(null,arguments)};var
_Tan=Module[\"_Tan\"]=function(){return(_Tan=Module[\"_Tan\"]=Module[\"asm\"][\"bb\"]).apply(null,arguments)};var
_Tanh=Module[\"_Tanh\"]=function(){return(_Tanh=Module[\"_Tanh\"]=Module[\"asm\"][\"cb\"]).apply(null,arguments)};var
_Tile=Module[\"_Tile\"]=function(){return(_Tile=Module[\"_Tile\"]=Module[\"asm\"][\"db\"]).apply(null,arguments)};var
_TopK=Module[\"_TopK\"]=function(){return(_TopK=Module[\"_TopK\"]=Module[\"asm\"][\"eb\"]).apply(null,arguments)};var
_Transform=Module[\"_Transform\"]=function(){return(_Transform=Module[\"_Transform\"]=Module[\"asm\"][\"fb\"]).apply(null,arguments)};var
_Transpose=Module[\"_Transpose\"]=function(){return(_Transpose=Module[\"_Transpose\"]=Module[\"asm\"][\"gb\"]).apply(null,arguments)};var
__FusedMatMul=Module[\"__FusedMatMul\"]=function(){return(__FusedMatMul=Module[\"__FusedMatMul\"]=Module[\"asm\"][\"hb\"]).apply(null,arguments)};var
_malloc=Module[\"_malloc\"]=function(){return(_malloc=Module[\"_malloc\"]=Module[\"asm\"][\"ib\"]).apply(null,arguments)};var
_free=Module[\"_free\"]=function(){return(_free=Module[\"_free\"]=Module[\"asm\"][\"jb\"]).apply(null,arguments)};var
___errno_location=Module[\"___errno_location\"]=function(){return(___errno_location=Module[\"___errno_location\"]=Module[\"asm\"][\"kb\"]).apply(null,arguments)};var

_emscripten_get_global_libc=Module[\"_emscripten_get_global_libc\"]=function(){return(_emscripten_get_global_libc=Module[\"_emscripten_get_global_libc\"]=Module[\"asm\"][\"lb\"]).apply(null,arguments)};var _pthread_self=Module[\"_pthread_self\"]=function(){return(_pthread_self=Module[\"_pthread_self\"]=Module[\"asm\"][\"mb\"]).apply(null,arguments)};var ___pthread_tsd_run_dtors=Module[\"___pthread_tsd_run_dtors\"]=function(){return(___pthread_tsd_run_dtors=Module[\"___pthread_tsd_run_dtors\"]=Module[\"asm\"][\"nb\"]).apply(null,arguments)};var _emscripten_main_thread_process_queued_calls=Module[\"_emscripten_main_thread_process_queued_calls\"]=function(){return(_emscripten_main_thread_process_queued_calls=Module[\"_emscripten_main_thread_process_queued_calls\"]=Module[\"asm\"][\"ob\"]).apply(null,arguments)};var _emscripten_current_thread_process_queued_calls=Module[\"_emscripten_current_thread_process_queued_calls\"]=function(){return(_emscripten_current_thread_process_queued_calls=Module[\"_emscripten_current_thread_process_queued_calls\"]=Module[\"asm\"][\"pb\"]).apply(null,arguments)};var _emscripten_register_main_browser_thread_id=Module[\"_emscripten_register_main_browser_thread_id\"]=function(){return(_emscripten_register_main_browser_thread_id=Module[\"_emscripten_register_main_browser_thread_id\"]=Module[\"asm\"][\"qb\"]).apply(null,arguments)};var _emscripten_main_browser_thread_id=Module[\"_emscripten_main_browser_thread_id\"]=function(){return(_emscripten_main_browser_thread_id=Module[\"_emscripten_main_browser_thread_id\"]=Module[\"asm\"][\"rb\"]).apply(null,arguments)};var __emscripten_do_dispatch_to_thread=Module[\"__emscripten_do_dispatch_to_thread\"]=function(){return(__emscripten_do_dispatch_to_thread=Module[\"__emscripten_do_dispatch_to_thread\"]=Module[\"asm\"][\"sb\"]).apply(null,arguments)};var _emscripten_sync_run_in_main_thread_4=Module[\"_emscripten_sync_run_in_main_thread_4\"]=function(){return(_emscripten_sync_run_in_main_thread_4=Module[\"_emscripten_sync_run_in_main_thread_4\"]=Module[\"asm\"][\"tb\"]).apply(null,arguments)};var _emscripten_run_in_main_runtime_thread_js=Module[\"_emscripten_run_in_main_runtime_thread_js\"]=function(){return(_emscripten_run_in_main_runtime_thread_js=Module[\"_emscripten_run_in_main_runtime_thread_js\"]=Module[\"asm\"][\"ub\"]).apply(null,arguments)};var __emscripten_call_on_thread=Module[\"__emscripten_call_on_thread\"]=function(){return(__emscripten_call_on_thread=Module[\"__emscripten_call_on_thread\"]=Module[\"asm\"][\"vb\"]).apply(null,arguments)};var _emscripten_tls_init=Module[\"_emscripten_tls_init\"]=function(){return(_emscripten_tls_init=Module[\"_emscripten_tls_init\"]=Module[\"asm\"][\"wb\"]).apply(null,arguments)};var __emscripten_thread_init=Module[\"__emscripten_thread_init\"]=function(){return(__emscripten_thread_init=Module[\"__emscripten_thread_init\"]=Module[\"asm\"][\"xb\"]).apply(null,arguments)};var stackSave=Module[\"stackSave\"]=function(){return(stackSave=Module[\"stackSave\"]=Module[\"asm\"][\"yb\"]).apply(null,arguments)};var stackRestore=Module[\"stackRestore\"]=function(){return(stackRestore=Module[\"stackRestore\"]=Module[\"asm\"][\"zb\"]).apply(null,arguments)};var stackAlloc=Module[\"stackAlloc\"]=function(){return(stackAlloc=Module[\"stackAlloc\"]=Module[\"asm\"][\"Ab\"]).apply(null,arguments)};var _emscripten_stack_set_limits=Module[\"_emscripten_stack_set_limits\"]=function(){return(_emscripten_stack_set_limits=Module[\"_emscripten_stack_set_limits\"]=Module[\"asm\"][\"Bb\"]).apply(null,arguments)};var _memalign=Module[\"_memalign\"]=function(){return(_memalign=Module[\"_memalign\"]=Module[\"asm\"][\"Cb\"]).apply(null,arguments)};var __emscripten_allow_main_runtime_queued_calls=Module[\"__emscripten_allow_main_runtime_queued_calls\"]=10512;var __emscripten_main_thread_futex=Module[\"__emscripten_main_thread_futex\"]=12148;Module[\"cwrap\"]=cwrap;Module[\"PThread\"]=PThread;Module[\"PThread\"]=PThread;Module[\"wasmMemory\"]=wasmMemory;Module[\"ExitStatus\"]=ExitStatus;var

calledRun;function ExitStatus(status){this.name=\"ExitStatus\";this.message=\"Program terminated with exit(\"+status+\")\";this.status=status}dependenciesFulfilled=function runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function run(args){args=args||arguments_;if(runDependencies>0){return}if(ENVIRONMENT_IS_PTHREAD){readyPromiseResolve(Module);initRuntime();postMessage({\"cmd\":\"loaded\"});return}preRun();if(runDependencies>0){return}function doRun(){if(calledRun)return;calledRun=true;Module[\"calledRun\"]=true;if(ABORT)return;initRuntime();preMain();readyPromiseResolve(Module);if(Module[\"onRuntimeInitialized\"])Module[\"onRuntimeInitialized\"]();postRun()}if(Module[\"setStatus\"]){Module[\"setStatus\"](\"Running...\");setTimeout(function(){setTimeout(function(){Module[\"setStatus\"](\"\")},1);doRun()},1)}else{doRun()}}Module[\"run\"]=run;function exit(status,implicit){if(implicit&&noExitRuntime&&status===0){return}if(!implicit){if(ENVIRONMENT_IS_PTHREAD){postMessage({\"cmd\":\"exitProcess\",\"returnCode\":status});throw new ExitStatus(status)}else{}}if(noExitRuntime){}else{PThread.terminateAllThreads();EXITSTATUS=status;exitRuntime();if(Module[\"onExit\"])Module[\"onExit\"](status);ABORT=true}quit_(status,new ExitStatus(status))}if(Module[\"preInit\"]){if(typeof Module[\"preInit\"]==\"function\")Module[\"preInit\"]=[Module[\"preInit\"]];while(Module[\"preInit\"].length>0){Module[\"preInit\"].pop()()}}if(ENVIRONMENT_IS_PTHREAD){noExitRuntime=false;PThread.initWorker()}run();\n\n\n return WasmBackendModuleThreadedSimd.ready\n}\n);\n})();\nif (typeof exports === 'object' && typeof module === 'object')\n module.exports = WasmBackendModuleThreadedSimd;\nelse if (typeof define === 'function' && define['amd'])\n define([], function() { return WasmBackendModuleThreadedSimd; });\nelse if (typeof exports === 'object')\n exports[\"WasmBackendModuleThreadedSimd\"] = WasmBackendModuleThreadedSimd;\n","export const wasmWorkerContents = 'var Module={};function threadPrintErr(){var text=Array.prototype.slice.call(arguments).join(\" \");console.error(text)}function threadAlert(){var text=Array.prototype.slice.call(arguments).join(\" \");postMessage({cmd:\"alert\",text:text,threadId:Module[\"_pthread_self\"]()})}var err=threadPrintErr;this.alert=threadAlert;Module[\"instantiateWasm\"]=function(info,receiveInstance){var instance=new WebAssembly.Instance(Module[\"wasmModule\"],info);Module[\"wasmModule\"]=null;receiveInstance(instance);return instance.exports};function moduleLoaded(){}this.onmessage=function(e){try{if(e.data.cmd===\"load\"){Module[\"wasmModule\"]=e.data.wasmModule;Module[\"wasmMemory\"]=e.data.wasmMemory;Module[\"buffer\"]=Module[\"wasmMemory\"].buffer;Module[\"ENVIRONMENT_IS_PTHREAD\"]=true;if(typeof e.data.urlOrBlob===\"string\"){importScripts(e.data.urlOrBlob)}else{var objectUrl=URL.createObjectURL(e.data.urlOrBlob);importScripts(objectUrl);URL.revokeObjectURL(objectUrl)}WasmBackendModuleThreadedSimd(Module).then(function(instance){Module=instance;moduleLoaded()})}else if(e.data.cmd===\"objectTransfer\"){Module[\"PThread\"].receiveObjectTransfer(e.data)}else if(e.data.cmd===\"run\"){Module[\"__performance_now_clock_drift\"]=performance.now()-e.data.time;Module[\"__emscripten_thread_init\"](e.data.threadInfoStruct,0,0);var max=e.data.stackBase;var top=e.data.stackBase+e.data.stackSize;Module[\"establishStackSpace\"](top,max);Module[\"_emscripten_tls_init\"]();Module[\"PThread\"].receiveObjectTransfer(e.data);Module[\"PThread\"].setThreadStatus(Module[\"_pthread_self\"](),1);try{var result=Module[\"invokeEntryPoint\"](e.data.start_routine,e.data.arg);if(!Module[\"getNoExitRuntime\"]())Module[\"PThread\"].threadExit(result)}catch(ex){if(ex===\"Canceled!\"){Module[\"PThread\"].threadCancel()}else if(ex!=\"unwind\"){if(ex instanceof Module[\"ExitStatus\"]){if(Module[\"getNoExitRuntime\"]()){}else{Module[\"PThread\"].threadExit(ex.status)}}else{Module[\"PThread\"].threadExit(-2);throw

ex}}}}else
if(e.data.cmd===\"cancel\"){if(Module[\"_pthread_self\"]()){Module[\"PThread\"].threadCancel()}}else
if(e.data.target===\"setimmediate\"){}else
if(e.data.cmd===\"processThreadQueue\"){if(Module[\"_pthread_self\"]()){Module[\"_emscripten_current_thread_process_queued_calls\"]()}}else{err(\"worker.js received unknown command \"+e.data.cmd);err(e.data)}}catch(ex){err(\"worker.js onmessage() captured an uncaught exception: \"+ex);if(ex&&ex.stack)err(ex.stack);throw ex}};if(typeof process===\"object\"&&typeof process.versions===\"object\"&&typeof process.versions.node===\"string\"){self={location:{href:__filename}};var onmessage=this.onmessage;var nodeWorkerThreads=require(\"worker_threads\");global.Worker=nodeWorkerThreads.Worker;var parentPort=nodeWorkerThreads.parentPort;parentPort.on(\"message\",function(data){onmessage({data:data})});var nodeFS=require(\"fs\");var nodeRead=function(filename){return nodeFS.readFileSync(filename,\"utf8\")};function globalEval(x){global.require=require;global.Module=Module;eval.call(null,x)}importScripts=function(f){globalEval(nodeRead(f))};postMessage=function(msg){parentPort.postMessage(msg)};if(typeof performance===\"undefined\"){performance={now:function(){return Date.now()}}}';","\nvar WasmBackendModule = (function() {\n var _scriptDir = typeof document !== 'undefined' && document.currentScript ? document.currentScript.src : undefined;\n if (typeof __filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return (\nfunction(WasmBackendModule) {\n WasmBackendModule = WasmBackendModule || {};\n\n\nvar Module=typeof WasmBackendModule!==\"undefined\"?WasmBackendModule:{};var readyPromiseResolve,readyPromiseReject;Module[\"ready\"]=new Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var moduleOverrides={};var key;for(key in Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var thisProgram=\"./this.program\";var quit_=function(status,toThrow){throw toThrow};var ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof window===\"object\";ENVIRONMENT_IS_WORKER=typeof importScripts===\"function\";ENVIRONMENT_IS_NODE=typeof process===\"object\"&&typeof process.versions===\"object\"&&typeof process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONMENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var scriptDirectory=\"\";function locateFile(path){if(Module[\"locateFile\"]){return Module[\"locateFile\"](path,scriptDirectory)}return scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\"path\").dirname(scriptDirectory)+\"/\"}else{scriptDirectory=__dirname+\"/\"}read_=function shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=nodePath[\"normalize\"](filename);return nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\")};readBinary=function readBinary(filename){var ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return ret};if(process[\"argv\"].length>1){thisProgram=process[\"argv\"][1].replace(/\\\\/g,\"/\")}arguments_=process[\"argv\"].slice(2);process[\"on\"](\"uncaughtException\",function(ex){if(!(ex instanceof ExitStatus)){throw ex}});process[\"on\"](\"unhandledRejection\",abort);quit_=function(status){process[\"exit\"](status)};Module[\"inspect\"]=function(){return\"[Emscripten Module object]\"}}else if(ENVIRONMENT_IS_SHELL){if(typeof read!=\"undefined\"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var data;if(typeof readbuffer===\"function\"){return new Uint8Array(readbuffer(f))}data=read(f,\"binary\");assert(typeof data===\"object\");return data};if(typeof

scriptArgs!=\"undefined\"){arguments_=scriptArgs}else
if(typeof arguments!=\"undefined\"){arguments_=arguments}if(typeof
quit===\"function\"){quit_=function(status){quit(status)}}if(typeof print!==\"undefined\"){if(typeof
console===\"undefined\")console={};console.log=print;console.warn=console.error=typeof
printErr!==\"undefined\"?printErr:print}}else
if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDire
ctory=self.location.href}else if(typeof
document!==\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(_scriptDir){s
criptDirectory=_scriptDir}if(scriptDirectory.indexOf(\"blob:\")!==0){scriptDirectory=scriptDirectory.substr(0,script
Directory.lastIndexOf(\"/\")+1)}else{scriptDirectory=\"\"}{read_=function(url){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.send(null);return
xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.responseType=\"arraybuffer\";xhr.send(null);return
new Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new
XMLHttpRequest;xhr.open(\"GET\",url,true);xhr.responseType=\"arraybuffer\";xhr.onload=function(){if(xhr.status
==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror()};xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title}}else{}var
out=Module[\"print\"]||console.log.bind(console);var err=Module[\"printErr\"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module[\"arguments\"])arguments_=Module[\"arguments\"];if(Module[\"thisProgram\"])thisProgram=
Module[\"thisProgram\"];if(Module[\"quit\"])quit_=Module[\"quit\"];var
wasmBinary;if(Module[\"wasmBinary\"])wasmBinary=Module[\"wasmBinary\"];var
noExitRuntime=Module[\"noExitRuntime\"]||true;if(typeof WebAssembly!==\"object\"){abort(\"no native wasm
support detected\")}var wasmMemory;var
ABORT=false;var EXITSTATUS;function assert(condition,text){if(!condition){abort(\"Assertion failed:
\"+text)}}function getCFunc(ident){var func=Module[\"_\"+ident];assert(func,\"Cannot call unknown function
\"+ident+\", make sure it is exported\");return func}function ccall(ident,returnType,argTypes,args,opts){var
toC={\"string\":function(str){var ret=0;if(str!==null&&str!==undefined&&str!==0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\"array\":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType===\"string\")return UTF8ToString(ret);if(returnType===\"boolean\")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return
ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type===\"number\"});var
numericRet=returnType!==\"string\";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}}var UTF8Decoder=typeof
TextDecoder!==\"undefined\"?new TextDecoder(\"utf8\"):undefined;function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
endPtr=idx;while(heap[endPtr]&&!(endPtr>=endIdx))++endPtr;if(endPtr-
idx>16&&heap.subarray&&UTF8Decoder){return UTF8Decoder.decode(heap.subarray(idx,endPtr))}else{var
str=\"\";while(idx<endPtr){var u0=heap[idx++];if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var

ch=u0-65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}}return str}function UTF8ToString(ptr,maxBytesToRead){return ptr?UTF8ArrayToString(HEAPU8,ptr,maxBytesToRead):\"\"}function stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var u=str.charCodeAt(i);if(u>=55296&&u<=57343){var u1=str.charCodeAt(++i);u=65536+((u&1023)<<10)|u1&1023}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function stringToUTF8(str,outPtr,maxBytesToWrite){return stringToUTF8Array(str,HEAPU8,outPtr,maxBytesToWrite)}function writeArrayToMemory(array,buffer){HEAP8.set(array,buffer)}function alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function updateGlobalBufferAndViews(buf){buffer=buf;Module[\"HEAP8\"]=HEAP8=new Int8Array(buf);Module[\"HEAP16\"]=HEAP16=new Int16Array(buf);Module[\"HEAP32\"]=HEAP32=new Int32Array(buf);Module[\"HEAPU8\"]=HEAPU8=new Uint8Array(buf);Module[\"HEAPU16\"]=HEAPU16=new Uint16Array(buf);Module[\"HEAPU32\"]=HEAPU32=new Uint32Array(buf);Module[\"HEAPF32\"]=HEAPF32=new Float32Array(buf);Module[\"HEAPF64\"]=HEAPF64=new Float64Array(buf)}var INITIAL_MEMORY=Module[\"INITIAL_MEMORY\"]||16777216;var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;__ATINIT__.push({func:function(){___wasm_call_ctors()}});function preRun(){if(Module[\"preRun\"]){if(typeof Module[\"preRun\"]==\"function\")Module[\"preRun\"]=[Module[\"preRun\"]];while(Module[\"preRun\"].length){addOnPreRun(Module[\"preRun\"].shift())}}callRuntimeCallbacks(__ATPRERUN__)}function initRuntime(){runtimeInitialized=true;callRuntimeCallbacks(__ATINIT__)}function preMain(){callRuntimeCallbacks(__ATMAIN__)}function postRun(){if(Module[\"postRun\"]){if(typeof Module[\"postRun\"]==\"function\")Module[\"postRun\"]=[Module[\"postRun\"]];while(Module[\"postRun\"].length){addOnPostRun(Module[\"postRun\"].shift())}}callRuntimeCallbacks(__ATPOSTRUN__)}function addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function addRunDependency(id){runDependencies++;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}}function removeRunDependency(id){runDependencies--;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}if(runDependencies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}if(dependenciesFulfilled){var callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}}Module[\"preloadedImages\"]={};Module[\"preloadedAudios\"]={};function abort(what){if(Module[\"onAbort\"]){Module[\"onAbort\"](what)}what+=\"\";err(what);ABORT=true;EXITSTATUS=1;what=\"abort(\"+what+\"). Build with -s ASSERTIONS=1 for more info.\";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var dataURIPrefix=\"data:application/octet-stream; base64,\";function isDataURI(filename){return hasPrefix(filename,dataURIPrefix)}var fileURIPrefix=\"file://\";function isFileURI(filename){return hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile=\"tfjs-backend-

wasm.wasm\";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function getBinary(file){try{if(file==wasmBinaryFile&&wasmBinary){return new Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw\"both async and sync fetching of the wasm failed\"}}catch(err){abort(err)}}function getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof fetch===\"function\"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){if(!response[\"ok\"]){throw\"failed to load wasm binary file at '\"+wasmBinaryFile+\"'\"}return response[\"arrayBuffer\"]()}).catch(function(){return getBinary(wasmBinaryFile)})}else{if(readAsync){return new Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new Uint8Array(response))},reject)})}}}return Promise.resolve().then(function(){return getBinary(wasmBinaryFile)})}function createWasm(){var info={\"a\":asmLibraryArg};function receiveInstance(instance,module){var exports=instance.exports;Module[\"asm\"]=exports;wasmMemory=Module[\"asm\"][\"j\"];updateGlobalBufferAndViews(wasmMemory.buffer);wasmTable=Module[\"asm\"][\"r\"];removeRunDependency(\"wasm-instantiate\")}addRunDependency(\"wasm-instantiate\");function receiveInstantiatedSource(output){receiveInstance(output[\"instance\"])}function instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err(\"failed to asynchronously prepare wasm: \"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof WebAssembly.instantiateStreaming===\"function\"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFile)&&typeof fetch===\"function\"){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return result.then(receiveInstantiatedSource,function(reason){err(\"wasm streaming compile failed: \"+reason);err(\"falling back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)})})}else{return instantiateArrayBuffer(receiveInstantiatedSource)}}if(Module[\"instantiateWasm\"]){try{var exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports}catch(e){err(\"Module.instantiateWasm callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}function callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof callback==\"function\"){callback(Module);continue}var func=callback.func;if(typeof func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)()}else{wasmTable.get(func)(callback.arg)}}else{func(callback.arg===undefined?null:callback.arg)}}}function _abort(){abort()}function _emscripten_memcpy_big(dest,src,num){HEAPU8.copyWithin(dest,src,src+num)}function _emscripten_get_heap_size(){return HEAPU8.length}function emscripten_realloc_buffer(size){try{wasmMemory.grow(size-buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return 1}catch(e){}}function _emscripten_resize_heap(requestedSize){var oldSize=_emscripten_get_heap_size();var maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var cutDown=1;cutDown<=4;cutDown*=2){var overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize+100663296);var newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var ret=HEAP32[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var ret=UTF8ToString(ptr);return

ret},get64:function(low,high){return
low}};function _fd_close(fd){return 0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){}function
_fd_write(fd,iov,iovcnt,pnum){var num=0;for(var i=0;i<iovcnt;i++){var ptr=HEAP32[iov+i*8>>2];var
len=HEAP32[iov+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,HEAPU8[ptr+j])}num+=len}HEAP32[pnum>>2]=num;return 0}function
_pthread_create(){return 6}function _pthread_join(){return 28}function
setErrNo(value){HEAP32[___errno_location()>>2]=value;return value}function
_sysconf(name){switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return
maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case
19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case
77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case
46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case
161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case
49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case
80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case
93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case
31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case
36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case
44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return
255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case
84:{if(typeof navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-
1}var
asmLibraryArg={\"a\":_abort,\"d\":_emscripten_memcpy_big,\"e\":_emscripten_resize_heap,\"f\":_fd_close,\"c\":_f
d_seek,\"b\":_fd_write,\"h\":_pthread_create,\"g\":_pthread_join,\"i\":_sysconf};var asm=createWasm();var
___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=function(){return(___wasm_call_ctors=Module[\"___wasm
_call_ctors\"]=Module[\"asm\"][\"k\"]).apply(null,arguments)};var
_init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"l\"]).apply(null,arguments)};
var
_init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Mod
ule[\"_init_with_threads_count\"]=Module[\"asm\"][\"m\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads
_count\"]=Module[\"asm\"][\"n\"]).apply(null,arguments)};var
_register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=M
odule[\"asm\"][\"o\"]).apply(null,arguments)};var
_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"
asm\"][\"p\"]).apply(null,arguments)};var
_dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"q\"]).apply(n
ull,arguments)};var
_Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"s\"]).apply(null,arguments
)};var
_Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"t\"]).apply(null,argument
s)};var
_AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"u\"]).apply(null,ar
guments)};var
_All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"v\"]).apply(null,arguments)};
var
_Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"w\"]).apply(null,argumen
ts)};var

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_ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"x\"]).apply(null,arguments)};var
_AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"y\"]).apply(null,arguments)};var
_BatchMatMul=Module[\"_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\"_BatchMatMul\"]=Module[\"asm\"][\"z\"]).apply(null,arguments)};var
_Ceil=Module[\"_Ceil\"]=function(){return(_Ceil=Module[\"_Ceil\"]=Module[\"asm\"][\"A\"]).apply(null,arguments)};var
_ClipByValue=Module[\"_ClipByValue\"]=function(){return(_ClipByValue=Module[\"_ClipByValue\"]=Module[\"asm\"][\"B\"]).apply(null,arguments)};var
_Conv2D=Module[\"_Conv2D\"]=function(){return(_Conv2D=Module[\"_Conv2D\"]=Module[\"asm\"][\"C\"]).apply(null,arguments)};var
_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=function(){return(_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var
_Cos=Module[\"_Cos\"]=function(){return(_Cos=Module[\"_Cos\"]=Module[\"asm\"][\"E\"]).apply(null,arguments)};var
_Cosh=Module[\"_Cosh\"]=function(){return(_Cosh=Module[\"_Cosh\"]=Module[\"asm\"][\"F\"]).apply(null,arguments)};var
_CropAndResize=Module[\"_CropAndResize\"]=function(){return(_CropAndResize=Module[\"_CropAndResize\"]=Module[\"asm\"][\"G\"]).apply(null,arguments)};var
_Cumsum=Module[\"_Cumsum\"]=function(){return(_Cumsum=Module[\"_Cumsum\"]=Module[\"asm\"][\"H\"]).apply(null,arguments)};var
_DepthToSpace=Module[\"_DepthToSpace\"]=function(){return(_DepthToSpace=Module[\"_DepthToSpace\"]=Module[\"asm\"][\"I\"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=function(){return(_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=Module[\"asm\"][\"J\"]).apply(null,arguments)};var
_Elu=Module[\"_Elu\"]=function(){return(_Elu=Module[\"_Elu\"]=Module[\"asm\"][\"K\"]).apply(null,arguments)};var
_Equal=Module[\"_Equal\"]=function(){return(_Equal=Module[\"_Equal\"]=Module[\"asm\"][\"L\"]).apply(null,arguments)};var
_Exp=Module[\"_Exp\"]=function(){return(_Exp=Module[\"_Exp\"]=Module[\"asm\"][\"M\"]).apply(null,arguments)};var
_FlipLeftRight=Module[\"_FlipLeftRight\"]=function(){return(_FlipLeftRight=Module[\"_FlipLeftRight\"]=Module[\"asm\"][\"N\"]).apply(null,arguments)};var
_Floor=Module[\"_Floor\"]=function(){return(_Floor=Module[\"_Floor\"]=Module[\"asm\"][\"O\"]).apply(null,arguments)};var
_FloorDiv=Module[\"_FloorDiv\"]=function(){return(_FloorDiv=Module[\"_FloorDiv\"]=Module[\"asm\"][\"P\"]).apply(null,arguments)};var
_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=function(){return(_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=Module[\"asm\"][\"Q\"]).apply(null,arguments)};var
_FusedConv2D=Module[\"_FusedConv2D\"]=function(){return(_FusedConv2D=Module[\"_FusedConv2D\"]=Module[\"asm\"][\"R\"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=function(){return(_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=Module[\"asm\"][\"S\"]).apply(null,arguments)};var
_Gather=Module[\"_Gather\"]=function(){return(_Gather=Module[\"_Gather\"]=Module[\"asm\"][\"T\"]).apply(null,arguments)};var
_GatherNd=Module[\"_GatherNd\"]=function(){return(_GatherNd=Module[\"_GatherNd\"]=Module[\"asm\"][\"U\"]).apply(null,arguments)};var
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_Greater=Module[\"_Greater\"]=function(){return(_Greater=Module[\"_Greater\"]=Module[\"asm\"][\"V\"]).apply(null,arguments)};var
_GreaterEqual=Module[\"_GreaterEqual\"]=function(){return(_GreaterEqual=Module[\"_GreaterEqual\"]=Module[\"asm\"][\"W\"]).apply(null,arguments)};var
_LeakyRelu=Module[\"_LeakyRelu\"]=function(){return(_LeakyRelu=Module[\"_LeakyRelu\"]=Module[\"asm\"][\"X\"]).apply(null,arguments)};var
_Less=Module[\"_Less\"]=function(){return(_Less=Module[\"_Less\"]=Module[\"asm\"][\"Y\"]).apply(null,arguments)};var
_LessEqual=Module[\"_LessEqual\"]=function(){return(_LessEqual=Module[\"_LessEqual\"]=Module[\"asm\"][\"Z\"]).apply(null,arguments)};var
_Log=Module[\"_Log\"]=function(){return(_Log=Module[\"_Log\"]=Module[\"asm\"][\"_\"]).apply(null,arguments)};var
_LogicalAnd=Module[\"_LogicalAnd\"]=function(){return(_LogicalAnd=Module[\"_LogicalAnd\"]=Module[\"asm\"][\"$\"]).apply(null,arguments)};var
_Max=Module[\"_Max\"]=function(){return(_Max=Module[\"_Max\"]=Module[\"asm\"][\"aa\"]).apply(null,arguments)};var
_MaxPool=Module[\"_MaxPool\"]=function(){return(_MaxPool=Module[\"_MaxPool\"]=Module[\"asm\"][\"ba\"]).apply(null,arguments)};var
_Maximum=Module[\"_Maximum\"]=function(){return(_Maximum=Module[\"_Maximum\"]=Module[\"asm\"][\"ca\"]).apply(null,arguments)};var
_Mean=Module[\"_Mean\"]=function(){return(_Mean=Module[\"_Mean\"]=Module[\"asm\"][\"da\"]).apply(null,arguments)};var
_Min=Module[\"_Min\"]=function(){return(_Min=Module[\"_Min\"]=Module[\"asm\"][\"ea\"]).apply(null,arguments)};var
_Minimum=Module[\"_Minimum\"]=function(){return(_Minimum=Module[\"_Minimum\"]=Module[\"asm\"][\"fa\"]).apply(null,arguments)};var
_MirrorPad=Module[\"_MirrorPad\"]=function(){return(_MirrorPad=Module[\"_MirrorPad\"]=Module[\"asm\"][\"ga\"]).apply(null,arguments)};var
_Multiply=Module[\"_Multiply\"]=function(){return(_Multiply=Module[\"_Multiply\"]=Module[\"asm\"][\"ha\"]).apply(null,arguments)};var
_Neg=Module[\"_Neg\"]=function(){return(_Neg=Module[\"_Neg\"]=Module[\"asm\"][\"ia\"]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module[\"_NonMaxSuppressionV3\"]=function(){return(_NonMaxSuppressionV3=Module[\"_NonMaxSuppressionV3\"]=Module[\"asm\"][\"ja\"]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module[\"_NonMaxSuppressionV4\"]=function(){return(_NonMaxSuppressionV4=Module[\"_NonMaxSuppressionV4\"]=Module[\"asm\"][\"ka\"]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module[\"_NonMaxSuppressionV5\"]=function(){return(_NonMaxSuppressionV5=Module[\"_NonMaxSuppressionV5\"]=Module[\"asm\"][\"la\"]).apply(null,arguments)};var
_NotEqual=Module[\"_NotEqual\"]=function(){return(_NotEqual=Module[\"_NotEqual\"]=Module[\"asm\"][\"ma\"]).apply(null,arguments)};var
_OneHot=Module[\"_OneHot\"]=function(){return(_OneHot=Module[\"_OneHot\"]=Module[\"asm\"][\"na\"]).apply(null,arguments)};var
_PadV2=Module[\"_PadV2\"]=function(){return(_PadV2=Module[\"_PadV2\"]=Module[\"asm\"][\"oa\"]).apply(null,arguments)};var
_Pow=Module[\"_Pow\"]=function(){return(_Pow=Module[\"_Pow\"]=Module[\"asm\"][\"pa\"]).apply(null,arguments)};var
_Prelu=Module[\"_Prelu\"]=function(){return(_Prelu=Module[\"_Prelu\"]=Module[\"asm\"][\"qa\"]).apply(null,arguments)};var

_Prod=Module[\"_Prod\"]=function(){return(_Prod=Module[\"_Prod\"]=Module[\"asm\"][\"ra\"]).apply(null,arguments)};var
_RealDiv=Module[\"_RealDiv\"]=function(){return(_RealDiv=Module[\"_RealDiv\"]=Module[\"asm\"][\"sa\"]).apply(null,arguments)};var
_Relu=Module[\"_Relu\"]=function(){return(_Relu=Module[\"_Relu\"]=Module[\"asm\"][\"ta\"]).apply(null,arguments)};var
_Relu6=Module[\"_Relu6\"]=function(){return(_Relu6=Module[\"_Relu6\"]=Module[\"asm\"][\"ua\"]).apply(null,arguments)};var
_ResizeBilinear=Module[\"_ResizeBilinear\"]=function(){return(_ResizeBilinear=Module[\"_ResizeBilinear\"]=Module[\"asm\"][\"va\"]).apply(null,arguments)};var
_Reverse=Module[\"_Reverse\"]=function(){return(_Reverse=Module[\"_Reverse\"]=Module[\"asm\"][\"wa\"]).apply(null,arguments)};var
_RotateWithOffset=Module[\"_RotateWithOffset\"]=function(){return(_RotateWithOffset=Module[\"_RotateWithOffset\"]=Module[\"asm\"][\"xa\"]).apply(null,arguments)};var
_Round=Module[\"_Round\"]=function(){return(_Round=Module[\"_Round\"]=Module[\"asm\"][\"ya\"]).apply(null,arguments)};var
_Rsqrt=Module[\"_Rsqrt\"]=function(){return(_Rsqrt=Module[\"_Rsqrt\"]=Module[\"asm\"][\"za\"]).apply(null,arguments)};var
_ScatterNd=Module[\"_ScatterNd\"]=function(){return(_ScatterNd=Module[\"_ScatterNd\"]=Module[\"asm\"][\"Aa\"]).apply(null,arguments)};var
_SelectV2=Module[\"_SelectV2\"]=function(){return(_SelectV2=Module[\"_SelectV2\"]=Module[\"asm\"][\"Ba\"]).apply(null,arguments)};var
_Sigmoid=Module[\"_Sigmoid\"]=function(){return(_Sigmoid=Module[\"_Sigmoid\"]=Module[\"asm\"][\"Ca\"]).apply(null,arguments)};var
_Sin=Module[\"_Sin\"]=function(){return(_Sin=Module[\"_Sin\"]=Module[\"asm\"][\"Da\"]).apply(null,arguments)};var
_Softmax=Module[\"_Softmax\"]=function(){return(_Softmax=Module[\"_Softmax\"]=Module[\"asm\"][\"Ea\"]).apply(null,arguments)};var
_Sqrt=Module[\"_Sqrt\"]=function(){return(_Sqrt=Module[\"_Sqrt\"]=Module[\"asm\"][\"Fa\"]).apply(null,arguments)};var
_Square=Module[\"_Square\"]=function(){return(_Square=Module[\"_Square\"]=Module[\"asm\"][\"Ga\"]).apply(null,arguments)};var
_SquaredDifference=Module[\"_SquaredDifference\"]=function(){return(_SquaredDifference=Module[\"_SquaredDifference\"]=Module[\"asm\"][\"Ha\"]).apply(null,arguments)};var
_Step=Module[\"_Step\"]=function(){return(_Step=Module[\"_Step\"]=Module[\"asm\"][\"Ia\"]).apply(null,arguments)};var
_StridedSlice=Module[\"_StridedSlice\"]=function(){return(_StridedSlice=Module[\"_StridedSlice\"]=Module[\"asm\"][\"Ja\"]).apply(null,arguments)};var
_Sub=Module[\"_Sub\"]=function(){return(_Sub=Module[\"_Sub\"]=Module[\"asm\"][\"Ka\"]).apply(null,arguments)};var
_Sum=Module[\"_Sum\"]=function(){return(_Sum=Module[\"_Sum\"]=Module[\"asm\"][\"La\"]).apply(null,arguments)};var
_Tan=Module[\"_Tan\"]=function(){return(_Tan=Module[\"_Tan\"]=Module[\"asm\"][\"Ma\"]).apply(null,arguments)};var
_Tanh=Module[\"_Tanh\"]=function(){return(_Tanh=Module[\"_Tanh\"]=Module[\"asm\"][\"Na\"]).apply(null,arguments)};var
_Tile=Module[\"_Tile\"]=function(){return(_Tile=Module[\"_Tile\"]=Module[\"asm\"][\"Oa\"]).apply(null,arguments)};var

_TopK=Module[\"_TopK\"]=function(){return(_TopK=Module[\"_TopK\"]=Module[\"asm\"][\"Pa\"]).apply(null,arguments)};var
_Transform=Module[\"_Transform\"]=function(){return(_Transform=Module[\"_Transform\"]=Module[\"asm\"][\"Qa\"]).apply(null,arguments)};var
_Transpose=Module[\"_Transpose\"]=function(){return(_Transpose=Module[\"_Transpose\"]=Module[\"asm\"][\"Ra\"]).apply(null,arguments)};var
__FusedMatMul=Module[\"__FusedMatMul\"]=function(){return(__FusedMatMul=Module[\"__FusedMatMul\"]=Module[\"asm\"][\"Sa\"]).apply(null,arguments)};var
_malloc=Module[\"_malloc\"]=function(){return(_malloc=Module[\"_malloc\"]=Module[\"asm\"][\"Ta\"]).apply(null,arguments)};var
_free=Module[\"_free\"]=function(){return(_free=Module[\"_free\"]=Module[\"asm\"][\"Ua\"]).apply(null,arguments)};var
___errno_location=Module[\"___errno_location\"]=function(){return(___errno_location=Module[\"___errno_location\"]=Module[\"asm\"][\"Va\"]).apply(null,arguments)};var
stackSave=Module[\"stackSave\"]=function(){return(stackSave=Module[\"stackSave\"]=Module[\"asm\"][\"Wa\"]).apply(null,arguments)};var
stackRestore=Module[\"stackRestore\"]=function(){return(stackRestore=Module[\"stackRestore\"]=Module[\"asm\"][\"Xa\"]).apply(null,arguments)};var
stackAlloc=Module[\"stackAlloc\"]=function(){return(stackAlloc=Module[\"stackAlloc\"]=Module[\"asm\"][\"Ya\"]).apply(null,arguments)};Module[\"cwrap\"]=cwrap;var calledRun;function
ExitStatus(status){this.name=\"ExitStatus\";this.message=\"Program terminated with
exit(\"+status+\")\";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}preRun();if(runDependencies>0){return}function
doRun(){if(calledRun)return;calledRun=true;Module[\"calledRun\"]=true;if(ABORT)return;initRuntime();preMain();readyPromiseResolve(Module);if(Module[\"onRuntimeInitialized\"])Module[\"onRuntimeInitialized\"]();postRun()}if(Module[\"setStatus\"]){Module[\"setStatus\"](\"Running...\");setTimeout(function(){setTimeout(function(){Module[\"setStatus\"](\"\")},1);doRun()},1)}else{doRun()}}Module[\"run\"]=run;if(Module[\"preInit\"]){if(typeof
Module[\"preInit\"]==\"function\")Module[\"preInit\"]=[Module[\"preInit\"]];while(Module[\"preInit\"].length>0){
Module[\"preInit\"].pop()()}}run();\n\n\n return WasmBackendModule.ready\n}\n);\n})();\nif (typeof exports ===
'object' && typeof module === 'object')\n module.exports = WasmBackendModule;\nelse if (typeof define ===
 'function' && define['amd'])\n define([], function() { return WasmBackendModule; });\nelse if (typeof exports ===
'object')\n exports[\"WasmBackendModule\"] = WasmBackendModule;\n","/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==\n
*/\nimport './flags_wasm';\n\nimport {backend_util, BackendTimingInfo, DataStorage, DataType, deprecationWarn,
 engine, env, KernelBackend, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasmModule,
WasmFactoryConfig} from '../wasm-out/tfjs-backend-wasm';\nimport {BackendWasmThreadedSimdModule} from
'../wasm-out/tfjs-backend-wasm-threaded-simd';\nimport wasmFactoryThreadedSimd from '../wasm-out/tfjs-backend-wasm-threaded-simd.js';\n// @ts-ignore\nimport {wasmWorkerContents} from '../wasm-out/tfjs-backend-wasm-threaded-simd.worker.js';\nimport wasmFactory from '../wasm-out/tfjs-backend-wasm.js';\n\ninterface
TensorData {\n id: number;\n memoryOffset: number;\n shape: number[];\n dtype: DataType;\n refCount:
number;\n /** Only used for string tensors, storing encoded bytes. */\n stringBytes?: Uint8Array[];\n}\n\nexport

```
type DataId = object;  // object instead of {} to force non-primitive.\n\nexport class BackendWasm extends KernelBackend {\n  // 0 is reserved for null data ids.\n  private dataIdNextNumber = 1;\n  dataIdMap: DataStorage<TensorData>;\n\n  constructor(public wasm: BackendWasmModule|BackendWasmThreadedSimdModule) {\n    super();\n this.wasm.tfjs.initWithThreadsCount(threadsCount);\n    actualThreadsCount = this.wasm.tfjs.getThreadsCount();\n    this.dataIdMap = new DataStorage(this, engine());\n  }\n\n  write(values: backend_util.BackendValues, shape: number[], dtype: DataType):\n      DataId {\n    const dataId = {id: this.dataIdNextNumber++};\n    this.move(dataId, values, shape, dtype, 1);\n    return dataId;\n  }\n\n  numDataIds(): number {\n    return this.dataIdMap.numDataIds();\n  }\n\n  async time(f: () => void): Promise<BackendTimingInfo> {\n    const start = util.now();\n    f();\n    const kernelMs = util.now() - start;\n    return {kernelMs};\n  }\n\n  move(\n      dataId: DataId, values: backend_util.BackendValues, shape: number[],\n      dtype: DataType, refCount: number): void {\n    const id = this.dataIdNextNumber++;\n    if (dtype === 'string') {\n      const stringBytes = values as Uint8Array[];\n\n    this.dataIdMap.set(\n        dataId,\n        {id, stringBytes, shape, dtype, memoryOffset: null, refCount});\n    return;\n    }\n\n    const size = util.sizeFromShape(shape);\n    const numBytes = size * util.bytesPerElement(dtype);\n    const memoryOffset = this.wasm._malloc(numBytes);\n\n    this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount});\n\n    this.wasm.tfjs.registerTensor(id, size, memoryOffset);\n\n    if (values != null) {\n      this.wasm.HEAPU8.set(\n          new Uint8Array(\n              (values as backend_util.TypedArray).buffer,\n              (values as backend_util.TypedArray).byteOffset, numBytes),\n          memoryOffset);\n    }\n  }\n\n  async read(dataId: DataId): Promise<backend_util.BackendValues> {\n    return this.readSync(dataId);\n  }\n\n  readSync(dataId: DataId): backend_util.BackendValues {\n    const {memoryOffset, dtype, shape, stringBytes} =\n        this.dataIdMap.get(dataId);\n    if (dtype === 'string') {\n      return stringBytes;\n    }\n    const bytes = this.wasm.HEAPU8.slice(\n        memoryOffset,\n        memoryOffset + util.sizeFromShape(shape) * util.bytesPerElement(dtype));\n    return typedArrayFromBuffer(bytes.buffer, dtype);\n  }\n\n  /**\n   * Dispose the memory if the dataId has 0 refCount. Return true if the memory\n   * is released, false otherwise.\n   * @param dataId\n   * @oaram force Optional, remove the data regardless of refCount\n   */\n  disposeData(dataId: DataId, force = false): boolean {\n    if (this.dataIdMap.has(dataId)) {\n      const data = this.dataIdMap.get(dataId);\n      data.refCount--;\n      if (!force && data.refCount > 0) {\n        return false;\n      }\n\n      this.wasm._free(data.memoryOffset);\n      this.wasm.tfjs.disposeData(data.id);\n      this.dataIdMap.delete(dataId);\n    }\n    return true;\n  }\n\n  /** Return refCount of a `TensorData`. */\n  refCount(dataId: DataId): number {\n    if (this.dataIdMap.has(dataId)) {\n      const tensorData = this.dataIdMap.get(dataId);\n      return tensorData.refCount;\n    }\n    return 0;\n  }\n\n  incRef(dataId: DataId) {\n    const data = this.dataIdMap.get(dataId);\n    if (data != null) {\n      data.refCount++;\n    }\n  }\n\n  floatPrecision(): 32 {\n    return 32;\n  }\n\n  // Returns the memory offset of a tensor. Useful for debugging and unit\n  // testing.\n  getMemoryOffset(dataId: DataId): number {\n    return this.dataIdMap.get(dataId).memoryOffset;\n  }\n\n  dispose() {\n    this.wasm.tfjs.dispose();\n    if ('PThread' in this.wasm) {\n      this.wasm.PThread.terminateAllThreads();\n    }\n    this.wasm = null;\n  }\n\n  memory() {\n    return {unreliable: false};\n  }\n\n  /**\n   * Make a tensor info for the output of an op. If `memoryOffset` is not\n   * present, this method allocates memory on the WASM heap. If `memoryOffset`\n   * is present, the memory was allocated elsewhere (in c++) and we just record\n   * the pointer where that memory lives.\n   */\n  makeOutput(shape: number[], dtype: DataType, memoryOffset?: number):\n      TensorInfo {\n    let dataId: {};\n    if (memoryOffset == null) {\n      dataId = this.write(null /* values */, shape, dtype);\n    } else {\n      const id = this.dataIdNextNumber++;\n      dataId = {id};\n      this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount: 1});\n      const size = util.sizeFromShape(shape);\n      this.wasm.tfjs.registerTensor(id, size, memoryOffset);\n    }\n    return {dataId, shape, dtype};\n  }\n\n  typedArrayFromHeap({shape, dtype, dataId}: TensorInfo):\n      backend_util.TypedArray {\n    const buffer = this.wasm.HEAPU8.buffer;\n    const {memoryOffset} = this.dataIdMap.get(dataId);\n    const size = util.sizeFromShape(shape);\n    switch (dtype) {\n      case 'float32':\n        return new Float32Array(buffer, memoryOffset, size);\n      case 'int32':\n        return new
```

```
Int32Array(buffer, memoryOffset, size);\n      case 'bool':\n        return new Uint8Array(buffer, memoryOffset,
 size);\n      default:\n        throw new Error(`Unknown dtype ${dtype}`);\n    }\n  }\n}\n\nfunction
createInstantiateWasmFunc(path: string) {\n  // this will be replace by rollup plugin patchWechatWebAssembly in\n
// minprogram's output.\n  // tslint:disable-next-line:no-any\n  return (imports: any, callback: any) => {\n
util.fetch(path, {credentials: 'same-origin'}).then((response) => {\n      if (!response['ok']) {\n
imports.env.a(`failed to load wasm binary file at '${path}'`);\n      }\n      response.arrayBuffer().then(binary => {\n
   WebAssembly.instantiate(binary, imports).then(output => {\n          callback(output.instance, output.module);\n
 });\n      });\n    });\n    return {};\n  };\n}\n\n/**\n * Returns the path of the WASM binary.\n * @param
simdSupported whether SIMD is supported\n * @param threadsSupported whether multithreading is supported\n *
@param wasmModuleFolder the directory containing the WASM binaries.\n */\nfunction getPathToWasmBinary(\n
   simdSupported: boolean, threadsSupported: boolean,\n    wasmModuleFolder: string) {\n  if (wasmPath != null)
{\n    // If wasmPath is defined, the user has supplied a full path to\n    // the vanilla .wasm binary.\n    return
wasmPath;\n  }\n\n  let path: WasmBinaryName = 'tfjs-backend-wasm.wasm';\n  if (simdSupported &&
threadsSupported) {\n    path = 'tfjs-backend-wasm-threaded-simd.wasm';\n  } else if (simdSupported) {\n    path =
'tfjs-backend-wasm-simd.wasm';\n  }\n\n  if (wasmFileMap != null) {\n    if (wasmFileMap[path] != null) {\n
return wasmFileMap[path];\n    }\n  }\n\n  return wasmModuleFolder + path;\n}\n\n/**\n * Initializes the wasm
module and creates the js <--> wasm bridge.\n *\n * NOTE: We wrap the wasm module in a object with property
'wasm' instead of\n * returning Promise<BackendWasmModule> to avoid freezing Chrome (last tested\n * in
Chrome 76).\n */\nexport async function init(): Promise<{wasm: BackendWasmModule}> {\n  const
[simdSupported,
 threadsSupported] = await Promise.all([\n    env().getAsync('WASM_HAS_SIMD_SUPPORT'),\n
env().getAsync('WASM_HAS_MULTITHREAD_SUPPORT')\n  ]);\n\n  return new Promise((resolve, reject) =>
{\n    const factoryConfig: WasmFactoryConfig = {};\n\n    /**\n     * This function overrides the Emscripten
module locateFile utility.\n     * @param path The relative path to the file that needs to be loaded.\n     * @param
prefix The path to the main JavaScript file's directory.\n     */\n    factoryConfig.locateFile = (path, prefix) => {\n
if (path.endsWith('.worker.js')) {\n        const response = wasmWorkerContents;\n        const blob = new
Blob([response], {type: 'application/javascript'});\n        return URL.createObjectURL(blob);\n      }\n\n      if
(path.endsWith('.wasm')) {\n        return getPathToWasmBinary(\n            simdSupported as boolean,
threadsSupported as boolean,\n            wasmPathPrefix != null ? wasmPathPrefix : prefix);\n      }\n      return prefix
+ path;\n
    };\n\n    // Use the instantiateWasm override when system fetch is not available.\n    // Reference:\n    //
https://github.com/emscripten-
core/emscripten/blob/2bca083cbbd5a4133db61fbd74d04f7feecfa907/tests/manual_wasm_instantiate.html#L170\n
if (customFetch) {\n      factoryConfig.instantiateWasm =\n
createInstantiateWasmFunc(getPathToWasmBinary(\n              simdSupported as boolean, threadsSupported as
boolean,\n              wasmPathPrefix != null ? wasmPathPrefix : ''));\n    }\n\n    let initialized = false;\n
factoryConfig.onAbort = () => {\n      if (initialized) {\n        // Emscripten already called console.warn so no need to
double log.\n        return;\n      }\n      if (initAborted) {\n        // Emscripten calls `onAbort` twice, resulting in double
error\n        // messages.\n        return;\n      }\n      initAborted = true;\n      const rejectMsg =\n
'Make sure the server can serve the `.wasm` file relative to the ' +\n          'bundled
 js file. For more details see https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-
bundlers';\n      reject({message: rejectMsg});\n    };\n\n    let wasm: Promise<BackendWasmModule>;\n    // If
`wasmPath` has been defined we must initialize the vanilla module.\n    if (threadsSupported && simdSupported
&& wasmPath == null) {\n      factoryConfig.mainScriptUrlOrBlob = new Blob(\n          [`var
WasmBackendModuleThreadedSimd = ` +\n              wasmFactoryThreadedSimd.toString()],\n          {type:
'text/javascript'});\n      wasm = wasmFactoryThreadedSimd(factoryConfig);\n    } else {\n      // The wasmFactory
works for both vanilla and SIMD binaries.\n      wasm = wasmFactory(factoryConfig);\n    }\n\n    // The WASM
module has been successfully created by the factory.\n    // Any error will be caught by the onAbort callback defined
```

above.\n wasm.then((module) => {\n initialized = true;\n initAborted = false;\n\n const voidReturnType: string = null;\n // Using the tfjs namespace to avoid conflict with emscripten's API.\n module.tfjs = {\n init: module.cwrap('init', null, []),\n initWithThreadsCount:\n module.cwrap('init_with_threads_count', null, ['number']),\n getThreadsCount: module.cwrap('get_threads_count', 'number', []),\n registerTensor: module.cwrap(\n 'register_tensor', null,\n [\n 'number', // id\n 'number', // size\n 'number', // memoryOffset\n]),\n disposeData: module.cwrap('dispose_data', voidReturnType, ['number']),\n dispose: module.cwrap('dispose', voidReturnType, []),\n };\n\n resolve({wasm: module});\n });\n });\n}\n\nfunction typedArrayFromBuffer(\n buffer: ArrayBuffer, dtype: DataType): backend_util.TypedArray {\n switch (dtype) {\n case 'float32':\n return new Float32Array(buffer);\n case 'int32':\n return new Int32Array(buffer);\n case 'bool':\n return new Uint8Array(buffer);\n default:\n throw new Error(`Unknown dtype ${dtype}`);\n}\n}\n\nconst wasmBinaryNames = [\n 'tfjs-backend-wasm.wasm', 'tfjs-backend-wasm-simd.wasm',\n 'tfjs-backend-wasm-threaded-simd.wasm'\n] as const ;\ntype WasmBinaryName = typeof wasmBinaryNames[number];\n\nlet wasmPath: string = null;\nlet wasmPathPrefix: string = null;\nlet wasmFileMap: {[key in WasmBinaryName]?: string} = {};\nlet initAborted = false;\nlet customFetch = false;\n\n/**\n * @deprecated Use `setWasmPaths` instead.\n * Sets the path to the `.wasm` file which will be fetched when the wasm\n * backend is initialized. See\n * https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n * for more details.\n * @param path wasm file path or url\n * @param usePlatformFetch optional boolean to use platform fetch to download\n * the wasm file, default to false.\n *\n * @doc {heading: 'Environment', namespace: 'wasm'}\n */\nexport function setWasmPath(path: string, usePlatformFetch = false): void {\n deprecationWarn(\n 'setWasmPath has been deprecated in favor of setWasmPaths and' +\n ' will be removed in a future release.');\n if (initAborted) {\n throw new Error(\n 'The WASM backend was already initialized. Make sure you call ' +\n '`setWasmPath()` before you call `tf.setBackend()` or `tf.ready()`');\n }\n wasmPath = path;\n customFetch = usePlatformFetch;\n}\n\n/**\n * Configures the locations of the WASM binaries.\n *\n * ```js\n * setWasmPaths({\n * 'tfjs-backend-wasm.wasm': 'renamed.wasm',\n * 'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n * 'tfjs-backend-wasm-threaded-simd.wasm': 'renamed-threaded-simd.wasm'\n * });\n * tf.setBackend('wasm');\n * ```\n *\n * @param prefixOrFileMap This can be either a string or object:\n * - (string) The path to the directory where the WASM binaries are located.\n * Note that this prefix will be used to load each binary (vanilla,\n * SIMD-enabled, threading-enabled, etc.).\n * - (object) Mapping from names of WASM binaries to custom\n * full paths specifying the locations of those binaries. This is useful if\n * your WASM binaries are not all located in the same directory, or if your\n * WASM binaries have been renamed.\n * @param usePlatformFetch optional boolean to use platform fetch to download\n * the wasm file, default to false.\n *\n * @doc {heading: 'Environment', namespace: 'wasm'}\n */\nexport function setWasmPaths(\n prefixOrFileMap: string|{[key in WasmBinaryName]?: string},\n usePlatformFetch = false): void {\n if (initAborted) {\n throw new Error(\n 'The WASM backend was already initialized. Make sure you call ' +\n '`setWasmPaths()` before you call `tf.setBackend()` or ' +\n '`tf.ready()`');\n }\n\n if (typeof prefixOrFileMap === 'string') {\n wasmPathPrefix = prefixOrFileMap;\n } else {\n wasmFileMap = prefixOrFileMap;\n const missingPaths =\n wasmBinaryNames.filter(name => wasmFileMap[name] == null);\n if (missingPaths.length > 0) {\n throw new Error(\n `There were no entries found for the following binaries: ` +\n `${missingPaths.join(',')}. Please either call setWasmPaths with a ` +\n `map providing a path for each binary, or with a string indicating ` +\n `the directory where all the binaries can be found.`);\n }\n }\n\n customFetch = usePlatformFetch;\n}\n\n/** Used in unit tests. */\nexport function resetWasmPath(): void {\n wasmPath = null;\n wasmPathPrefix = null;\n wasmFileMap = {};\n customFetch = false;\n initAborted = false;\n}\n\nlet threadsCount = -1;\nlet actualThreadsCount = -1;\n\n/**\n * Sets the number of threads that will be used by XNNPACK to create\n * threadpool (default to the number of logical CPU cores).\n *\n * This must be called before calling `tf.setBackend('wasm')`.\n */\nexport function setThreadsCount(numThreads:

number) {\n threadsCount = numThreads;\n}\n\n/**\n * Gets the actual threads count that is used by XNNPACK.\n *\n * It is set after the backend is intialized.\n */\nexport function getThreadsCount(): number {\n if (actualThreadsCount === -1) {\n   throw new Error(`WASM backend not initialized.`);\n }\n return actualThreadsCount;\n}\n","/** @license See the LICENSE file. */\n\n// This code is auto-generated, do not modify this file!\nconst version = '3.11.0';\nexport {version};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND,
 either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport './flags_wasm';\n\nimport {registerBackend} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm, init} from './backend_wasm';\n\nexport {BackendWasm, getThreadsCount, setThreadsCount, setWasmPath, setWasmPaths} from './backend_wasm';\nexport {version as version_wasm} from './version';\n\nconst WASM_PRIORITY = 2;\nregisterBackend('wasm', async () => {\n const {wasm} = await init();\n return new BackendWasm(wasm);\n},
WASM_PRIORITY);\n"],"names":["_FusedMatMul","util","Abs","backend_util","Add","AddN","Identity","setup","Transpose","All","Any","wasmFunc","ArgMax","AvgPool","Reshape","BatchMatMul","slice_util","buffer","sliceImplCPU","Slice","BatchToSpaceND","Cast","Ceil","ClipByValue","concatImplCPU","Concat","Conv2D","Conv2DBackpropInput","Cos","Cosh","CropAndResize","Cumsum","DepthToSpace","DepthwiseConv2dNative","Elu","supportsFullBroadcast","Equal","Exp","ExpandDims","Fill","FlipLeftRight","Floor","FloorDiv","FusedBatchNorm","FusedConv2D","FusedDepthwiseConv2D","GatherNd","gather_util","GatherV2","Greater","GreaterEqual","setupFunc","LeakyRelu","Less","LessEqual","Log","LogicalAnd","Max","Maximum","MaxPool","Mean","Min","Minimum","MirrorPad","Multiply","Neg","NonMaxSuppressionV3","NonMaxSuppressionV4","NonMaxSuppressionV5","kernelFunc","NotEqual","OneHot","OnesLike","Pack","PadV2","Pow","Prelu","Prod","rangeImplCPU","Range","RealDiv","Relu","Relu6","ResizeBilinear","Reverse","RotateWithOffset","Round","Rsqrt","ScatterNd","scatter_util","Select","Sigmoid","Sin","Softmax","SpaceToBatchND","SplitV","Sqrt","Square","SquaredDifference","Step","StridedSlice","Sub","Sum","Tan","Tanh","Tile","TopK","Transform","Unpack","ZerosLike","registerKernel","env","require$$0","require$$1","require$$2","global","require$$3","require$$4","KernelBackend","DataStorage","engine","wasmFactoryThreadedSimd","wasmFactory","deprecationWarn","registerBackend"],"mappings":";;;;

,GAAG,OAAO,CAAC,SAAS,CAAC,GAAG,CAAC,IAAI,CAAC,MAAM,CAAC,CAAC;UACpD,IAAI,QAAQ,C
AAC,KAAK,CAAC,MAAM,KAAK,CAAC,EAAE;cAC/B,MAAM,IAAI,KAAK,CACX,iDAAiD;kBACjD,QAAQ
,QAAQ,CAAC,KAAK,CAAC,MAAM,GAAG,CAAC,CAAC;WACvC;UACD,MAAM,GAAG,QAAQ,CAAC,EA
AE,CAAC;OACtB;MACD,MAAM,wBAAwB,GAAG,sBAAsB,IAAI,IAAI;UAC3D,CAAC;UACD,OAAO,CAAC,
SAAS,CAAC,GAAG,CAAC,sBAAsB,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;MAC5D,MAAM,eAAe,GACj
B,iBAAiB,CAAC,UAAkD,CAAC,CAAC;MAC1E,IAAI,eAAe,IAAI,IAAI,EAAE;UAC3B,MAAM,IAAI,KAAK,C
ACX,GAAG,UAAU,gDAAgD;cAC7D,sBAAsB,CAAC,CAAC;OAC7B;MAED,MAAM,OAAO,GAAG,UAAU,G
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CrD,MAAM,QAAQ,GAAG,UAAU,GAAG,CAAC,CAAC,KAAK,CAAC,CAAC,CAAC,GAAG,CAAC,CAAC,K
AAK,CAAC,CAAC,CAAC,CAAC;MACtD,MAAM,QAAQ,GAAG,CAAC,CAAC,KAAK,CAAC,CAAC,CAAC,CAAC,C
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GAAG,CAAC,GAAG,CAAC,MAAM,CAAC,CAAC,EAAE,CAAC;MAEnD,MAAM,WAAW,GAAG,IAAI,UAA
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AW,GAAG,IAAI,UAAU,CAAC,IAAI,UAAU,CAAC,CAAC,CAAC,KAAK,CAAC,CAAC,MAAM,CAAC,CAAC
;MAEnE,eAAe,CACX,GAAG,EAAE,WAAW,EAAE,CAAC,CAAC,KAAK,CAAC,MAAM,EAAE,GAAG,EAAE,
WAAW,EAAE,CAAC,CAAC,KAAK,CAAC,MAAM,EAClE,UAAU,EAAE,UAAU,EAAE,eAAe,EAAE,MAAM,
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CAAC;EAEM,MAAM,iBAAiB,GAAiB;MAC7C,UAAU,EAAEA,qBAAY;MACxB,WAAW,EAAE,MAAM;MAC
nB,SAAS,EAAE,KAAK;MAChB,UAAU,EAAE,gBAAoC;GACjD;;EC7GD;;;;;;;;;;;;;;;WAuBgB,uBAAuB,CACn
C,UAAkB,EAAE,OAAkB;MACxC,IAAI,QAA6D,CAAC;MAElE,SAAS,SAAS,CAAC,UAAU,CAAC,MAAM,CAAC,
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AI,WAAW,EAAE;;8EAEf,OAAO;2EACR;0EACD,IAAI,WAAW,EAAE;;;8EAGf,OAAO;2EACR;0EACD,WAAW,GAAG,IAAI,CAAC;0EACnB,MAAM,SAAS,GACX,kEAAkE;8EAClE,iIAAiI,CAAC;0EACtI,MAAM,CAAC,EAAC,OAAO,EAAE,SAAS,EAAC,CAAC,CAAC;uEAC9B,CAAC;sEAEF,IAAI,IAAI,gC,CAAC;;sEAErC,IAAI,gBAAgB,IAAI,aAAa,IAAI,QAAQ,IAAI,IAAI,EAAE;0EACzD,aAAa,CAAC,mBAAmB,GAAG,IAAI,CAAC,sCAAsC;8EACtCU,2BAAuB,CAAC,QAAQ,EAAE,CAAC,CAAC,EACpC,EAAC,IAAI,EAAE,iBAAiB,EAAC,CAAC,CAAC,CAAC;0EAC/B,IAAI,GAAG,GAAG,EAAE,CAAC,CAAC,CAAC,CAAC;uEACnB,CAAC;sEAEF,IAAI,GAAG,GAAG,EAAE,CAAC,CAAC,CAAC,CAAC;uEACnB,CAAC;;;sEAID,IAAI,CAAC,IAAI,CAAC,CAAC,CAAC,CAAC;0EACX,IAAI,WAAW,EAAE;0EACf,aAAa,CAAC,OAAO,GAAG;8EACtB,IAAI,WAAW,EAAE;;kFAEf,OAAO;+EACR;8EACD,IAAI,WAAW,EAAE;;;kFAGf,OAAO;+EACR;8EACD,WAAW,GAAG,IAAI,CAAC;8EACnB,MAAM,SAAS,GACX,kEAAkE;kFAClE,iIAAiI,CAAC;8EACtI,MAAM,CAAC,EAAC,OAAO,EAAE,SAAS,EAAC,CAAC,CAAC;2EAC9B,CAAC;0EAEF,IAAI,IAAI,gC,CAAC;;0EAErC,IAAI,gBAAgB,IAAI,aAAa,IAAI,QAAQ,IAAI,IAAI,EAAE;8EACzD,aAAa,CAAC,mBAAmB,GAAG,IAAI,CAAC,sCAAsC;kFACtCU,2BAAuB,CAAC,QAAQ,EAAE,CAAC,CAAC,EACpC,EAAC,IAAI,EAAE,iBAAiB,EAAC,CAAC,CAAC,CAAC;8EAC/B,IAAI,GAAG,GAAG,EAAE,CAAC,CAAC,CAAC,CAAC;2EACnB,CAAC;0EAEF,IAAI,GAAG,GAAG,EAAE,CAAC,CAAC,CAAC,CAAC;2EACnB,CAAC;;;0EAID,IAAI,CAAC,IAAI,CAAC,CAAC,CAAC,CAAC;8EACX,IAAI,WAAW,EAAE;8EACf,aAAa,CAAC,OAAO,GAAG;kFACtB,IAAI,WAAW,EAAE;;sFAEf,OAAO;mFACR;kFACD,IAAI,WAAW,EAAE;;;sFAGf,OAAO;mFACR;kFACD,WAAW,GAAG,IAAI,CAAC;kFACnB,MAAM,SAAS,GACX,kEAAkE;sFAClE,iIAAiI,CAAC;kFACtI,MAAM,CAAC,EAAC,OAAO,EAAE,SAAS,EAAC,CAAC,CAAC;+EAC9B,CAAC;8EAEF,IAAI,IAAI,gC,CAAC;;8EAErC,IAAI,gBAAgB,IAAI,aAAa,IAAI,QAAQ,IAAI,IAAI,EAAE;kFACzD,aAAa,CAAC,mBAAmB,GAAG,IAAI,CAAC,sCAAsC;sFACtCU,2BAAuB,CAAC,QAAQ,EAAE,CAAC,CAAC,EACpC,EAAC,IAAI,EAAE,iBAAiB,EAAC,CAAC,CAAC,CAAC;kFAC/B,IAAI,GAAG,GAAG,EAAE,CAAC,CAAC,CAAC,CAAC;+EACnB,CAAC;8EAEF,IAAI,GAAG,GAAG,EAAE,CAAC,CAAC,CAAC,CAAC;+EACnB,CAAC;;;8EAID,IAAI,CAAC,IAAI,CAAC,CAAC,CAAC,CAAC;kFACX,IAAI,WAAW,EAAE;kFACf,aAAa,CAAC,OAAO,GAAG;sFACtB,IAAI,WAAW,EAAE;;0FAEf,OAAO;uFACR;sFACD,IAAI,WAAW,EAAE;;;0FAGf,OAAO;uFACR;sFACD,WAAW,GAAG,IAAI,CAAC;sFACnB,MAAM,SAAS,GACX,kEAAkE;0FAClE,iIAAiI,CAAC;sFACtI,MAAM,CAAC,EAAC,OAAO,EAAE,SAAS,EAAC,CAAC,CAAC;mFAC9B,CAAC;kFAEF,IAAI,IAAI,gC,CAAC;;kFAErC,IAAI,gBAAgB,IAAI,aAAa,IAAI,QAAQ,IAAI,IAAI,EAAE;sFACzD,aAAa,CAAC,mBAAmB,GAAG,IAAI,CAAC,sCAAsC;0FACtCU,2BAAuB,CAAC,QAAQ,EAAE,CAAC,CAAC,EACpC,EAAC,IAAI,EAAE,iBAAiB,EAAC,CAAC,CAAC,CAAC;sFAC/B,IAAI,GAAG,GAAG,EAAE,CAAC,CAAC,CAAC,CAAC;mFACnB,CAAC;kFAEF,IAAI,GAAG,GAAG,EAAE,CAAC,CAAC,CAAC,CAAC;mFACnB,CAAC;;;kFAID,IAAI,CAAC,IAAI,CAAC,CAAC,CAAC,CAAC;sFACX,IAAI,WAAW,EAAE;sFACf,aAAa,CAAC,OAAO,GAAG;0FACtB,IAAI,WAAW,EAAE;;8FAEf,OAAO;2FACR;0FACD,IAAI,WAAW,EAAE;;;8FAGf,OAAO;2FACR;0FACD,WAAW,GAAG,IAAI,CAAC;0FACnB,MAAM,SAAS,GACX,kEAAkE;8FAClE,iIAAiI,CAAC;0FACtI,MAAM,CAAC,EAAC,OAAO,EAAE,SAAS,EAAC,CAAC,CAAC;uFAC9B,CAAC;sFAEF,IAAI,IAAI,gC,CAAC;;sFAErC,IAAI,gBAAgB,IAAI,aAAa,IAAI,QAAQ,IAAI,IAAI,EAAE;0FACzD,aAAa,CAAC,mBAAmB,GAAG,IAAI,CAAC,sCAAsC;8FACtCU,2BAAuB,CAAC,QAAQ,EAAE,CAAC,CAAC,EACpC,EAAC,IAAI,EAAE,iBAAiB,EAAC,CAAC,CAAC,CAAC;0FAC/B,IAAI,GAAG,GAAG,EAAE,CAAC,CAAC,CAAC,CAAC;uFACnB,CAAC;sFAEF,IAAI,GAAG,GAAG,EAAE,CAAC,CAAC,CAAC,CAAC;uFACnB,CAAC;;;sFAID,IAAI,CAAC,IAAI,CAAC,CAAC,CAAC,CAAC;0FACX,IAAI,WAAW,EAAE;0FACf,aAAa,CAAC,OAAO,GAAG;8FACtB,IAAI,WAAW,EAAE;;kGAEf,OAAO;+FACR;8FACD,IAAI,WAAW,EAAE;;;kGAGf,OAAO;+FACR;8FACD,WAAW,GAAG,IAAI,CAAC;8FACnB,MAAM,SAAS,GACX,kEAAkE;kGAClE,iIAAiI,CAAC;8FACtI,MAAM,CAAC,EAAC,OAAO,EAAE,SAAS,EAAC,CAAC,CAAC;2FAC9B,CAAC;0FAEF,IAAI,IAAI,gC,CAAC;;0FAErC,IAAI,gBAAgB,IAAI,aAAa,IAAI,QAAQ,IAAI,IAAI,EAAE;8FACzD,aAAa,CAAC,mBAAmB,GAAG,IAAI,CAAC,sCAAsC;kGACtCU,2BAAuB,CAAC,QAAQ,EAAE,CAAC,CAAC,EACpC,EAAC,IAAI,EAAE,iBAAiB,EAAC,CAAC,CAAC,CAAC;8FAC/B,IAAI,GAAG,GAAG,EAAE,CAAC,CAAC,CAAC,CAAC;2FACnB,CAAC;0FAEF,IAAI,GAAG,GAAG,EAAE,CAAC,CAAC,CAAC,CAAC;2FACnB,CAAC;;;0FAID,IAAI,CAAC,IAAI,CAAC,CAAC,CAAC,CAAC;8FACX,IAAI,WAAW,EAAE;8FACf,aAAa,CAAC,OAAO,GAAG;kGACtB,IAAI,WAAW,EAAE;;sGAEf,OAAO;mGACR;kGACD,IAAI,WAAW,EAAE;;;sGAGf,OAAO;mGACR;kGACD,WAAW,GAAG,IAAI,CAAC;kGACnB,MAAM,SAAS,GACX,kEAAkE;sGAClE,iIAAiI,CAAC;kGACtI,MAAM,CAAC,EAAC,OAAO,EAAE,SAAS,EAAC,CAAC,CAAC;+FAC9B,CAAC;8FAEF,IAAI,IAAI,gC,CAAC;;8FAErC,IAAI,gBAAgB,IAAI,aAAa,IAAI,QAAQ,IAAI,IAAI,EAAE;kGACzD,aAAa,CAAC,mBAAmB,GAAG,IAAI,CAAC,sCAAsC;sGACtCU,2BAAuB,CAAC,QAAQ,EAAE,CAAC,CAAC,EACpC,EAAC,IAAI,EAAE,iBAAiB,EAAC,CAAC,CAAC,CAAC;kGAC/B,IAAI,GAAG,GAAG,EAAE,CAAC,CAAC,CAAC,CAAC;+FACnB,CAAC;8FAEF,IAAI,GAAG,GAAG,EAAE,CAAC,CAAC,CAAC,CAAC;+FACnB,CAAC;;;8FAID,IAAI,CAAC,IAAI,CAAC,CAAC,CAAC,CAAC;kGACX,IAAI,WAAW,EAAE;kGACf,aAAa,CAAC,OAAO,GAAG;sGACtB,IAAI,WAAW,EAAE;;0GAEf,OAAO;uGACR;sGACD,IAAI,WAAW,EAAE;;;0GAGf,OAAO;uGACR;sGACD,WAAW,GAAG,IAAI,CAAC;sGACnB,MAAM,SAAS,GACX,kEAAkE;0GAClE,iIAAiI,CAAC;sGACtI,MAAM,CAAC,EAAC,OAAO,EAAE,SAAS,EAAC,CAAC,CAAC;mGAC9B,CAAC;kGAEF,IAAI,IAAI,gC,CAAC;;kGAErC,IAAI,gBAAgB,IAAI,aAAa,IAAI,QAAQ,IAAI,IAAI,EAAE;sGACzD,aAAa,CAAC,mBAAmB,GAAG,IAAI,CAAC,sCAAsC;0GACtCU,2BAAuB,CAAC,QAAQ,EAAE,CAAC,CAAC,EACpC,EAAC,IAAI,EAAE,iBAAiB,EAAC,CAAC,CAAC,CAAC;sGAC/B,IAAI,GAAG,GAAG,EAAE,CAAC,CAAC,CAAC,CAAC;mGACnB,CAAC;kGAEF,IAAI,GAAG,GAAG,EAAE,CAAC,CAAC,CAAC,CAAC;mGACnB,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in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/tf-backend-wasm.es2017.js.map
No license file was found, but licenses were detected in source scan.

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EAAC,MAAM,WAAW,CAAC;AAElD,MAAM,aAAa,GAAG,CAAC,CAAC;AACxB,eAAe,CAAC,MAAM,EAAE,KAAK,IAAI,EAAE;IACjC,MAAM,EAAC,IAAI,EAAC,GAAG,MAAM,IAAI,EAAE,CAAC;IAC5B,OAAO,IAAI,WAAW,CAAC,IAAI,CAAC,CAAC;AAC/B,CAAC,EAAE,aAAa,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law
or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport './flags_wasm';\n\nimport {registerBackend} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm, init} from './backend_wasm';\n\nexport {BackendWasm, getThreadsCount, setThreadsCount, setWasmPath, setWasmPaths} from './backend_wasm';\nexport {version as version_wasm} from './version';\n\nconst WASM_PRIORITY = 2;\nregisterBackend('wasm', async () => {\n const {wasm} = await init();\n return new BackendWasm(wasm);\n}, WASM_PRIORITY);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/base.js.map
No license file was found, but licenses were detected in source scan.

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Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/PadV2.js.map
No license file was found, but licenses were detected in source scan.

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../src/kernels/FloorDiv.ts","../src/kernels/FusedBatchNorm.ts","../src/kernels/FusedConv2D.ts","../src/kernels/FusedDepthwiseConv2D.ts","../src/kernels/GatherNd.ts","../src/kernels/GatherV2.ts","../src/kernels/Greater.ts","../src/kernels/GreaterEqual.ts","../src/kernels/LeakyRelu.ts","../src/kernels/Less.ts","../src/kernels/LessEqual.ts","../src/kernels/Log.ts","../src/kernels/LogicalAnd.ts","../src/kernels/Max.ts","../src/kernels/Maximum.ts","../src/kernels/MaxPool.ts","../src/kernels/Mean.ts","../src/kernels/Min.ts","../src/kernels/Minimum.ts","../src/kernels/MirrorPad.ts","../src/kernels/Multiply.ts","../src/kernels/Neg.ts","../src/kernels/NonMaxSuppression_util.ts","../src/kernels/NonMaxSuppressionV3.ts","../src/kernels/NonMaxSuppressionV4.ts","../src/kernels/NonMaxSuppressionV5.ts","../src/kernels/NotEqual.ts","../src/kernels/OneHot.ts","../src/kernels/OnesLike.ts","../src/kernels/Pack.ts","../src/kernels/PadV2.ts","../src/kernels/Pow.ts","../src/kernels/Prelu.ts","../src/kernels/Prod.ts","../src/kernels/Range.ts","../node_modules/@tensorflow/tfjs-backend-cpu/dist/kernels/Range_impl.js","../src/kernels/RealDiv.ts","../src/kernels/Relu.ts","../src/kernels/Relu6.ts","../src/kernels/ResizeBilinear.ts","../src/kernels/Reverse.ts","../src/kernels/RotateWithOffset.ts","../src/kernels/Round.ts","../src/kernels/Rsqrt.ts","../src/kernels/ScatterNd.ts","../src/kernels/Select.ts","../src/kernels/Sigmoid.ts","../src/kernels/Sin.ts","../src/kernels/Softmax.ts","../src/kernels/SpaceToBatchND.ts","../src/kernels/SplitV.ts","../src/kernels/Sqrt.ts","../src/kernels/Square.ts","../src/kernels/SquaredDifference.ts","../src/kernels/Step.ts","../src/kernels/StridedSlice.ts","../src/kernels/Sub.ts","../src/kernels/Sum.ts","../src/kernels/Tan.ts","../src/kernels/Tanh.ts","../src/kernels/Tile.ts","../src/kernels/TopK.ts","../src/kernels/Transform.ts","../src/kernels/ZerosLike.ts","../src/register_all_kernels.ts","../src/kernels/Unpack.ts","../src/flags_wasm.ts","../wasm-out/tfjs-backend-wasm-threaded-simd.js","../wasm-out/tfjs-backend-wasm.js","../src/backend_wasm.ts","../wasm-out/tfjs-backend-wasm-threaded-simd.worker.js","../src/version.ts","../src/base.ts"],"sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==*/\n\n// This enum must align with the enum defined in cc/backend.h.\nexport enum CppDType {\n float32 = 0,\n int32 = 1,\n bool = 2,\n string = 3,\n complex64 = 4\n}\n\n// Must match enum in cc/fusable_activations.h.\nexport enum FusableActivation {\n linear = 0,\n relu = 1,\n relu6 = 2,\n prelu = 3,\n leakyrelu = 4,\n sigmoid = 5,\n elu = 6\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==*/\n\nimport {_FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet wasmFusedMatMul:\n   (aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n   bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n   transposeB: boolean, activation: number, biasId: number,\n   preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n   void;\n\nfunction setup(backend: BackendWasm) {\n wasmFusedMatMul = backend.wasm.cwrap(_FusedMatMul, null /* void */, [\n   'number', // a_id\n   'array',   // a_shape\n   'number', // a_shape.length\n   'number', // b_id\n   'array',   // b_shape\n   'number', // b_shape.length\n   'number', // transpose_a\n   'number', // transpose_b\n   'number', //

activation\n 'number', // biasId\n 'number', // preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number' // out_id\n]);\n}\n\nfunction fusedBatchMatMul(args: {\n inputs: _FusedMatMulInputs,\n backend: BackendWasm,\n attrs: _FusedMatMulAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {a, b, bias, preluActivationWeights} = inputs;\n\n if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n throw new Error(\n `_FusedMatMul for non non-float32 tensors not yet supported.`);\n }\n\n const {transposeA, transposeB, activation, leakyreluAlpha} = attrs;\n const aId = backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n\n let biasId = 0;\n if (bias != null)
{\n const biasData = backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n throw new Error(\n `_FusedMatMul only supports rank-1 bias but got ` +\n `rank ${biasData.shape.length}.`);\n }\n biasId = biasData.id;\n }\n const preluActivationWeightsId = preluActivationWeights == null ?\n 0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n const fusedActivation =\n FusableActivation[activation as {} as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n throw new Error(\n `${activation} activation not yet supported for FusedConv2D ` +\n `in the wasm backend.`);\n }\n\n const leftDim = transposeA ? a.shape[2] : a.shape[1];\n const rightDim = transposeB ? b.shape[1] : b.shape[2];\n const batchDim = a.shape[0];\n\n const out = backend.makeOutput([batchDim, leftDim, rightDim], a.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n\n wasmFusedMatMul(\n aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n transposeA, transposeB, fusedActivation, biasId, preluActivationWeightsId,\n leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedMatMulConfig: KernelConfig = {\n kernelName: _FusedMatMul,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchMatMul as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {DataType, KernelConfig, TensorInfo, UnaryInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nexport function createUnaryKernelConfig(\n kernelName: string, outType?: DataType): KernelConfig {\n let wasmFunc: (xId: number, dtype: number, outId: number) => void;\n\n function setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n 'number', // x_id\n 'number', // dtype\n 'number', // out_id\n]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: UnaryInputs}):\n TensorInfo {\n const {backend, inputs: {x}} = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n
const out = backend.makeOutput(x.shape, outType || x.dtype);\n const outId =
backend.dataIdMap.get(out.dataId).id;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n wasmFunc(xId, CppDType[x.dtype], outId);\n return out;\n }\n\n return {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions
and\n * limitations under the License.\n *
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*/\nimport {Abs, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {backend_util, BinaryInputs, DataType, KernelConfig, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nexport function createBinaryKernelConfig(\n kernelName: string, supportsFullBroadcast: boolean,\n dtype?: DataType): KernelConfig {\n let wasmFunc:\n (aId: number, aShape: Uint8Array, aShapeLen: number, bId: number,\n bShape: Uint8Array, bShapeLen: number, dtype: number, outId: number) =>\n void;\n\n function setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n 'number', // a_id,\n 'array', // a_shape\n 'number', // a_shape.length\n 'number', // b_id\n 'array', // b_shape\n 'number', // b_shape.length\n 'number', // dtype\n 'number' // out_id\n]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: BinaryInputs}):\n TensorInfo {\n const {backend, inputs} = args;\n const {a, b} = inputs;\n const aId = backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n\n const outputType = dtype != null ? dtype : a.dtype;\n const newShape = backend_util.assertAndGetBroadcastShape(a.shape, b.shape);\n const out = backend.makeOutput(newShape, outputType);\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(newShape) === 0) {\n return out;\n }\n\n const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n const kernelFunc = () => wasmFunc(\n aId, aShapeBytes, a.shape.length, bId, bShapeBytes, b.shape.length,\n CppDType[a.dtype], outId);\n\n // Currently only some float operations support full broadcast.\n if (supportsFullBroadcast && a.dtype === 'float32') {\n kernelFunc();\n return out;\n }\n\n const aBroadcastDims = backend_util.getBroadcastDims(a.shape, newShape);\n const bBroadcastDims = backend_util.getBroadcastDims(b.shape, newShape);\n const loopsOverAllOfA = aBroadcastDims.every((v, i) => v === i);\n const loopsOverAllOfB = bBroadcastDims.every((v, i) => v === i);\n if (loopsOverAllOfA && loopsOverAllOfB) {\n kernelFunc();\n return out;\n } else {\n throw new Error(\n `Broadcasting along outer dims is not yet ` +\n `supported for ${a.dtype} ${kernelName}.`);\n }\n }\n\n return {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {Add, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const addConfig: KernelConfig =\n createBinaryKernelConfig(Add, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by

applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {AddN, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmFunc:\n (inputIds: Uint8Array, inputIdsLen: number, dtype: number, outId: number) =>\n void;\n\nfunction setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(AddN, null /* void */, [\n 'array', // input_ids\n 'number', // input_ids.length\n 'number', // dtype\n 'number', // out_id\n]);\n}\n\nfunction addn(args: {inputs: TensorInfo[], backend: BackendWasm}) {\n const
{inputs, backend} = args;\n const out = backend.makeOutput(inputs[0].shape, inputs[0].dtype);\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n return out;\n }\n\n const inputIds = inputs.map(x => backend.dataIdMap.get(x.dataId).id);\n const inputIdsBytes = new Uint8Array(new Int32Array(inputIds).buffer);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(inputIdsBytes, inputIds.length, CppDType[out.dtype], outId);\n\n return out;\n}\n\nexport const addNConfig: KernelConfig = {\n kernelName: AddN,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: addn as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law
or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function identity(args: {inputs: IdentityInputs, backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const inVals = backend.typedArrayFromHeap(x);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const identityConfig: KernelConfig = {\n kernelName: Identity,\n backendName: 'wasm',\n
kernelFunc: identity as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {identity} from './Identity';\nimport {CppDType}
from './types';\n\nlet wasmTranspose: (\n xId: number, xShape: Uint8Array, xShapeLength: number, dtype: CppDType,\n outId: number, perm: Uint8Array, permLength: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTranspose = backend.wasm.cwrap(Transpose, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // dtype\n 'number', // outId\n 'array', // perm\n 'number', // perm.length\n]);\n}\n\nexport function transpose(\n args:\n {inputs: TransposeInputs, backend: BackendWasm, attrs: TransposeAttrs}):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n // Reduce any dimensions with size one. Lower-rank transpose kernel performs\n // better due to simpler memory access pattern.\n

const [reducedShape, perm] = removeOneSizeDims(inputs.x.shape, attrs.perm);\n\n let permIsNoOp = true;\n for (let i = 0; i < perm.length; i++) {\n   if (perm[i] !== i) {\n   permIsNoOp
 = false;\n   }\n }\n const outShape = computeOutShape(inputs.x.shape, attrs.perm);\n const x = {\n   dataId: inputs.x.dataId,\n   shape: reducedShape,\n   dtype: inputs.x.dtype\n };\n\n if (permIsNoOp) {\n   const cloned = identity({inputs, backend});\n   cloned.shape = outShape;\n   return cloned;\n }\n\n const out = backend.makeOutput(outShape, x.dtype);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n const permBytes = new Uint8Array(new Int32Array(perm).buffer);\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n wasmTranspose(\n   xId, xShapeBytes, x.shape.length, CppDType[x.dtype], outId, permBytes,\n   perm.length);\n return out;\n}\n\nfunction computeOutShape(inShape: number[], perm: number[]): number[] {\n const outShape = new Array(inShape.length);\n for (let i = 0; i < outShape.length; i++) {\n   outShape[i] = inShape[perm[i]];\n }\n return outShape;\n}\n\nfunction
 removeOneSizeDims(\n   shape: number[], perm: number[]): [number[], number[]] {\n const newShape: number[] = [];\n const newPerm: number[] = [];\n for (let i = 0; i < shape.length; ++i) {\n   if (shape[i] !== 1) {\n   newShape.push(shape[i]);\n   }\n   if (shape[perm[i]] !== 1) {\n   newPerm.push(perm[i]);\n   }\n }\n for (let i = 0; i < newPerm.length; ++i) {\n   let minValIdx = -1;\n   for (let j = 0; j < newPerm.length; ++j) {\n   if (newPerm[j] >= i &&\n   (minValIdx === -1 || newPerm[minValIdx] > newPerm[j])) {\n   minValIdx = j;\n   }\n   }\n   newPerm[minValIdx] = i;\n }\n return [newShape, newPerm];\n}\n\nexport const transposeConfig: KernelConfig = {\n kernelName: Transpose,\n backendName: 'wasm',\n kernelFunc: transpose as {} as KernelFunc,\n setupFunc: setup,\n};\n","/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use
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==\n */\n\nimport {backend_util, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\nimport {transpose} from './Transpose';\n\n/**\n * Compute permutation axes and do a transpose if necessary.\n *\n * Used by reduction ops.\n * @param x input TensorInfo\n * @param axis reduction axes\n * @param backend wasm backend instance\n */\nexport function permuteAxesAndTranspose(\n   x: TensorInfo, axis: number|number[],
 backend: BackendWasm): {\n transposed: TensorInfo|null,\n axes: number[],\n originalAxes: number[],\n inputWasTransposed: boolean\n} {\n const xShape = x.shape;\n const xRank = x.shape.length;\n\n const originalAxes = util.parseAxisParam(axis, xShape);\n let axes = originalAxes;\n const permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n let xTransposed = null;\n let inputWasTransposed = false;\n if (permutedAxes != null) {\n   const newShape: number[] = new Array(xRank);\n   for (let i = 0; i < newShape.length; i++) {\n   newShape[i] = xShape[permutedAxes[i]];\n   }\n\n   axes = backend_util.getInnerMostAxes(axes.length, xRank);\n   xTransposed =\n   transpose({inputs: {x}, attrs: {perm: permutedAxes}, backend});\n\n   const xId = backend.dataIdMap.get(x.dataId).id;\n   const transposedId = backend.dataIdMap.get(xTransposed.dataId).id;\n   if (transposedId !== xId) {\n   inputWasTransposed = true;\n   }\n }\n\n return {transposed:
 xTransposed, originalAxes, axes, inputWasTransposed};\n}\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language

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==========\n
*/\n\nimport {All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport
{permuteAxesAndTranspose} from
'./kernel_utils';\n\nlet wasmAll: (xId: number, reduceSize: number, outId: number) => void;\n\nfunction
setup(backend: BackendWasm): void {\n wasmAll = backend.wasm.cwrap(All, null /*void*/, ['number, number,
number']);\n}\n\nfunction all(args: {backend: BackendWasm, inputs: AllInputs, attrs: AllAttrs}):\n TensorInfo {\n
const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId =
backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes,
inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n
const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n input = transposed;\n inputId =
transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('all',
axes, inputRank);\n const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape,
axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape,
x.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmAll(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n
backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return
out;\n}\n\nexport const allConfig: KernelConfig = {\n kernelName: All,\n backendName: 'wasm',\n setupFunc:
setup,\n kernelFunc: all as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights
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distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either
express or implied.\n * See the License for the specific language governing permissions and\n * limitations under
the License.\n *
==========\n
*/\n\nimport {Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from
'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport
{permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmAny: (xId: number, reduceSize: number, outId:
number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmAny = backend.wasm.cwrap(Any,
null /*void*/, ['number, number, number']);\n}\n\nfunction any(args: {backend: BackendWasm, inputs: AnyInputs,
attrs: AnyAttrs}):\n TensorInfo {\n const {backend,
inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId =
backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes,
inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n
const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n input = transposed;\n inputId =
transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('any',
axes, inputRank);\n const [outShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize =
util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if
(util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n
wasmAny(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n
backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape =
backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return

out;\n}\n\nexport const anyConfig: KernelConfig = {\n kernelName: Any,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: any as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the
 License.\n *
==========\n */\n\nimport {ArgMax, ArgMaxAttrs, ArgMaxInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmFunc: (\n   xId: number, dtype: number, outerSize: number, innerSize: number,\n   outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmFunc = backend.wasm.cwrap(ArgMax, null /* void */, [\n   'number', // x_id\n   'number', // dtype\n   'number', // outer_size\n   'number', // inner_size\n   'number'   // out_id\n]);\n}\n\nfunction argmax(\n   args: {inputs: ArgMaxInputs, backend: BackendWasm, attrs: ArgMaxAttrs}) {\n const {backend, inputs, attrs} = args;\n const {axis} = attrs as {} as ArgMaxAttrs;\n const {x} = inputs as {} as ArgMaxInputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let
 inputId = xId;\n let input = x;\n\n const {transposed, axes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n   const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   if (transposedId !== xId) {\n   // transpose was not a no-op. We will need to dispose of this\n   // once we are done.\n   input = transposed;\n   inputId = transposedId;\n   }\n }\n\n const outShape = input.shape.slice(0, -1);\n const out = backend.makeOutput(outShape, 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const outerSize = util.sizeFromShape(out.shape);\n const innerSize = input.shape[axes[0]];\n wasmFunc(inputId, CppDType[input.dtype], outerSize, innerSize, outId);\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n return out;\n}\n\nexport const argMaxConfig: KernelConfig = {\n kernelName: ArgMax,\n backendName: 'wasm',\n
  kernelFunc: argmax as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmAvgPool: (\n xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n   filterHeight: number, filterWidth: number, padTop: number, padRight: number,\n   padBottom: number, padLeft: number, strideHeight: number,\n   strideWidth: number, channels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmAvgPool = backend.wasm.cwrap(AvgPool, null /* void */, [\n   'number', // xId\n   'number', // batchSize\n   'number', // inputHeight\n   'number', // inputWidth\n   'number', // filterHeight\n   'number', // filterWidth\n   'number', // padTop\n   'number', // padRight\n   'number', // padBottom\n   'number', // padLeft\n   'number', // strideHeight\n   'number', // strideWidth\n   'number', // channels\n   'number', // outId\n]);\n}\n\nfunction avgPool(\n   args: {inputs: AvgPoolInputs, backend: BackendWasm, attrs: AvgPoolAttrs}) {\n const {inputs, attrs, backend} = args;\n\n const x = inputs.x as Tensor4D;\n const xId =

backend.dataIdMap.get(x.dataId).id;\n\n const {filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n   x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const channels = convInfo.inChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n   throw new Error(\n   `wasm backend does not support dataFormat:'` +\n   `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n if (convInfo.dilationWidth !== 1 || convInfo.dilationHeight !== 1) {\n   throw new Error(\n   `was backend only supports average pooling with dilation = [1, 1],
  ` +\n        `got [${convInfo.dilationHeight}, ${convInfo.dilationWidth}].`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmAvgPool(\n   xId, x.shape[0], x.shape[1], x.shape[2], filterHeight, filterWidth,\n   padTop, padRight, padBottom, padLeft, strideHeight, strideWidth, channels,\n   outId);\n return out;\n}\n\nexport const avgPoolConfig: KernelConfig = {\n kernelName: AvgPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: avgPool as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
  on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function reshape(\n   args: {inputs: ReshapeInputs, attrs: ReshapeAttrs, backend: BackendWasm}) {\n const {inputs, attrs} = args;\n const {x} = inputs;\n const {shape} = attrs;\n\n const xSize = util.sizeFromShape(x.shape);\n const $shape = util.inferFromImplicitShape(shape, xSize);\n\n util.assert(\n   xSize === util.sizeFromShape($shape),\n   () => `new shape: ${$shape}, old shape: ${x.shape}. New shape and old ` +\n   `shape must have the same number of elements.`);\n\n // Backend needs to track refCount
  for the dataId for reshape op\n args.backend.incRef(x.dataId);\n return {dataId: x.dataId, shape: $shape, dtype: x.dtype};\n}\n\nexport const reshapeConfig: KernelConfig = {\n kernelName: Reshape,\n backendName: 'wasm',\n kernelFunc: reshape as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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/\n\nimport {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from './Reshape';\n\nlet wasmBatchMatMul: (\n   aId: number, aShape: Uint8Array, aShapeSize: number, bId: number,\n   bShape: Uint8Array, bShapeSize: number, transposeA: boolean,\n   transposeB: boolean, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmBatchMatMul = backend.wasm.cwrap(BatchMatMul, null / void */, [\n   'number', // a_id\n   'array',   // a_shape\n   'number', // a_shape.length\n   'number', // b_id\n   'array',   // b_shape\n   'number', // b_shape.length\n   'number', // transpose_a\n   'number', // transpose_b\n

'number' // out_id\n]);\n}\n\nfunction batchMatMul(args: {\n inputs: BatchMatMulInputs,\n backend: BackendWasm,\n attrs: BatchMatMulAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {a, b} = inputs;\n const
 {transposeA, transposeB} = attrs;\n\n if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n   throw new Error(\n `BatchMatMul for non non-float32 tensors not yet supported.`);\n }\n\n const aRank = a.shape.length;\n const bRank = b.shape.length;\n\n const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];\n const innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];\n\n const outerShapeA = transposeA ? a.shape[aRank - 1] : a.shape[aRank - 2];\n const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank - 1];\n\n const outerDimsA = a.shape.slice(0, -2);\n const outerDimsB = b.shape.slice(0, -2);\n\n const batchDimA = util.sizeFromShape(outerDimsA);\n const batchDimB = util.sizeFromShape(outerDimsB);\n\n const batchDimsCompatible =\n   batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;\n\n util.assert(\n   aRank >= 2 && bRank >= 2 && batchDimsCompatible,\n   () => `Error in matMul: the input batch dimensions
 must either be the ` +\n          `same or at least one input batch dimension must be 1. Got input ` +\n          `batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);\n\n  const outShapeOuterDims =\n      batchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);\n  const outShape = outShapeOuterDims.concat([outerShapeA, outerShapeB]);\n\n  util.assert(\n      innerShapeA === innerShapeB,\n      () => `Error in matMul: inner shapes (${innerShapeA}) and (` +\n          `${innerShapeB}) of Tensors with shapes ${a.shape} and ` +\n          `${b.shape} and transposeA=${transposeA}` +\n          ` and transposeB=${transposeB} must match.`);\n\n const a3dShape = transposeA ? [batchDimA, innerShapeA, outerShapeA] :\n [batchDimA, outerShapeA, innerShapeA];\n const b3dShape = transposeB ? [batchDimB, outerShapeB, innerShapeB] :\n   [batchDimB, innerShapeB, outerShapeB];\n\n // The rest of the implementation
 is designed to operate on rank-3 tensors\n const a3d = reshape({inputs: {x: a}, backend, attrs: {shape: a3dShape}});\n const b3d = reshape({inputs: {x: b}, backend, attrs: {shape: b3dShape}});\n\n const a3dId = backend.dataIdMap.get(a3d.dataId).id;\n const b3dId = backend.dataIdMap.get(b3d.dataId).id;\n\n const leftDim = transposeA ? a3d.shape[2] : a3d.shape[1];\n const rightDim = transposeB ? b3d.shape[1] : b3d.shape[2];\n const batchDim = Math.max(batchDimA, batchDimB);\n\n const out = backend.makeOutput([batchDim, leftDim, rightDim], a3d.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new Uint8Array(new Int32Array(a3d.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b3d.shape).buffer);\n\n wasmBatchMatMul(\n   a3dId, aShapeBytes, a3d.shape.length, b3dId, bShapeBytes,\n   b3d.shape.length, transposeA, transposeB, outId);\n\n backend.disposeData(a3d.dataId);\n backend.disposeData(b3d.dataId);\n\n out.shape
 = outShape;\n return out;\n}\n\nexport const batchMatMulConfig: KernelConfig = {\n kernelName: BatchMatMul,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: batchMatMul as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport { backend_util, buffer, Slice, slice_util, util } from '@tensorflow/tfjs-core';\nimport
 { assertNotComplex } from '../cpu_util';\nexport function sliceImpl(vals, begin, size, shape, dtype) {\n const isContinous = slice_util.isSliceContinous(shape, begin, size);\n const length = util.sizeFromShape(size);\n const xStrides = util.computeStrides(shape);\n if (isContinous) {\n   const flatOffset = slice_util.computeFlatOffset(begin, xStrides);\n   if (dtype === 'string') {\n   return vals.slice(flatOffset,

flatOffset + length);\n }\n return vals.subarray(flatOffset, flatOffset + length);\n }\n const decodedData = dtype === 'string' ?\n backend_util.fromUint8ToStringArray(vals) :\n vals;\n const inBuf = buffer(shape, dtype, decodedData);\n const outBuf = buffer(size, dtype);\n for (let i = 0; i < outBuf.size; ++i) {\n const outLoc = outBuf.indexToLoc(i);\n const inLoc = outLoc.map((idx, j) => idx + begin[j]);\n outBuf.set(inBuf.get(...inLoc), ...outLoc);\n }\n if (dtype === 'string') {\n return backend_util.fromStringArrayToUint8(outBuf.values);\n }\n return outBuf.values;\n}\nexport function slice(args) {\n const { inputs, backend, attrs } = args;\n const { x } = inputs;\n const { begin, size } = attrs;\n assertNotComplex(x, 'slice');\n const [$begin, $size] = slice_util.parseSliceParams(x, begin, size);\n slice_util.assertParamsValid(x, $begin, $size);\n const vals = backend.data.get(x.dataId).values;\n const outVals = sliceImpl(vals, $begin, $size, x.shape, x.dtype);\n return backend.makeTensorInfo($size, x.dtype, outVals);\n}\nexport const sliceConfig = {\n kernelName: Slice,\n backendName: 'cpu',\n kernelFunc: slice\n};\n//# sourceMappingURL=data:application/json; base64,eyJ2ZXJzaW9uIjozLCJmaWxlIjoiU2xpY2UuanMiLCJzb3VyY2VSb290IjoiIiwic291cmNlcyI6WyIuLi8uLi8uLi8uLi8uLi8uLi90ZmpzLWJhY2tlbmQtY3B1L3NyYy9rZXJuZWxzL1NsaWNlLnRzIl0sIm5hbWVzIjpbXSwibWFwcGluZ3MiOiJBQUFBOzs7Ozs7Ozs7Ozs7R0FlRztBQU8sRUFBQyxFQUFFLEVBQUUsRUFBRSxFQUFFLEVBQUUsRUFBRSxFQUFFLEVBQUUsRUFBRS

DLElBQUksRUFBRSxNQUFNLEVBQUUsS0FBSyxFQUFFLENBQUMsQ0FBQyxLQUFLLEVBQUUsQ0FBQyxDQUFDLEtBQUssQ0FBQyxDQUFDLDO0lBQ2pFLE9BQU8sT0FBTyxxDQUFDLDLGNBQUMsQ0FBQyxDQUFDLEtBQUssQ0FBQyxDQUFDLEtBQUssRUFBRUUsQ0FBQyxDQUFDLEtBQUssRUFBRUUsQ0FBQyxDQUFDLEtBQUssRUFBRUUs

wodmFscywgJGJlZ2luLCAkc2l6ZSwgeC5zaGFwZSwgeC5kdHlwZSk7XG4gIHJldHVybiBiYWNrZW5kLm1ha2VUZW5zb3JJbmZvKCRzaXplLCB4LmR0eXBlLCBvdXRWYWxzKTtcbn1cblxuZXhwb3J0IGNvbnN0IHNsaWNlQ29uZmlnOiBLZXJuZWxDb25maWcgPSB7XG4gIGtlcm5lbE5hbWU6IFNsaWNlLFxuICBiYWNrZW5kTmFtZTogJ3dhc21cblxuZXhwb3J0IGNvbnN0IHNsaWNlQ29uZmlnOiBLZXJuZWxDb25maWcgPSB7XG4gIGtlcm5lbE5hbWU6IFNsaWNlLFxuICBiYWNrZW5kTmFtZTogJ3dhc20nLFxuICBzZXR1cFRlYXJEb3duRnVuY3M6IHNldHVwRnVuYyxcbiAgdGVhckRvd25GdW5jOiB0ZWFyRG93bkZ1bmNcbn07XG4iXX0=","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Slice, slice_util, SliceAttrs, SliceInputs, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {sliceImplCPU} from '../kernel_utils/shared';\n\nexport function slice(\n   args: {inputs: SliceInputs, attrs: SliceAttrs, backend: BackendWasm}) {\n const {inputs: {x}, attrs: {begin, size}, backend} = args;\n\n const [begin_, size_] = slice_util.parseSliceParams(x, begin, size);\n\n const isContinous = slice_util.isSliceContinous(x.shape, begin_, size_);\n const xVals = backend.readSync(x.dataId);\n const out = backend.makeOutput(size_, x.dtype);\n const xStrides = util.computeStrides(x.shape);\n const outData = backend.dataIdMap.get(out.dataId);\n\n if (isContinous) {\n   const flatOffset = slice_util.computeFlatOffset(begin_, xStrides);\n\n   if (x.dtype === 'string') {\n   outData.stringBytes =\n   (xVals as Uint8Array[])\n   .slice(flatOffset, flatOffset + util.sizeFromShape(size_));\n   } else {\n   const outVals = backend.typedArrayFromHeap(out);\n   outVals.set(\n   (xVals as TypedArray)\n   .subarray(flatOffset, flatOffset + util.sizeFromShape(size_)));\n   }\n\n   return out;\n }\n\n if (x.dtype === 'string') {\n   const res = sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype);\n   outData.stringBytes = res as Uint8Array[];\n   return out;\n }\n\n const outVals = backend.typedArrayFromHeap(out);\n const rank = x.shape.length;\n if (rank === 2) {\n   slice2d(\n   xVals as TypedArray, xStrides[0], outVals, begin_ as [number, number],\n   size_ as [number, number]);\n } else if (rank === 3) {\n   slice3d(\n   xVals as TypedArray, xStrides[0], xStrides[1], outVals,\n   begin_ as [number, number, number], size_ as [number, number, number]);\n } else if (rank === 4) {\n   slice4d(\n   xVals as TypedArray, xStrides[0], xStrides[1], xStrides[2], outVals,\n   begin_ as [number, number, number, number],\n   size_ as [number, number, number, number]);\n } else {\n   const res =\n   sliceImplCPU(xVals, begin_, size_, x.shape, x.dtype) as TypedArray;\n   outVals.set(res);\n }\n\n return out;\n}\n\nfunction slice2d(\n   xVals: backend_util.TypedArray, xStride: number,\n   outVals: backend_util.TypedArray, begin: [number, number],\n   size: [number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n const endI = beginI + size[0];\n for (let i = beginI; i < endI; i++) {\n   const xOffset = i * xStride + beginJ;\n   outVals.set(xVals.subarray(xOffset, xOffset + size[1]), outOffset);\n   outOffset += size[1];\n }\n}\n\nfunction slice3d(\n   xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n   outVals: backend_util.TypedArray, begin: [number, number, number],\n   size: [number, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n for (let i = beginI; i < endI; i++) {\n   for (let j = beginJ; j < endJ; j++) {\n   const xOffset = i * xStride1 + j * xStride2 + beginK;\n   outVals.set(xVals.subarray(xOffset, xOffset + size[2]), outOffset);\n   outOffset += size[2];\n   }\n }\n}\n\nfunction slice4d(\n   xVals: backend_util.TypedArray, xStride1: number, xStride2: number,\n   xStride3: number, outVals: backend_util.TypedArray,\n   begin: [number, number, number, number],\n   size: [number, number, number, number]): void {\n let outOffset = 0;\n const beginI = begin[0];\n const beginJ = begin[1];\n const beginK = begin[2];\n const endI = beginI + size[0];\n const endJ = beginJ + size[1];\n const endK = beginK + size[2];\n const beginL = begin[3];\n\n for (let i = beginI; i < endI; i++) {\n   for (let j = beginJ; j < endJ; j++) {\n   for (let k = beginK; k < endK; k++) {\n

const xOffset = i * xStride1 + j * xStride2 + k * xStride3 + beginL;\n outVals.set(xVals.subarray(xOffset, xOffset + size[3]), outOffset);\n outOffset += size[3];\n }\n }\n }\n}\n\nexport const sliceConfig: KernelConfig = {\n kernelName: Slice,\n backendName: 'wasm',\n kernelFunc: slice as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from './Reshape';\nimport {slice} from './Slice';\nimport {transpose} from './Transpose';\n\nfunction batchToSpaceND(args: {\n inputs: BatchToSpaceNDInputs,\n backend: BackendWasm,\n attrs: BatchToSpaceNDAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {blockShape, crops} = attrs;\n\n const prod = blockShape.reduce((a, b) => a * b);\n\n const reshaped = backend_util.getReshaped(x.shape, blockShape, prod);\n const permuted = backend_util.getPermuted(reshaped.length, blockShape.length);\n const reshapedPermuted =\n backend_util.getReshapedPermuted(x.shape, blockShape, prod);\n const sliceBeginCoords =\n backend_util.getSliceBeginCoords(crops, blockShape.length);\n const sliceSize =\n backend_util.getSliceSize(reshapedPermuted, crops, blockShape.length);\n\n const xReshaped = reshape({inputs: {x}, backend, attrs: {shape: reshaped}});\n const xTransposed =\n transpose({inputs: {x: xReshaped}, backend, attrs: {perm: permuted}});\n const xTransposedReshaped = reshape({\n inputs: {x: xTransposed}, backend, attrs: {shape: reshapedPermuted}});\n const result = slice({\n inputs: {x: xTransposedReshaped},\n backend,\n attrs: {begin: sliceBeginCoords,\n size: sliceSize}\n });\n\n backend.disposeData(xReshaped.dataId);\n backend.disposeData(xTransposed.dataId);\n backend.disposeData(xReshaped.dataId);\n\n return result;\n}\n\nexport const batchToSpaceNDConfig: KernelConfig = {\n kernelName: BatchToSpaceND,\n backendName: 'wasm',\n kernelFunc: batchToSpaceND as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function cast(\n args: {inputs: CastInputs, attrs: CastAttrs, backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, attrs: {dtype}, backend} = args;\n const out = backend.makeOutput(x.shape, dtype);\n const inVals = backend.typedArrayFromHeap(x);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(inVals);\n return out;\n}\n\nexport const castConfig: KernelConfig = {\n kernelName: Cast,\n backendName: 'wasm',\n kernelFunc: cast as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"

BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport {KernelConfig, Ceil} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const ceilConfig: KernelConfig = createUnaryKernelConfig(Ceil);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n
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/\n\nimport {ClipByValue, ClipByValueAttrs, ClipByValueInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmClip: (xId: number, min: number, max: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmClip = backend.wasm.cwrap(ClipByValue, null / void */, [\n   'number', // x_id\n   'number', // min\n   'number', // max\n   'number'   // out_id\n]);\n}\n\nfunction clip(args: {\n inputs: ClipByValueInputs,\n backend: BackendWasm,\n attrs: ClipByValueAttrs\n}) {\n const
{inputs, backend, attrs} = args;\n const {x} = inputs;\n const {clipValueMin, clipValueMax} = attrs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmClip(xId, clipValueMin, clipValueMax, outId);\n return out;\n}\n\nexport const clipByValueConfig: KernelConfig = {\n kernelName: ClipByValue,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: clip as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF
ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {concatImplCPU} from '../kernel_utils/shared';\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\n\nexport function concat(\n   args: {inputs: ConcatInputs, backend: BackendWasm, attrs: ConcatAttrs}) {\n const {inputs, backend} = args;\n\n const axis = util.parseAxisParam(args.attrs.axis, inputs[0].shape)[0];\n\n let outShape = backend_util.computeOutShape(inputs.map(t => t.shape), axis);\n\n // Keep only non-empty tensors (ignore tensors with 0 in their shape).\n const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);\n if ($inputs.length ===
1) {\n   return identity({inputs: {x: $inputs[0]}, backend});\n }\n\n const out = backend.makeOutput(outShape, inputs[0].dtype);\n\n if (util.sizeFromShape(outShape) === 0) {\n   return out;\n }\n\n const shapes = $inputs.map(t => t.shape);\n backend_util.assertParamsConsistent(shapes, axis);\n\n if ($inputs[0].dtype ===
'string') {\n   // Any concat of n-dimensional tensors across any axis can be reduced to\n   // a concatenation of two-dimensional tensors across the axis 1 by first\n   // partitioning the axes of the original tensors into those less than the\n   // axis to be concatenated and the rest. Then reshape the tensors\n   // into a two-dimensional tensor by collapsing these two sets of axes and\n   // concatenate the resulting matrices across the axis 1, finally reshaping\n// the result to have the proper shape.\n   const inputs2D = $inputs.map(t => {\n   const innerSize = util.sizeFromShape(t.shape.slice(axis));\n   const shape = [-1, innerSize];\n

return reshape({inputs: {x: t}, backend, attrs: {shape}});\n });\n\n const inputsValShapes = inputs2D.map(t => {\n   return {vals: backend.readSync(t.dataId), shape: t.shape};\n });\n\n // Concats 2d tensors along axis=1.\n outShape =\n   backend_util.computeOutShape(inputs2D.map(t => t.shape), 1 /* axis */);\n const simplyConcat = inputs2D[0].shape[0] === 1;\n const outVals = concatImplCPU(\n inputsValShapes, outShape, inputs[0].dtype,\n   simplyConcat) as string[];\n\n const finalOutShape =\n   backend_util.computeOutShape($inputs.map(t => t.shape), axis);\n\n out.shape = finalOutShape;\n const outData = backend.dataIdMap.get(out.dataId);\n outData.stringBytes = backend_util.fromStringArrayToUint8(outVals);\n\n inputs2D.forEach(t => backend.disposeData(t.dataId));\n\n return out;\n}\n\n const batchDim = util.sizeFromShape($inputs[0].shape.slice(0, axis));\n let sumInnerDims = 0;\n const innerDims = $inputs.map(input => {\n const innerDim = util.sizeFromShape(input.shape.slice(axis));\n sumInnerDims += innerDim;\n return innerDim;\n });\n const inVals = $inputs.map(input => backend.typedArrayFromHeap(input));\n const outVals = backend.typedArrayFromHeap(out);\n for (let b = 0; b < batchDim; b++) {\n let outOffset = b * sumInnerDims;\n for (let i = 0; i < inVals.length; i++) {\n   const innerDim = innerDims[i];\n   const inOffset = b * innerDim;\n   const vals = inVals[i].subarray(inOffset, inOffset + innerDim);\n   outVals.set(vals, outOffset);\n   outOffset += innerDim;\n }\n }\n return out;\n}\n\nexport const concatConfig: KernelConfig = {\n kernelName: Concat,\n backendName: 'wasm',\n kernelFunc: concat as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\nimport { backend_util, util } from '@tensorflow/tfjs-core';\nexport function concatImpl(inputs, outShape, dtype, simplyConcat) {\n const outVals = util.getArrayFromDType(dtype, util.sizeFromShape(outShape));\n if (simplyConcat && dtype !== 'string') {\n   // Use built-in TypedArray.set() method for speed.\n   let offset = 0;\n   inputs.forEach(input => {\n   const size = util.sizeFromShape(input.shape);\n   outVals.set(input.vals, offset);\n   offset += size;\n   });\n }\n else {\n   let colOffset = 0;\n   inputs.forEach(input => {\n   const decodedData = dtype === 'string' ?\n   backend_util.fromUint8ToStringArray(input.vals) :\n   input.vals;\n   let tIdx = 0;\n   for (let row = 0; row < input.shape[0]; ++row) {\n   const resIdx = row * outShape[1] + colOffset;\n   for (let col = 0; col < input.shape[1]; ++col) {\n   outVals[resIdx + col] = decodedData[tIdx++];\n   }\n   }\n   colOffset += input.shape[1];\n   });\n }\n return outVals;\n}\n//# sourceMappingURL=data:application/json; base64,eyJ2ZXJzaW9uIjozLCJmaWxlIjoiQ29uY2F0X2ltcGwuanMiLCJzb3VyY2VSb290IjoiIiwic291cmNlcyI6WyIuLi8uLi8uLi8uLi8uLi8uLi90ZmpzLWJhY2tlbmQtY3B1L3NyYy9rZXJuZWxzL0NvbmNhdF9pbXBsLnRzIl0sIm5hbWVzIjpbXSwibWFwcGluZ3MiOiJBQUFBOzs7Ozs7Ozs7Ozs7R0FlRlRztBQUVILE9BQU8sRUFBRSxZQUFZLEVBQUUsSUFBSSxFQUFFLE1BQU0sdUJBQXVCLENBQUM7QUFFM0QsTUFBTSxVQUFVLFVBQVUsQ0FBQyxNQUFNLEVBQUUsUUFBUSxFQUFFLEtBQUssRUFBRSxZQUFZO0lBQzlELE1BQU0sT0FBTyxHQUFHLElBQUksQ0FBQyxlQUFlLENBQUMsS0FBSyxFQUFFLElBQUksQ0FBQyxhQUFhLENBQUMsUUFBUSxDQUFDLENBQUMsQ0FBQztJQUMxRSxJQUFJLFlBQVksSUFBSSxLQUFLLEtBQUssUUFBUSxFQUFFO1FBQ3RDLHlDQUF5QztRQUN6QyxJQUFJLE1BQU0sR0FBRyxDQUFDLENBQUM7UUFDZixNQUFNLENBQUMsT0FBTyxDQUFDLEtBQUssQ0FBQyxFQUFFO1lBQ3JCLE1BQU0sSUFBSSxHQUFHLElBQUksQ0FBQyxhQUFhLENBQUMsS0FBSyxDQUFDLEtBQUssQ0FBQyxDQUFDO1lBQzdDLE9BQU8sQ0FBQyxHQUFHLENBQUMsS0FBSyxDQUFDLElBQUksRUFBRSxNQUFNLENBQUMsQ0FBQztZQUNoQyxNQUFNLElBQUksSUFBSSxDQUFDO1FBQ2pCLENBQUMsQ0FBQyxDQUFDO0tBQ0o7U0FDSTtRQUNILElBQUksU0FBUyxHQUFHLENBQUMsQ0FBQztRQUNsQixNQUFNLENBQUMsT0FBTyxDQUFDLEtBQUssQ0FBQyxFQUFFO1lBQ3JCLE1BQU0sV0FBVyxHQUFHLEtBQUssS0FBSyxRQUFRLENBQUMsQ0FBQztnQkFDcEMsWUFBWSxDQUFDLHFCQUFxQixDQUFDLEtBQUssQ0FBQyxJQUFJLENBQUMsQ0FBQyxDQUFDO2dCQUNoRCxLQUFLLENBQUMsSUFBSSxDQUFDO1lBQ2YsSUFBSSxJQUFJLEdBQUcsQ0FBQyxDQUFDO1lBQ2IsS0FBSyxJQUFJLEdBQUcsR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEtBQUssQ0FBQyxLQUFLLENBQUMsQ0FBQyxDQUFDLEVBQUUsRUFBRSxHQUFHLEVBQUU7Z0JBQ2xELE1BQU0sTUFBTSxHQUFHLEdBQUcsR0FBRyxRQUFRLENBQUMsQ0FBQyxDQUFDLEdBQUcsU1FBUztnQkFDNUMsS0FBSyxJQUFJLEdBQUcsR0FBRyxDQUFDLEVBQUUsR0FBRyxHQUFHLEtBQUssQ0FBQyxLQUFLLENBQUMsQ0FBQyxDQUFDLEVBQUUsRUFBRSxHQUFHLEVBQUU7b0JBQ3BELE9BQU8sQ0FBQyxNQUFNLEdBQUcsR0FBRyxDQUFDLEdBQUcsV1dbSUFBSSxDQUFDO2lCQUM5QjthQUNGO1lBQ0QsU1FBUyxJQUFJLEtBQUssQ0FBQyxLQUFLLENBQUMsQ0FBQyxDQUFDLENBQUM7U1FDN0IsQ0FBQyxDQUFDLENBQUM7S0FDSjtJQUNELE9BQU8sT1FBTyxDQUFDO0FBQ2pCLENBQUMifQ==

BQUMsQ0FBQztLQUNKO1NBQU07UUFDTCxJQUFJLFNBQVMsR0FBRyxDQUFDLENBQUM7UUFFbEIsTUFBTSxDQUFDLE9BQU8sQ0FBQyxyLQUFLLENBQUMsRUFBRTtZQUNyQixNQUFNLFFBQVcsNQUFNLFFBQVcsNQUFNLFFBQVcs

law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {backend_util, Conv2D, Conv2DAttrs, Conv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmConv2d: (\n xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number, padTop: number,\n padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n dilationHeight: number, dilationWidth: number, strideHeight: number,\n strideWidth: number, inputChannels: number, outputChannels: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmConv2d = backend.wasm.cwrap(Conv2D, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n}\n\nfunction conv2d(\n args: {inputs: Conv2DInputs, backend: BackendWasm, attrs: Conv2DAttrs}) {\n const {inputs, attrs, backend} = args;\n\n const {x, filter} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const {strides, dilations, pad, dimRoundingMode, dataFormat} = attrs;\n const $dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode, false, $dataFormat);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend Conv2D does not support dataFormat:` +\n `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmConv2d(\n xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n dilationHeight, dilationWidth, strideHeight, strideWidth, inputChannels,\n outputChannels, outId);\n return out;\n}\n\nexport const conv2DConfig: KernelConfig = {\n kernelName: Conv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: conv2d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from

'../backend_wasm';\n\nlet wasmConv2DBackpropInput: (\n dyId: number, filterId: number, batchSize: number, filterHeight: number,\n filterWidth: number, inHeight: number, inWidth: number, inChannels: number,\n outHeight: number, outWidth: number, outChannels: number,\n strideHeight: number, strideWidth: number, topPad: number, leftPad: number,\n fltS0: number, fltS1: number, fltS2: number, xBatchStride: number,\n xRowStride: number, xColStride: number, xChannelStride: number,\n yBatchStride: number, yRowStride: number, yColStride: number,\n yChannelStride: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmConv2DBackpropInput = backend.wasm.cwrap(Conv2DBackpropInput, null, [\n 'number', // dyId\n 'number', // filterId\n 'number',
// batchSize\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // inHeight\n 'number', // inWidth\n 'number', // inChannels\n 'number', // outHeight\n 'number', // outWidth\n 'number', // outChannels\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // topPad\n 'number', // leftPad\n 'number', // fltS0\n 'number', // fltS1\n 'number', // fltS2\n 'number', // xBatchStride\n 'number', // xRowStride\n 'number', // xColStride\n 'number', // xChannelStride\n 'number', // yBatchStride\n 'number', // yRowStride\n 'number', // yColStride\n 'number', // yChannelStride\n 'number', // outId\n]);\n}\n\nfunction conv2DBackpropInput(args: {\n backend: BackendWasm,\n inputs: Conv2DBackpropInputInputs,\n attrs: Conv2DBackpropInputAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {dy, filter} = inputs;\n const {strides, pad, dataFormat,
dimRoundingMode, inputShape} = attrs;\n\n const dilations = 1;\n\n const $dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n inputShape, filter.shape as [number, number, number, number], strides,\n dilations, pad, dimRoundingMode, false /* depthwise */, $dataFormat);\n const {\n batchSize,\n filterHeight,\n filterWidth,\n inChannels,\n inHeight,\n inWidth,\n outChannels,\n outHeight,\n outWidth,\n strideHeight,\n strideWidth\n } = convInfo;\n\n const topPad = filterHeight - 1 - convInfo.padInfo.top;\n const leftPad = filterWidth - 1 - convInfo.padInfo.left;\n\n const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n const dxStrides = util.computeStrides(convInfo.inShape);\n const dyStrides = util.computeStrides(dy.shape);\n const [fltS0, fltS1, fltS2] = util.computeStrides(filter.shape);\n const xBatchStride = dxStrides[0];\n const xRowStride = isChannelsLast
? dxStrides[1] : dxStrides[2];\n const xColStride = isChannelsLast ? dxStrides[2] : 1;\n const xChannelStride = isChannelsLast ? 1 : dxStrides[1];\n const yBatchStride = dyStrides[0];\n const yRowStride = isChannelsLast ? dyStrides[1] : dyStrides[2];\n const yColStride = isChannelsLast ? dyStrides[2] : 1;\n const yChannelStride = isChannelsLast ? 1 : dyStrides[1];\n\n const out = backend.makeOutput(convInfo.inShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const dyId = backend.dataIdMap.get(dy.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n wasmConv2DBackpropInput(\n dyId, filterId, batchSize, filterHeight, filterWidth, inHeight, inWidth,\n inChannels, outHeight, outWidth, outChannels, strideHeight, strideWidth,\n topPad, leftPad, fltS0, fltS1, fltS2, xBatchStride, xRowStride,\n xColStride, xChannelStride, yBatchStride, yRowStride, yColStride,\n yChannelStride, outId);\n return out;\n}\n\nexport const conv2DBackpropInputConfig: KernelConfig = {\n kernelName: Conv2DBackpropInput,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: conv2DBackpropInput as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {Cos, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const cosConfig: KernelConfig = createUnaryKernelConfig(Cos);\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version

2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport {Cosh, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const coshConfig: KernelConfig = createUnaryKernelConfig(Cosh);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from './Cast';\n\n// Must match enum in CropAndResize.cc\nenum InterpolationMethod {\n bilinear = 0,\n nearest = 1\n}\n\nlet wasmCropAndResize: (\n imagesId: number, boxesId: number, boxIndId: number, numBoxes: number,\n imagesShape: Uint8Array, cropHeight: number, cropWidth: number,\n method: number, extrapolationValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmCropAndResize = backend.wasm.cwrap(CropAndResize, null /*void*/, [\n 'number', // imagesId\n 'number', // boxesId\n 'number', // boxIndId\n 'number', // numBoxes\n 'array', // images shape\n 'number', // cropHeight\n 'number', // cropWidth\n 'number', // method\n 'number', // extrapolation value\n 'number' // out id\n]);\n}\n\nfunction cropAndResize(args: {\n backend: BackendWasm,\n inputs: CropAndResizeInputs,\n attrs: CropAndResizeAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {method, extrapolationValue, cropSize} = attrs;\n const {image, boxes, boxInd} = inputs;\n\n const numBoxes = boxes.shape[0];\n\n const [cropHeight, cropWidth] = cropSize as [number, number];\n const outShape = [numBoxes, cropHeight, cropWidth, image.shape[3]];\n\n let imagesData = backend.dataIdMap.get(image.dataId);\n let castedData;\n if (image.dtype !== 'float32') {\n castedData = cast({backend, inputs: {x: image}, attrs: {dtype: 'float32'}});\n imagesData = backend.dataIdMap.get(castedData.dataId);\n }\n\n const imagesId = imagesData.id;\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const boxIndId = backend.dataIdMap.get(boxInd.dataId).id;\n\n const out = backend.makeOutput(outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const imagesShapeBytes = new Uint8Array(new Int32Array(image.shape).buffer);\n\n wasmCropAndResize(\n imagesId, boxesId, boxIndId, numBoxes, imagesShapeBytes, cropHeight,\n cropWidth,\n InterpolationMethod[method as {} as keyof typeof InterpolationMethod],\n extrapolationValue, outId);\n\n if (castedData != null) {\n backend.disposeData(castedData.dataId);\n }\n\n return out;\n}\n\nexport const cropAndResizeConfig: KernelConfig = {\n kernelName: CropAndResize,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: cropAndResize as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n

```
*/\n\nimport {backend_util, KernelConfig, KernelFunc, Cumsum, CumsumAttrs, CumsumInputs, TensorInfo, util}
from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from
'./types';\n\nimport {transpose} from './Transpose';\n\nlet wasmCumsum: (xId: number, exclusive: number, reverse:
number,\n                finalDim: number, outId: number, dtype: CppDType) => void;\n\nfunction setup(backend:
BackendWasm) {\n  wasmCumsum = backend.wasm.cwrap(Cumsum, null /* void */, [\n    'number', // x_id\n
'number', // exclusive\n    'number', // reverse\n    'number', // final_dim\n    'number', // out_id\n    'number'  //
dtype\n  ]);\n}\n\nexport function cumsum(\n  args: {inputs: CumsumInputs, backend: BackendWasm, attrs:
CumsumAttrs}):\nTensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {axis,
exclusive, reverse} = attrs;\n  const xRank = x.shape.length;\n\n  util.assert(x.dtype
 === 'float32' || x.dtype === 'int32',\n    () => `cumsum does not support ${x.dtype} tensors in the WASM
backend`);\n  // permute required axis to inner most axis\n  const permutation =
backend_util.getAxesPermutation([axis], xRank);\n  let permutedX = x;\n  if (permutation !== null) {\n
permutedX = transpose({inputs: {x}, attrs: {perm: permutation}, backend});\n  }\n  const permutedAxis =
backend_util.getInnerMostAxes(1, xRank)[0];\n  backend_util.assertAxesAreInnerMostDims('cumsum',
[permutedAxis], xRank);\n\n  const permutedOut = backend.makeOutput(permutedX.shape, permutedX.dtype);\n
const finalDim = permutedX.shape[permutedAxis];\n  const permutedXId =
backend.dataIdMap.get(permutedX.dataId).id;\n  const permutedOutId =
backend.dataIdMap.get(permutedOut.dataId).id;\n  wasmCumsum(permutedXId, exclusive ? 1 : 0, reverse ? 1 : 0,
finalDim,\n               permutedOutId, CppDType[x.dtype]);\n\n  // transpose data back if permuted\n  let out =
permutedOut;\n  if (permutation
 !== null) {\n    const undoPermutation = backend_util.getUndoAxesPermutation(permutation);\n    out =
transpose(\n      {inputs: {x: permutedOut}, attrs: {perm: undoPermutation}, backend});\n
backend.disposeData(permutedX.dataId);\n    backend.disposeData(permutedOut.dataId);\n  }\n  return
out;\n}\n\nexport const cumsumConfig: KernelConfig = {\n  kernelName: Cumsum,\n  backendName: 'wasm',\n
setupFunc: setup,\n  kernelFunc: cumsum as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google
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OR CONDITIONS OF ANY KIND, either express or implied.\n
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==========================================================================\n
*/\n\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo,
util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthToSpace:
(\n    xId: number, blockSize: number, channelsLast: number, xStrides: Uint8Array,\n    xStridesLength: number,
outputShape: Uint8Array, outputStrides: Uint8Array,\n    outSize: number, outId: number) => void;\n\nfunction
setup(backend: BackendWasm): void {\n  wasmDepthToSpace = backend.wasm.cwrap(DepthToSpace, null
/*void*/, [\n    'number',  // xId\n    'number',  // blockSize\n    'number',  // channelsLast\n    'array',   // xStrides\n
'number',  // xStridesLength\n    'array',   // outputShape\n    'array',   // outputStrides\n    'number',  // outSize\n
'number',  // outId\n
  ]);\n}\n\nexport function depthToSpace(args: {\n  backend: BackendWasm,\n  inputs: DepthToSpaceInputs,\n
attrs: DepthToSpaceAttrs\n}): TensorInfo {\n  const {backend, inputs, attrs} = args;\n  const {x} = inputs;\n  const
{blockSize, dataFormat} = attrs;\n\n  const batchSize = x.shape[0];\n  const inputHeight = (dataFormat ===
'NHWC') ? x.shape[1] : x.shape[2];\n  const inputWidth = (dataFormat === 'NHWC') ? x.shape[2] : x.shape[3];\n
const inputDepth = (dataFormat === 'NHWC') ? x.shape[3] : x.shape[1];\n\n  const outputHeight = inputHeight *
blockSize;\n  const outputWidth = inputWidth * blockSize;\n  const outputDepth = inputDepth / (blockSize *
blockSize);\n\n  const outputShape = (dataFormat === 'NHWC') ?\n      [batchSize, outputHeight, outputWidth,
outputDepth] :\n      [batchSize, outputDepth, outputHeight, outputWidth];\n\n  const out =
```

backend.makeOutput(outputShape, 'float32');\n\n const xData = backend.dataIdMap.get(x.dataId);\n const xId = xData.id;\n const xStridesBytes
 =\n   new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n\n const outputShapeBytes = new Uint8Array(new Int32Array(outputShape).buffer);\n const outStridesBytes =\n   new Uint8Array(new Int32Array(util.computeStrides(outputShape)).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n const channelsLast = dataFormat === 'NHWC' ? 1 : 0;\n wasmDepthToSpace(\n   xId, blockSize, channelsLast, xStridesBytes, x.shape.length - 1,\n   outputShapeBytes, outStridesBytes, outputShape.length, outId);\n\n return out;\n}\n\nexport const depthToSpaceConfig: KernelConfig = {\n kernelName: DepthToSpace,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: depthToSpace as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License
 at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==========\n */\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs, DepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthwiseConv2d: (\n   xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n   filterId: number, filterHeight: number, filterWidth: number, padTop: number,\n   padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n   dilationHeight: number, dilationWidth:
 number, strideHeight: number,\n   strideWidth: number, inputChannels: number, outputChannels: number,\n   outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmDepthwiseConv2d =\n   backend.wasm.cwrap(DepthwiseConv2dNative, null /* void */, [\n   'number', // xId\n   'number', // batchSize\n   'number', // inputHeight\n   'number', // inputWidth\n   'number', // filterId\n   'number', // filterHeight\n   'number', // filterWidth\n   'number', // padTop\n   'number', // padRight\n   'number', // padBottom\n   'number', // padLeft\n   'number', // isSamePad\n   'number', // dilationHeight\n   'number', // dilationWidth\n   'number', // strideHeight\n   'number', // strideWidth\n   'number', // inputChannels\n   'number', // outputChannels\n   'number', // outId\n   ]);\n}\n\nfunction depthwiseConv2d(args: {\n inputs: DepthwiseConv2dNativeInputs,\n
  backend: BackendWasm,\n attrs: DepthwiseConv2dNativeAttrs\n}) {\n const {inputs, attrs, backend} = args;\n\n const {x, filter} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const {strides, dilations, pad, dimRoundingMode} = attrs;\n\n const $dilations = dilations == null ? [1, 1] : dilations;\n\n const convInfo = backend_util.computeConv2DInfo(\n   (x as Tensor4D).shape, (filter as Tensor4D).shape, strides,\n   ($dilations as number | [number, number]), pad, dimRoundingMode,\n   true /* depthwise */);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n
  const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n   throw new Error(\n   `wasm backend DepthwiseConv2dNative does not support dataFormat:'` +\n   `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmDepthwiseConv2d(\n   xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n   filterWidth,

padTop, padRight, padBottom, padLeft, isSamePad,\n dilationHeight, dilationWidth, strideHeight, strideWidth, inputChannels,\n outputChannels, outId);\n return out;\n}\n\nexport const depthwiseConv2dNativeConfig: KernelConfig = {\n kernelName: DepthwiseConv2dNative,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: depthwiseConv2d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport {Elu, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const eluConfig: KernelConfig = createUnaryKernelConfig(Elu);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport {Equal, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const equalConfig: KernelConfig =\n createBinaryKernelConfig(Equal, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const expConfig: KernelConfig = createUnaryKernelConfig(Exp, 'float32');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from './Reshape';\n\nexport function expandDims(args: {\n inputs: ExpandDimsInputs,\n attrs: ExpandDimsAttrs,\n backend: BackendWasm\n}) {\n const {inputs, attrs, backend} = args;\n const {input} = inputs;\n const {dim} = attrs;\n\n const inputRank = input.shape.length;\n const newShape = input.shape.slice();\n let $dim = dim;\n if (dim < 0) {\n // Negative value is counted from the tail of rank.\n util.assert(\n -(inputRank + 1) <= dim,\n () => `Axis must be in the interval [${- (inputRank + 1)}, ${\n inputRank}]`);\n $dim = inputRank + dim + 1;\n }\n newShape.splice($dim, 0, 1);\n\n return reshape({inputs:

{x: input}, backend, attrs: {shape: newShape}});\n}\n\nexport const expandDimsConfig: KernelConfig = {\n kernelName: ExpandDims,\n backendName: 'wasm',\n kernelFunc: expandDims as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n*/\n\nimport {KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {Fill, FillAttrs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nexport function fill(args: {attrs: FillAttrs, backend: BackendWasm}) {\n const {attrs: {shape, value, dtype}, backend} = args;\n const out = backend.makeOutput(shape, dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(value as number);\n return out;\n}\n\nexport const fillConfig: KernelConfig = {\n kernelName: Fill,\n backendName: 'wasm',\n kernelFunc: fill as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n*/\n\nimport {FlipLeftRight, FlipLeftRightInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFlipLeftRight: (\n xId: number, batch: number, imageHeight: number, imageWidth: number,\n numChannels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmFlipLeftRight = backend.wasm.cwrap(FlipLeftRight, null /* void */, [\n 'number', // xId\n 'number', // batch\n 'number', // imageHeight\n 'number', // imageWidth\n 'number', // numChannels\n 'number', // outId\n]);\n}\n\nexport function flipLeftRight(\n args: {inputs: FlipLeftRightInputs, backend: BackendWasm}): TensorInfo {\n const {inputs, backend} = args;\n const {image} = inputs;\n\n const out = backend.makeOutput(image.shape, image.dtype);\n const imageId = backend.dataIdMap.get(image.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n\n wasmFlipLeftRight(\n imageId, batch, imageHeight, imageWidth, numChannels, outId);\n return out;\n}\n\nexport const flipLeftRightConfig: KernelConfig = {\n kernelName: FlipLeftRight,\n backendName: 'wasm',\n kernelFunc: flipLeftRight as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n*/\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const floorConfig: KernelConfig = createUnaryKernelConfig(Floor);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *

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==========\n */\n\nimport {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const floorDivConfig: KernelConfig =\n createBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmBatchNorm: (\n xId: number, meanId: number, varianceId: number, offsetId: number,\n scaleId: number, varianceEpsilon: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmBatchNorm = backend.wasm.cwrap(\n FusedBatchNorm, null /* void */,\n ['number', 'number', 'number', 'number', 'number', 'number', 'number']);\n}\n\nfunction fusedBatchNorm(args: {\n backend: BackendWasm,\n inputs: FusedBatchNormInputs,\n attrs: FusedBatchNormAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {varianceEpsilon} = attrs;\n const {x, mean, variance, offset, scale} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const meanId = backend.dataIdMap.get(mean.dataId).id;\n const varianceId = backend.dataIdMap.get(variance.dataId).id;\n const offsetId = offset != null ? backend.dataIdMap.get(offset.dataId).id : 0;\n const scaleId = scale != null ? backend.dataIdMap.get(scale.dataId).id : 0;\n\n const out = backend.makeOutput(x.shape, x.dtype);\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(x.shape) === 0) {\n return out;\n }\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmBatchNorm(\n xId, meanId, varianceId, offsetId, scaleId, varianceEpsilon, outId);\n return out;\n}\n\nexport const fusedBatchNormConfig: KernelConfig = {\n kernelName: FusedBatchNorm,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedBatchNorm as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {backend_util, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet wasmFusedConv2d:\n (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number,\n biasId: number, padTop: number, padRight: number, padBottom: number,\n padLeft: number, isSamePad: number, dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels: number, activation: number,\n preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm) {\n

wasmFusedConv2d = backend.wasm.cwrap(FusedConv2D, null /*
 void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // biasId\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // activation\n 'number', // preluActivationWeightsId\n 'number', // leakyreluAlpha\n 'number', // outId\n]);\n}\n\nfunction fusedConv2d(args: {\n inputs: FusedConv2DInputs,\n backend: BackendWasm,\n attrs: FusedConv2DAttrs\n}) {\n const {inputs, attrs, backend} = args;\n const {x, filter, bias, preluActivationWeights} = inputs;\n const {\n strides,\n pad,\n dilations,\n dataFormat,\n
 dimRoundingMode,\n activation,\n leakyreluAlpha\n } = attrs;\n\n const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n pad, dimRoundingMode);\n\n const fusedActivation =\n FusableActivation[activation as {} as keyof typeof FusableActivation];\n if (fusedActivation == null) {\n throw new Error(\n `${activation} activation not yet supported for FusedConv2D ` +\n `in the wasm backend.`);\n }\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const outputChannels = convInfo.outChannels;\n\n let biasId = 0;\n if (bias != null) {\n const biasData = backend.dataIdMap.get(bias.dataId);\n if (biasData.shape.length !== 1) {\n throw new Error(\n `FusedConv2D only supports rank-1 bias but got ` +\n `rank ${biasData.shape.length}.`);\n }\n if (biasData.shape[0] !== outputChannels)
 {\n throw new Error(\n `FusedConv2D bias shape (${biasData.shape}) does not ` +\n `match the number of output channels (${outputChannels})`);\n }\n biasId = biasData.id;\n }\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n const batchSize = convInfo.batchSize;\n const inHeight = convInfo.inHeight;\n const inWidth = convInfo.inWidth;\n\n if (dataFormat !== 'NHWC') {\n throw new Error(\n `wasm backend FusedConv2D does not
 support dataFormat:'` +\n `${dataFormat}'. Please use 'NHWC'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n const preluActivationWeightsId = preluActivationWeights == null ?\n 0 :\n backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n wasmFusedConv2d(\n xId, batchSize, inHeight, inWidth, filterId, filterHeight, filterWidth,\n biasId, padTop, padRight, padBottom, padLeft, isSamePad,\n dilationHeight,\n dilationWidth, strideHeight, strideWidth, inputChannels, outputChannels,\n fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0, outId);\n\n return out;\n}\n\nexport const fusedConv2DConfig: KernelConfig = {\n kernelName: FusedConv2D,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: fusedConv2d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {backend_util, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs, FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport

```
{BackendWasm} from '../backend_wasm';\n\nimport {FusableActivation} from './types';\n\nlet
wasmFusedDepthwiseConv2d:\n    (xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n
filterId: number,
 filterHeight: number, filterWidth: number,\n     biasId: number, padTop: number, padRight: number, padBottom:
number,\n     padLeft: number, isSamePad: number, dilationHeight: number,\n     dilationWidth: number,
strideHeight: number, strideWidth: number,\n     inputChannels: number, outputChannels: number, activation:
number,\n     preluActivationWeightsId: number, leakyreluAlpha: number, outId: number) =>\n
void;\n\nfunction setup(backend: BackendWasm) {\n  wasmFusedDepthwiseConv2d =\n
backend.wasm.cwrap(FusedDepthwiseConv2D, null /* void */, [\n        'number',  // xId\n        'number',  //
batchSize\n        'number',  // inputHeight\n        'number',  // inputWidth\n        'number',  // filterId\n        'number',  //
filterHeight\n        'number',  // filterWidth\n        'number',  // biasId\n        'number',  // padTop\n        'number',  //
padRight\n        'number',  // padBottom\n        'number',  // padLeft\n        'number',  // isSamePad\n        'number',
  // dilationHeight\n        'number',  // dilationWidth\n        'number',  // strideHeight\n        'number',  // strideWidth\n
    'number',  // inputChannels\n        'number',  // outputChannels\n        'number',  // activation\n        'number',  //
preluActivationWeightsId\n        'number',  // leakyreluAlpha\n        'number',  // outId\n      ]);\n}\n\nfunction
fusedDepthwiseConv2d(args: {\n  inputs: FusedDepthwiseConv2DInputs,\n  backend: BackendWasm,\n  attrs:
FusedDepthwiseConv2DAttrs\n}) {\n  const {inputs, attrs, backend} = args;\n  const {x, filter, bias,
preluActivationWeights} = inputs;\n  const {\n    strides,\n    pad,\n    dilations,\n    dataFormat,\n
dimRoundingMode,\n    activation,\n    leakyreluAlpha\n  } = attrs;\n\n  const convInfo =
backend_util.computeConv2DInfo(\n      (x as Tensor4D).shape, (filter as Tensor4D).shape, strides, dilations,\n
pad, dimRoundingMode, true /* depthwise */);\n\n  const fusedActivation =\n      FusableActivation[activation
 as {} as keyof typeof FusableActivation];\n  if (fusedActivation == null) {\n    throw new Error(\n
`${activation} activation not yet supported for FusedDepthwiseConv2D ` +\n        `in the wasm backend.`);\n  }\n\n
const xId = backend.dataIdMap.get(x.dataId).id;\n  const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n
const outputChannels = convInfo.outChannels;\n\n  let biasId = 0;\n  if (bias != null) {\n    const biasData =
backend.dataIdMap.get(bias.dataId);\n    if (biasData.shape.length !== 1) {\n      throw new Error(\n
`FusedDepthwiseConv2D only supports rank-1 bias but got ` +\n          `rank ${biasData.shape.length}.`);\n    }\n
if (biasData.shape[0] !== outputChannels) {\n      throw new Error(\n          `FusedDepthwiseConv2D bias shape
(${biasData.shape}) does not ` +\n          `match the number of output channels (${outputChannels})`);\n    }\n
biasId = biasData.id;\n  }\n\n  const filterHeight = convInfo.filterHeight;\n  const
 filterWidth = convInfo.filterWidth;\n  const padTop = convInfo.padInfo.top;\n  const padRight =
convInfo.padInfo.right;\n  const padBottom = convInfo.padInfo.bottom;\n  const padLeft = convInfo.padInfo.left;\n
const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth = convInfo.dilationWidth;\n  const
strideHeight = convInfo.strideHeight;\n  const strideWidth = convInfo.strideWidth;\n  const inputChannels =
convInfo.inChannels;\n  const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n  const batchSize =
convInfo.batchSize;\n  const inHeight = convInfo.inHeight;\n  const inWidth = convInfo.inWidth;\n\n  if
(dataFormat !== 'NHWC') {\n    throw new Error(\n        `wasm backend FusedDepthwiseConv2D does not support
dataFormat:'` +\n        `${dataFormat}'. Please use 'NHWC'.`);\n  }\n\n  const out =
backend.makeOutput(convInfo.outShape, 'float32');\n  const outId = backend.dataIdMap.get(out.dataId).id;\n  const
preluActivationWeightsId = preluActivationWeights ==
 null ?\n      0 :\n      backend.dataIdMap.get(preluActivationWeights.dataId).id;\n\n
wasmFusedDepthwiseConv2d(\n      xId, batchSize, inHeight, inWidth, filterId, filterHeight, filterWidth,\n
biasId, padTop, padRight, padBottom, padLeft, isSamePad, dilationHeight,\n      dilationWidth, strideHeight,
strideWidth, inputChannels, outputChannels,\n      fusedActivation, preluActivationWeightsId, leakyreluAlpha || 0,
outId);\n\n  return out;\n}\n\nexport const fusedDepthwiseConv2DConfig: KernelConfig = {\n  kernelName:
FusedDepthwiseConv2D,\n  backendName: 'wasm',\n  setupFunc: setup,\n  kernelFunc: fusedDepthwiseConv2d as
{} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed
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```

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law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {gather_util, GatherNd, GatherNdInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmGatherNd: (\n xId: number, dtype: CppDType, indicesId: number, numSlices: number,\n sliceRank: number, sliceSize: number, strides: Uint8Array, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmGatherNd = backend.wasm.cwrap(GatherNd, null /*void*/, [\n 'number', // xId\n 'number', // dtype\n 'number', // indicesId\n 'number', // numSlices\n 'number', // sliceRank\n
'number', // sliceSize\n 'array', // strides\n 'number' // outId\n]);\n}\n\nfunction gatherNd(args: {backend: BackendWasm, inputs: GatherNdInputs}):\n TensorInfo {\n const {backend, inputs} = args;\n const {params, indices} = inputs;\n\n const [resultShape, numSlices, sliceSize, strides] =\n gather_util.prepareAndValidate(params, indices);\n\n const out = backend.makeOutput(resultShape, params.dtype);\n if (numSlices === 0) {\n return out;\n }\n\n const indicesShape = indices.shape;\n const sliceRank = indicesShape[indicesShape.length - 1];\n\n const xData = backend.dataIdMap.get(params.dataId);\n const xId = xData.id;\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const stridesBytes = new Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmGatherNd(\n xId, CppDType[params.dtype], indicesId, numSlices, sliceRank, sliceSize,\n
stridesBytes, outId);\n\n return out;\n}\n\nexport const gatherNdConfig: KernelConfig = {\n kernelName: GatherNd,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherNd\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {backend_util, GatherV2, GatherV2Attrs, GatherV2Inputs, KernelConfig,
KernelFunc, Tensor, TensorInfo, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {reshape} from './Reshape';\nimport {CppDType} from './types';\n\nlet wasmGather: (\n xId: number, dtype: CppDType, xStrides: Uint8Array, stridesSize: number,\n indicesId: number, batchSize: number, outStrides: Uint8Array,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmGather = backend.wasm.cwrap('Gather', null /*void*/, [\n 'number', // xId\n 'number', // dtype\n 'array', // xStrides\n 'number', // stridesSize\n 'number', // indicesId\n 'number', // batchSize\n 'array', // outStrides\n 'number' // outId\n]);\n}\n\nfunction gatherV2(\n args: {backend: BackendWasm, inputs: GatherV2Inputs, attrs: GatherV2Attrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x, indices} = inputs;\n const {axis, batchDims} = attrs;\n\n // Throw error when any
index is out of bound.\n const parsedAxis = util.parseAxisParam(axis, x.shape)[0];\n const indicesVals = backend.readSync(indices.dataId) as TypedArray;\n const axisDim = x.shape[parsedAxis];\n for (let i = 0; i < indicesVals.length; ++i) {\n const index = indicesVals[i];\n util.assert(\n index <= axisDim - 1 && index >= 0,\n () =>\n `GatherV2: the index value ${index} is not in [0, ${axisDim - 1}]`);\n }\n\n const shapeInfo = backend_util.segment_util.collectGatherOpShapeInfo(\n x as Tensor, indices as Tensor, parsedAxis, batchDims);\n\n const flattenX = reshape({\n inputs: {x},\n attrs: {\n shape: [\n shapeInfo.batchSize, shapeInfo.outerSize, shapeInfo.dimSize,\n shapeInfo.sliceSize\n]\n },\n backend\n });\n const

indicesSize = util.sizeFromShape(indices.shape);\n const flattenIndex = reshape({\n   inputs: {x: indices},\n   attrs: {shape: [shapeInfo.batchSize, indicesSize / shapeInfo.batchSize]},\n
  backend\n });\n const flattenOutputShape = [\n   shapeInfo.batchSize, shapeInfo.outerSize, indicesSize / shapeInfo.batchSize,\n   shapeInfo.sliceSize\n];\n\n const out = backend.makeOutput(flattenOutputShape, x.dtype);\n if (util.sizeFromShape(x.shape) === 0) {\n   return out;\n }\n const stridesSize = flattenX.shape.length - 1;\n\n const xData = backend.dataIdMap.get(flattenX.dataId);\n const xId = xData.id;\n\n const indicesData = backend.dataIdMap.get(flattenIndex.dataId);\n const indicesId = indicesData.id;\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const xStridesBytes = new Uint8Array(\n   new Int32Array(util.computeStrides(flattenX.shape)).buffer);\n const outStridesBytes = new Uint8Array(\n   new Int32Array(util.computeStrides(flattenOutputShape)).buffer);\n\n wasmGather(\n   xId, CppDType[x.dtype], xStridesBytes, stridesSize, indicesId,\n   shapeInfo.batchSize, outStridesBytes, outId);\n\n backend.disposeData(flattenX.dataId);\n
  backend.disposeData(flattenIndex.dataId);\n\n // reshape\n out.shape = shapeInfo.outputShape;\n return out;\n}\n\nexport const gatherV2Config: KernelConfig = {\n kernelName: GatherV2,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: gatherV2 as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport {Greater, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterConfig: KernelConfig =\n createBinaryKernelConfig(Greater, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport {GreaterEqual, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const greaterEqualConfig: KernelConfig =\n createBinaryKernelConfig(GreaterEqual, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmFunc: (\n   xId: number, dtype: number, leakyreluAlpha: number, outId: number) => void;\n\nfunction setupFunc(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(LeakyRelu, null /* void */, [\n   'number', // x_id\n   'number', // dtype\n   'number', // leakyrelu_alpha\n   'number', // out_id\n]);\n}\n\nexport function leakyRelu(\n   args:\n   {inputs: LeakyReluInputs, attrs: LeakyReluAttrs,

backend: BackendWasm}):\n TensorInfo {\n const {inputs: {x}, attrs: {alpha}, backend} = args;\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n // According to TF API, LeakyRelu returns float32 when input is either float32\n // or int32.\n const out = backend.makeOutput(x.shape, 'float32');\n\n if (util.sizeFromShape(x.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmFunc(xId, CppDType[x.dtype], alpha, outId);\n }\n\n return out;\n}\n\nexport const leakyReluConfig: KernelConfig = {\n kernelName: LeakyRelu,\n backendName: 'wasm',\n setupFunc,\n kernelFunc: leakyRelu as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport {KernelConfig, Less} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessConfig: KernelConfig =\n createBinaryKernelConfig(Less, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, LessEqual} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const lessEqualConfig: KernelConfig =\n createBinaryKernelConfig(LessEqual, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport {KernelConfig, Log} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const logConfig: KernelConfig = createUnaryKernelConfig(Log);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport {KernelConfig, LogicalAnd}\n from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const logicalAndConfig: KernelConfig =\n createBinaryKernelConfig(LogicalAnd, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *

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==========\n */\n\nimport {backend_util,
KernelConfig, KernelFunc, Max, MaxAttrs, MaxInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmMax: (xId: number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMax = backend.wasm.cwrap(Max, null /*void*/, [\n 'number', // x_id\n 'number', // dtype\n 'number', // reduce_size\n 'number', // out_id\n]);\n}\n\nfunction max(args: {backend: BackendWasm, inputs: MaxInputs, attrs: MaxAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {reductionIndices: axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed)
{\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n input = transposed;\n inputId = transposedId;\n }\n\n const inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('max', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmMax(inputId, CppDType[x.dtype], reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return out;\n}\n\nexport const maxConfig: KernelConfig = {\n kernelName: Max,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: max as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const maximumConfig:
KernelConfig =\n createBinaryKernelConfig(Maximum, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmMaxPool:
(\n xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterHeight: number, filterWidth: number, padTop: number, padRight: number,\n padBottom: number, padLeft: number, dilationHeight:

number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmMaxPool = backend.wasm.cwrap(MaxPool, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n}\n\nfunction maxPool(\n args: {inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n const {inputs, attrs, backend} = args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n // TF API supports int32 input. CPU and WebGL backend also support int32\n // input. WASM backend doesn't support it because it uses xnnpack which only\n // supports float32.\n //\n // Add the following assert only for the WASM backend instead of at core op\n // level.\n //\n // TODO: add support for int32 input.\n util.assert(\n x.dtype === 'float32',\n () =>\n `Error in MaxPool: only float32 input is supported. Got ${x.dtype}.`);\n\n const {filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend does not support dataFormat:'` +\n `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmMaxPool(\n xId, x.shape[0], x.shape[1], x.shape[2], filterHeight, filterWidth,\n padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n strideHeight, strideWidth, inputChannels, outputChannels, outId);\n return out;\n}\n\nexport const maxPoolConfig: KernelConfig = {\n kernelName: MaxPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: maxPool as {} as KernelFunc\n};\n\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Mean, MeanAttrs, MeanInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {cast} from './Cast';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\n\nlet wasmMean: (xId: number, reduceSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMean =\n backend.wasm.cwrap(Mean, null /*void*/, ['number, number, number']);\n}\n\nexport function mean(\n args: {backend: BackendWasm, inputs: MeanInputs, attrs: MeanAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was not a no-op. We will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n reductionAxes.length,

input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'mean', reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize = util.sizeFromShape(reduceShape);\n let castedInput = input;\n if (input.dtype !== 'float32') {\n castedInput =\n cast({backend, inputs: {x: input}, attrs: {dtype: 'float32'}});\n inputId = backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(outShape, 'float32');\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmMean(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n if (input.dtype !== 'float32') {\n backend.disposeData(castedInput.dataId);\n }\n\n return out;\n}\n\nexport const meanConfig: KernelConfig = {\n kernelName: Mean,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: mean as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF
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==\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmMin: (xId: number, dtype: number, reduceSize: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmMin = backend.wasm.cwrap(Min, null /*void*/, [\n 'number', // x_id\n 'number', // dtype\n 'number', // reduce_size\n 'number', // out_id\n]);\n}\n\nfunction min(args: {backend: BackendWasm, inputs: MinInputs, attrs: MinAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x}
 = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n   // transpose was not a no-op. We will need to dispose of this\n   // once we are done.\n   input = transposed;\n   inputId = transposedId;\n }\n }\n\n const inputRank = input.shape.length;\n\n backend_util.assertAxesAreInnerMostDims('min', axes, inputRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, axes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmMin(inputId, CppDType[x.dtype], reduceSize,
 outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return out;\n}\n\nexport const minConfig: KernelConfig = {\n kernelName: Min,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: min as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES

OR CONDITIONS OF ANY KIND, either express or implied.\n
 * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\nimport {KernelConfig, Minimum} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\nconst supportsFullBroadcast = false;\nexport const minimumConfig: KernelConfig =\n
createBinaryKernelConfig(Minimum, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2021 Google
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See
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==========\n
*/\n\nimport {KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs} from '@tensorflow/tfjs-
core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\n// Must match
enum in MirrorPad.cc\nenum MirrorPaddingMode {\n reflect = 0,\n symmetric = 1\n}\n\nlet wasmMirrorPad: (\n
xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n   prePaddingsBytes:
Uint8Array, postPaddingsBytes: Uint8Array, mode: number,\n   outId: number) => void;\n\nfunction
setup(backend: BackendWasm) {\n wasmMirrorPad = backend.wasm.cwrap(MirrorPad, null /* void */, [\n
'number', // xId\n   'array',   // x.shape\n   'number', // x.shape.length\n   'number', // x.dtype\n   'array',   // pre-
paddings\n   'array',   // post-paddings\n   'number', //
 mode\n   'number', // outId\n]);\n}\n\nfunction mirrorPad(args: {\n inputs: MirrorPadInputs,\n backend:
BackendWasm,\n attrs: MirrorPadAttrs\n}) {\n const {inputs: {x}, backend, attrs: {paddings, mode}} = args;\n\n
const outShape = paddings.map(\n   (p, i) => p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n const xId =
backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(outShape, x.dtype);\n const outId =
backend.dataIdMap.get(out.dataId).id;\n const xShapeBytes = new Uint8Array(new
Int32Array(x.shape).buffer);\n\n const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);\n const
postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n const prePaddingsBytes =\n   new
Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const postPaddingsBytes =\n   new Uint8Array(new
Int32Array(postPaddingsFlat).buffer);\n\n wasmMirrorPad(\n   xId, xShapeBytes, x.shape.length,
CppDType[x.dtype], prePaddingsBytes,\n   postPaddingsBytes,
 MirrorPaddingMode[mode], outId);\n return out;\n}\n\nexport const mirrorPadConfig: KernelConfig = {\n
kernelName: MirrorPad,\n backendName: 'wasm',\n kernelFunc: mirrorPad as {} as KernelFunc,\n setupFunc:
setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
==========\n
*/\n\nimport {KernelConfig, Multiply} from '@tensorflow/tfjs-core';\n\nimport
 {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = true;\nexport const
multiplyConfig: KernelConfig =\n   createBinaryKernelConfig(Multiply, supportsFullBroadcast);\n","/**\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {KernelConfig, Neg} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const negConfig: KernelConfig = createUnaryKernelConfig(Neg);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {BackendWasm} from '../backend_wasm';\n\n// Analogous to `struct Result` in `non_max_suppression_impl.h`.\ninterface Result {\n pSelectedIndices: number;\n selectedSize: number;\n pSelectedScores: number;\n pValidOutputs: number;\n}\n\n/**\n * Parse the result of the c++ method, which has the shape equivalent to\n * `Result`.\n */\nexport function parseResultStruct(\n   backend: BackendWasm, resOffset: number): Result {\n const result = new Int32Array(backend.wasm.HEAPU8.buffer, resOffset, 4);\n const pSelectedIndices = result[0];\n const selectedSize = result[1];\n const pSelectedScores = result[2];\n const pValidOutputs = result[3];\n // Since the result was allocated on the heap, we have to delete it.\n backend.wasm._free(resOffset);\n return {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs};\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs, NonMaxSuppressionV3Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n   boxesId: number, scoresId: number, maxOutputSize: number,\n   iouThreshold: number, scoreThreshold: number) => number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n   NonMaxSuppressionV3,\n   'number', // Result*\n   [\n   'number', // boxesId\n   'number', // scoresId\n   'number', // maxOutputSize\n   'number', // iouThreshold\n   'number', // scoreThreshold\n   ]);\n}\n\nfunction kernelFunc(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV3Inputs,\n attrs: NonMaxSuppressionV3Attrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold} = attrs;\n const {boxes, scores} = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset =\n   wasmFunc(boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n   parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V3, we have to delete it from the heap.\n backend.wasm._free(pSelectedScores);\n backend.wasm._free(pValidOutputs);\n\n const selectedIndicesTensor\n =\n   backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n return selectedIndicesTensor;\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n kernelName:

NonMaxSuppressionV3,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs, NonMaxSuppressionV4Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc: (\n boxesId: number, scoresId: number, maxOutputSize: number,\n   iouThreshold: number, scoreThreshold: number,\n padToMaxOutputSize: boolean) => number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n   NonMaxSuppressionV4,\n   'number', // Result*\n   [\n   'number', // boxesId\n   'number', // scoresId\n   'number', // maxOutputSize\n   'number', // iouThreshold\n   'number', // scoreThreshold\n   'bool',   // padToMaxOutputSize\n   ]);\n}\n\nfunction nonMaxSuppressionV4(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV4Inputs,\n attrs: NonMaxSuppressionV4Attrs\n}): TensorInfo[] {\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold, padToMaxOutputSize} =\n   attrs;\n const {boxes, scores} = inputs;\n\n const boxesId = backend.dataIdMap.get(boxes.dataId).id;\n const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset = wasmFunc(\n   boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n padToMaxOutputSize);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using scores for V4, we have to delete it from the heap.\n backend.wasm._free(pSelectedScores);\n\n const selectedIndicesTensor =\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n\n const validOutputsTensor = backend.makeOutput([], 'int32', pValidOutputs);\n\n return [selectedIndicesTensor, validOutputsTensor];\n}\n\nexport const nonMaxSuppressionV4Config: KernelConfig = {\n kernelName: NonMaxSuppressionV4,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: nonMaxSuppressionV4 as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs, NonMaxSuppressionV5Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {parseResultStruct} from './NonMaxSuppression_util';\n\nlet wasmFunc:\n   (boxesId: number, scoresId: number, maxOutputSize: number,\n   iouThreshold: number, scoreThreshold: number, softNmsSigma: number) =>\n   number;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(\n   NonMaxSuppressionV5,\n   'number', // Result*\n   [\n   'number', // boxesId\n   'number', // scoresId\n   'number', // maxOutputSize\n   'number', // iouThreshold\n   'number', // scoreThreshold\n   'number', // softNmsSigma\n   ]);\n}\n\nfunction kernelFunc(args: {\n backend: BackendWasm,\n inputs: NonMaxSuppressionV5Inputs,\n attrs: NonMaxSuppressionV5Attrs\n}): TensorInfo[] {\n const {backend, inputs, attrs} = args;\n const {iouThreshold, maxOutputSize, scoreThreshold, softNmsSigma} = attrs;\n const {boxes, scores} = inputs;\n\n const boxesId =

backend.dataIdMap.get(boxes.dataId).id;\n
const scoresId = backend.dataIdMap.get(scores.dataId).id;\n\n const resOffset = wasmFunc(\n boxesId, scoresId, maxOutputSize, iouThreshold, scoreThreshold,\n softNmsSigma);\n\n const {pSelectedIndices, selectedSize, pSelectedScores, pValidOutputs} =\n parseResultStruct(backend, resOffset);\n\n // Since we are not using validOutputs for V5, we have to delete it from the\n // heap.\n backend.wasm._free(pValidOutputs);\n\n const selectedIndicesTensor =\n backend.makeOutput([selectedSize], 'int32', pSelectedIndices);\n const selectedScoresTensor =\n backend.makeOutput([selectedSize], 'float32', pSelectedScores);\n\n return [selectedIndicesTensor, selectedScoresTensor];\n}\n\nexport const nonMaxSuppressionV5Config: KernelConfig = {\n kernelName: NonMaxSuppressionV5,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: kernelFunc as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport {KernelConfig, NotEqual} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const notEqualConfig: KernelConfig =\n createBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmOneHot: (\n indicesId: number, depth: number, onValue: number, offValue: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmOneHot = backend.wasm.cwrap(OneHot, null /* void */, [\n 'number', // indices_id\n 'number', // depth,\n 'number', // onValue\n 'number', // offValue\n 'number' // out_id\n]);\n}\n\nfunction oneHot(\n args: {inputs: OneHotInputs, attrs: OneHotAttrs, backend: BackendWasm}) {\n const {inputs, backend, attrs} = args;\n const {indices} = inputs;\n const {depth, onValue, offValue} = attrs;\n\n const out = backend.makeOutput([...indices.shape, depth], 'int32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n wasmOneHot(indicesId, depth, onValue, offValue, outId);\n\n return out;\n}\n\nexport const oneHotConfig: KernelConfig = {\n kernelName: OneHot,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: oneHot as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n

*/\n\nimport {KernelConfig, KernelFunc, OnesLike, OnesLikeInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nfunction onesLike(args: {inputs: OnesLikeInputs, backend: BackendWasm}) {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(1);\n return out;\n}\n\nexport const onesLikeConfig: KernelConfig = {\n kernelName: OnesLike,\n backendName: 'wasm',\n kernelFunc: onesLike as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, KernelFunc, Pack, PackAttrs, PackInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\nimport {BackendWasm} from '../backend_wasm';\n\nimport {concat} from './Concat';\nimport {expandDims} from './ExpandDims';\n\nexport function pack(\n   args: {inputs: PackInputs, backend: BackendWasm, attrs: PackAttrs}):\n   TensorInfo {\n const {inputs, backend, attrs} = args;\n const {axis} = attrs;\n\n if (inputs.length === 1) {\n   return expandDims(\n   {inputs: {input: inputs[0]}, backend, attrs: {dim: axis}});\n }\n\n const shape = inputs[0].shape;\n const dtype = inputs[0].dtype;\n\n inputs.forEach(t => {\n   util.assertShapesMatch(\n   shape, t.shape,\n   'All tensors passed to stack must have matching shapes');\n   util.assert(\n   dtype === t.dtype,\n   () => 'All tensors passed to stack must have matching dtypes');\n });\n\n const intermediateTensorInfos: TensorInfo[] = [];\n const expandedTensors = inputs.map(t => {\n   const expandedT =\n   expandDims({inputs: {input: t}, backend, attrs: {dim: axis}});\n   intermediateTensorInfos.push(expandedT);\n   return expandedT;\n });\n\n const result = concat({inputs: expandedTensors, backend, attrs: {axis}});\n\n intermediateTensorInfos.forEach(t => backend.disposeData(t.dataId));\n\n return result;\n}\n\nexport const packConfig: KernelConfig = {\n kernelName: Pack,\n backendName: 'wasm',\n kernelFunc: pack as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {fill} from './Fill';\n\nimport {CppDType} from './types';\n\nlet wasmPadV2: (\n   xId: number, xShapeBytes: Uint8Array, xShapeLength: number, xDtype: number,\n   prePaddingsBytes: Uint8Array, postPaddingsBytes: Uint8Array,\n   constantValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmPadV2 = backend.wasm.cwrap(PadV2, null /* void */, [\n   'number', // xId\n   'array',   // x.shape\n   'number', // x.shape.length\n   'number', // x.dtype\n   'array',   // pre-paddings\n   'array',   // post-paddings\n   'number', // constantValue\n   'number', // outId\n]);\n}\n\nfunction pad(\n   args: {inputs: PadV2Inputs, backend: BackendWasm, attrs: PadV2Attrs}) {\n const {inputs: {x}, backend, attrs:\n {paddings, constantValue}} = args;\n\n const outShape = paddings.map(\n   (p, i) => p[0] /* beforePad */ + x.shape[i] + p[1] /* afterPad */);\n\n if (util.sizeFromShape(x.shape) === 0) {\n   // Short-circuit the computation, since x doesn't have value, only\n   // the shape is used to compute output shape to pad.\n   return fill({\n backend,\n   attrs: {shape: outShape, value: constantValue, dtype: x.dtype}\n   });\n }\n\n const xId =

backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(outShape, x.dtype);\n const outTensorData = backend.dataIdMap.get(out.dataId);\n const outId = outTensorData.id;\n\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n const prePaddingsFlat = paddings.map(padTuple => padTuple[0]);\n const postPaddingsFlat = paddings.map(padTuple => padTuple[1]);\n const prePaddingsBytes =\n   new Uint8Array(new Int32Array(prePaddingsFlat).buffer);\n const postPaddingsBytes =\n   new Uint8Array(new
Int32Array(postPaddingsFlat).buffer);\n\n wasmPadV2(\n   xId, xShapeBytes, x.shape.length, CppDType[x.dtype], prePaddingsBytes,\n   postPaddingsBytes, constantValue, outId);\n return out;\n}\n\nexport const padV2Config: KernelConfig = {\n kernelName: PadV2,\n backendName: 'wasm',\n kernelFunc: pad as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {KernelConfig, Pow} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const powConfig: KernelConfig =\n createBinaryKernelConfig(Pow, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, Prelu, PreluInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {cast} from './Cast';\n\nlet wasmPrelu: (xId: number, weightsId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmPrelu = backend.wasm.cwrap(Prelu, null /* void */, [\n   'number', // x_id\n   'number', // weights_id\n   'number'   // out_id\n]);\n}\n\nfunction prelu(args: {inputs: PreluInputs, backend: BackendWasm}) {\n const {inputs, backend} = args;\n const {x, alpha} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const weightsId = backend.dataIdMap.get(alpha.dataId).id;\n\n let inputId = xId;\n const input = x;\n let castedInput = input;\n if (input.dtype !== 'float32') {\n   castedInput = cast({backend, inputs: {x}, attrs: {dtype: 'float32'}});\n   inputId = backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n
  const out = backend.makeOutput(x.shape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmPrelu(inputId, weightsId, outId);\n\n if (input.dtype !== 'float32') {\n backend.disposeData(castedInput.dataId);\n }\n return out;\n}\n\nexport const preluConfig: KernelConfig = {\n kernelName: Prelu,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prelu as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing
 permissions and\n * limitations under the License.\n *
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*/\n\nimport {backend_util, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\n\nimport {CppDType} from './types';\n\nlet wasmProd: (\n xId: number, reduceSize: number,\n dtype: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmProd = backend.wasm.cwrap(Prod, null /*void*/, [\n 'number',\n 'number',\n 'number',\n 'number'\n]);\n}\n\nfunction prod(args: {\n backend: BackendWasm,\n inputs: ProdInputs,\n attrs: ProdAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n if (transposedId !== xId) {\n // transpose was not a no-op. We will need to dispose of this\n // once we are done.\n input = transposed;\n inputId = transposedId;\n reductionAxes = backend_util.getInnerMostAxes(\n reductionAxes.length, input.shape.length);\n }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n 'prod', reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmProd(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n // reshape\n const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n out.shape = newShape;\n }\n\n return out;\n}\n\nexport const prodConfig: KernelConfig = {\n kernelName: Prod,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prod as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {rangeImplCPU} from '../kernel_utils/shared';\n\nexport const range =\n (args: {backend: BackendWasm, attrs: RangeAttrs}): TensorInfo => {\n const {backend, attrs} = args;\n const {start, stop, step, dtype} = attrs;\n const values = rangeImplCPU(start, stop, step, dtype);\n\n const out = backend.makeOutput([values.length], dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.set(values);\n return out;\n };\n\nexport const rangeConfig: KernelConfig = {\n kernelName: Range,\n backendName: 'wasm',\n kernelFunc: range as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\nimport { util } from '@tensorflow/tfjs-core';\nexport function rangeImpl(start, stop, step, dtype) {\n const sameStartStop = start === stop;\n const increasingRangeNegativeStep = start < stop && step < 0;\n const

decreasingRangePositiveStep = stop < start && step > 1;\n if (sameStartStop
 || increasingRangeNegativeStep ||\n   decreasingRangePositiveStep) {\n   return util.makeZerosTypedArray(0, dtype);\n }\n const numElements = Math.abs(Math.ceil((stop - start) / step));\n const values = util.makeZerosTypedArray(numElements, dtype);\n if (stop < start && step === 1) {\n   // Auto adjust the step's sign if it hasn't been set\n   // (or was set to 1)\n   step = -1;\n }\n values[0] = start;\n for (let i = 1; i < values.length; i++) {\n   values[i] = values[i - 1] + step;\n }\n return values;\n}\n//#
sourceMappingURL=data:application/json; base64,eyJ2ZXJzaW9uIjozLCJmaWxlIjoiUmFuZ2VfaW1wbC5qcyIsInNvdXJjZVJvb3QiOiIiLCJzb3VyY2VzIjpbIi4uLy4uLy4uLy4uLy4uLy4uL3RmanMtYmFja2VuZC1jcHUvc3JjL3tlcm5lbHMvUmFuZ2VfaW1wbC50cyJdLCJuYW1lcyI6W10sIm1hcHBpbmdzIjoiQUFBQTs7Ozs7Ozs7Ozs7O0dBZUc7QUFFSCxPQUFPLEVBQWMsTUFBTSxFQUFFLFVBQVUsRUFBRSxNQUFNLEVBQUUsTUFBTSxFQUFFLE1BQU0s

T09IDEpIHtcbiAgICAvLyBBdXRvIGFkanVzdCB0aGUgc3RlcCdzIHNpZ24gaWYgaXQgaGFzbid0IGJlZW4gc2V0XG4gICAgLy8gKG9yIHdhcyBzZXQgdG8gMSlcbiAgICBzdGVwID0gLTE7XG4gIH1cblxuICB2YWx1ZXNbMF0gPSBzdGFydDtcbiAgZm9yIChsZXQgaSA9IDE7IGkgPCBudW1WYWx1ZXM7IGkrKykge1xuICAgIHZhbHVlc1tpXSA9IHZhbHVlc1tpIC0gMV0gKyBzdGVwO1xuICB9XG5cbiAgcmV0dXJuIHZhbHVlcztcbn1cblxuLyoqXG4gKiBAbGljZW5zZVxuICogQ29weXJpZ2h0IDIwMTkgR29vZ2xlIExMQy4gQWxsIFJpZ2h0cyBSZXNlcnZlZC5cbiAqIExpY2Vuc2VkIHVuZGVyIHRoZSBBcGFjaGUgTGljZW5zZSwgVmVyc2lvbiAyLjAgKHRoZSBcIkxpY2Vuc2VcIik7XG4gKiB5b3UgbWF5IG5vdCB1c2UgdGhpcyBmaWxlIGV4Y2VwdCBpbiBjb21wbGlhbmNlIHdpdGggdGhlIExpY2Vuc2UuXG4gKiBZb3UgbWF5IG9idGFpbiBhIGNvcHkgb2YgdGhlIExpY2Vuc2UgYXRcbiAqXG4gKiBodHRwOi8vd3d3LmFwYWNoZS5vcmcvbGljZW5zZXMvTElDRU5TRS0yLjBcbiAqXG4gKiBVbmxlc3MgcmVxdWlyZWQgYnkgYXBwbGljYWJsZSBsYXcgb3IgYWdyZWVkIHRvIGluIHdyaXRpbmcsIHNvZnR3YXJlXG4gKiBkaXN0cmlidXRlZCB1bmRlciB0aGUgTGljZW5zZSBpcyBkaXN0cmlidXRlZCBvbiBhbiBcIkFTIElTXCIgQkFTSVMsXG4gKiBXSVRIT1VUIFdBUlJBTlRJRVMgT1IgQ09ORElUSU9OUyBPRiBBTlkgS0lORCwgZWl0aGVyIGV4cHJlc3Mgb3IgaW1wbGllZC5cbiAqIFNlZSB0aGUgTGljZW5zZSBmb3IgdGhlIHNwZWNpZmljIGxhbmd1YWdlIGdvdmVybmluZyBwZXJtaXNzaW9ucyBhbmRcbiAqIGxpbWl0YXRpb25zIHVuZGVyIHRoZSBMaWNlbnNlLlxuICogPT09PT09PT09P

'number', // numChannels\n 'number', // newHeight\n 'number', // newWidth\n 'number', // alignCorners\n 'number', // halfPixelCenters\n 'number' // outId\n]);\n}\n\nfunction resizeBilinear(args: {\n backend: BackendWasm,\n inputs: ResizeBilinearInputs,\n attrs: ResizeBilinearAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n\n const {images} = inputs;\n const {alignCorners, halfPixelCenters, size} = attrs;\n const [newHeight, newWidth] = size;\n\n const [batch, oldHeight, oldWidth, numChannels] = images.shape;\n const outShape = [batch, newHeight, newWidth, numChannels];\n\n let xData = backend.dataIdMap.get(images.dataId);\n let castedData;\n if (xData.dtype !== 'float32') {\n castedData =\n cast({backend, inputs: {x: images}, attrs: {dtype: 'float32'}});\n xData = backend.dataIdMap.get(castedData.dataId);\n }\n const xId = xData.id;\n\n const out = backend.makeOutput(outShape, 'float32');\n if (util.sizeFromShape(images.shape) === 0) {\n return out;\n }\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmResizeBilinear(\n xId, batch, oldHeight, oldWidth, numChannels, newHeight, newWidth,\n alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId);\n\n if (castedData != null) {\n backend.disposeData(castedData.dataId);\n }\n\n return out;\n}\n\nexport const resizeBilinearConfig: KernelConfig = {\n kernelName: ResizeBilinear,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: resizeBilinear as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\n\nlet wasmReverse: (\n xId: number, axes: Uint8Array, axesLength: number, outShape: Uint8Array,\n outShapeLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmReverse = backend.wasm.cwrap(Reverse, null, [\n 'number', // x_id\n 'array', // axes\n 'number', // axes_length\n 'array', // out_shape\n 'number', // out_shape_length\n 'number' // out_id\n]);\n}\n\nexport function reverse(\n args: {inputs: ReverseInputs, backend: BackendWasm, attrs: ReverseAttrs}):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {dims} = attrs;\n\n const axes = util.parseAxisParam(dims, x.shape);\n\n if (x.shape.length === 0) {\n return identity({inputs: {x}, backend});\n }\n\n const out = backend.makeOutput(x.shape, x.dtype);\n const xId = backend.dataIdMap.get(x.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const axesBytes = new Uint8Array(new Int32Array(axes).buffer);\n const outShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n\n wasmReverse(\n xId, axesBytes, axes.length, outShapeBytes, x.shape.length, outId);\n\n const reshaped =\n reshape({inputs: {x: out}, attrs: {shape: x.shape}, backend});\n\n backend.disposeData(out.dataId);\n return reshaped;\n}\n\nexport const reverseConfig: KernelConfig = {\n kernelName: Reverse,\n backendName: 'wasm',\n kernelFunc: reverse as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, KernelFunc, RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport

{BackendWasm} from '../backend_wasm';\n\nlet wasmRotate: (\n xId: number, batch: number, imageHeight: number, imageWidth: number,\n numChannels: number, radians: number, centerX: number, centerY: number,\n fillBytes: Uint8Array, fillLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmRotate = backend.wasm.cwrap(RotateWithOffset, null /* void */, [\n 'number', // xId\n 'number', // batch\n 'number', // imageHeight\n 'number', // imageWidth\n 'number', // numChannels\n 'number', // radians\n 'number', // centerX\n 'number', // centerY\n 'array', // fillBytes\n 'number', // fillLength\n 'number', // outId\n]);\n}\n\nexport function rotateWithOffset(args: {\n inputs: RotateWithOffsetInputs,\n backend: BackendWasm,\n attrs: RotateWithOffsetAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {image} = inputs;\n const {radians, fillValue, center} = attrs;\n\n const out = backend.makeOutput(image.shape, image.dtype);\n const imageId = backend.dataIdMap.get(image.dataId).id;\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n\n const [centerX, centerY] =\n backend_util.getImageCenter(center, imageHeight, imageWidth);\n\n const fillIsBlack = fillValue === 0;\n const fullOpacityValue = 255;\n\n const fillValues = typeof fillValue === 'number' ?\n [fillValue, fillValue, fillValue, fillIsBlack ? 0 : fullOpacityValue] :\n [...fillValue, fullOpacityValue];\n const fillBytes = new Uint8Array(new Int32Array(fillValues).buffer);\n\n wasmRotate(\n imageId, batch, imageHeight, imageWidth, numChannels, radians, centerX,\n centerY, fillBytes, fillValues.length, outId);\n return out;\n}\n\nexport const rotateWithOffsetConfig: KernelConfig = {\n kernelName: RotateWithOffset,\n backendName: 'wasm',\n kernelFunc: rotateWithOffset as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ==\n */\nimport {KernelConfig, Round} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const roundConfig: KernelConfig = createUnaryKernelConfig(Round);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ==\n */\nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const rsqrtConfig: KernelConfig = createUnaryKernelConfig(Rsqrt);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {KernelConfig, KernelFunc, scatter_util, ScatterNd, ScatterNdAttrs, ScatterNdInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from

'./types';\n\nlet wasmScatterNd: (\n indicesId: number, updatesId: number, dtype: CppDType, sliceRank: number,\n numUpdates: number, sliceSize: number, strides: Uint8Array,\n outputSize: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmScatterNd = backend.wasm.cwrap(ScatterNd, null /*void*/, [\n 'number', // indicesId\n 'number', // updatesId\n 'number', // dtype\n 'number', // sliceRank\n 'number', // numUpdates\n 'number', // sliceSize\n 'array', // strides\n 'number', // outputSize\n 'number' // outId\n]);\n}\n\nfunction scatterNd(\n args:\n {backend: BackendWasm, inputs: ScatterNdInputs, attrs:
ScatterNdAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {indices, updates} = inputs;\n const {shape} = attrs;\n\n const out = backend.makeOutput(shape, updates.dtype);\n if (util.sizeFromShape(shape) === 0) {\n return out;\n }\n\n const {sliceRank, numUpdates, sliceSize, strides, outputSize} =\n scatter_util.calculateShapes(updates, indices, shape);\n\n const indicesData = backend.dataIdMap.get(indices.dataId);\n const indicesId = indicesData.id;\n\n const updatesData = backend.dataIdMap.get(updates.dataId);\n const updatesId = updatesData.id;\n\n const stridesBytes = new Uint8Array(new Int32Array(strides).buffer);\n\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmScatterNd(\n indicesId, updatesId, CppDType[updates.dtype], sliceRank, numUpdates,\n sliceSize, stridesBytes, outputSize, outId);\n\n return out;\n}\n\nexport const scatterNdConfig: KernelConfig = {\n kernelName: ScatterNd,\n backendName: 'wasm',\n
  setupFunc: setup,\n kernelFunc: scatterNd as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {KernelConfig, KernelFunc, Select, SelectInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmSelect: (\n conditionId: number, tId: number,
  eId: number, offset: number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmSelect = backend.wasm.cwrap('SelectV2', null, [\n 'number', // conditionId\n 'number', // tId\n 'number', // eId\n 'number', // offset\n 'number', // outId\n]);\n}\n\nfunction select(args: {inputs: SelectInputs, backend: BackendWasm}) {\n const {inputs, backend} = args;\n const {condition, t, e} = inputs;\n\n const conditionId = backend.dataIdMap.get(condition.dataId).id;\n const tId = backend.dataIdMap.get(t.dataId).id;\n const eId = backend.dataIdMap.get(e.dataId).id;\n const out = backend.makeOutput(t.shape, t.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const cRank = condition.shape.length;\n const tRank = t.shape.length;\n\n const offset = cRank === 0 || cRank > 1 || tRank === 1 ?\n 1 :\n util.sizeFromShape(t.shape.slice(1));\n\n wasmSelect(conditionId, tId, eId, offset, outId);\n return out;\n}\n\nexport const
  selectConfig: KernelConfig = {\n kernelName: Select,\n backendName: 'wasm',\n kernelFunc: select as {} as KernelFunc,\n setupFunc: setup\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {KernelConfig, KernelFunc, Sigmoid, SigmoidInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm}

from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Sigmoid, null /* void */, ['number', 'number']);\n}\n\nfunction sigmoid(args: {backend: BackendWasm, inputs: SigmoidInputs}):\n   TensorInfo {\n const {backend, inputs: {x}} = args;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n   return out;\n }\n\n wasmFunc(xId, outId);\n return out;\n}\n\nexport const sigmoidConfig: KernelConfig = {\n kernelName: 'Sigmoid',\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sigmoid as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport {KernelConfig, Sin} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const sinConfig: KernelConfig = createUnaryKernelConfig(Sin);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n
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/\n\nimport {KernelConfig, KernelFunc, Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmFunc: (xId: number, outId: number, channels: number, batch: number) =>\n   void;\n\nfunction setup(backend: BackendWasm): void {\n wasmFunc = backend.wasm.cwrap(Softmax, null / void */, [\n   'number', // xId\n   'number', // outId\n   'number', // channels\n   'number'   // batch\n]);\n}\n\nfunction softmax(\n   args: {backend: BackendWasm,
 inputs: SoftmaxInputs, attrs: SoftmaxAttrs}):\n   TensorInfo {\n const {backend, inputs: {logits}, attrs: {dim}} = args;\n const xId = backend.dataIdMap.get(logits.dataId).id;\n const out = backend.makeOutput(logits.shape, logits.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const channels = logits.shape[dim];\n const batch = util.sizeFromShape(logits.shape) / channels;\n\n // Short-circuit zero-sized tensors.\n if (util.sizeFromShape(out.shape) === 0) {\n   return out;\n }\n\n wasmFunc(xId, outId, channels, batch);\n return out;\n}\n\nexport const softmaxConfig: KernelConfig = {\n kernelName: Softmax,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: softmax as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n
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*/\n\nimport {backend_util, KernelConfig, KernelFunc, ReshapeAttrs, ReshapeInputs, SpaceToBatchND, SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, TransposeAttrs, TransposeInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {padV2Config} from

'./PadV2';\nimport {reshape} from './Reshape';\nimport {transpose} from './Transpose';\n\nfunction spaceToBatchND(args: {\n inputs: SpaceToBatchNDInputs,\n backend: BackendWasm,\n attrs: SpaceToBatchNDAttrs\n}) {\n const {inputs, backend,
  attrs} = args;\n const {x} = inputs;\n const {blockShape, paddings} = attrs;\n\n const prod = util.sizeFromShape(blockShape);\n\n const completePaddings: Array<[number, number]> = [[0, 0]];\n completePaddings.push(...(paddings as Array<[number, number]>));\n\n for (let i = 1 + blockShape.length; i < x.shape.length; ++i) {\n   completePaddings.push([0, 0]);\n }\n\n const paddedX = padV2Config.kernelFunc({\n inputs: {x},\n   backend,\n   attrs: {paddings: completePaddings, constantValue: 0}\n }) as TensorInfo;\n\n const reshapedPaddedShape =\n   backend_util.getReshaped(paddedX.shape, blockShape, prod, false);\n\n const permutedReshapedPaddedPermutation = backend_util.getPermuted(\n   reshapedPaddedShape.length, blockShape.length, false);\n\n const flattenShape =\n   backend_util.getReshapedPermuted(paddedX.shape, blockShape, prod, false);\n\n const reshapeInputs: ReshapeInputs = {x: paddedX};\n const reshapeAttrs: ReshapeAttrs = {shape: reshapedPaddedShape};\n
  const paddedXReshaped =\n   reshape({inputs: reshapeInputs, backend, attrs: reshapeAttrs});\n\n const transposeInputs: TransposeInputs = {x: paddedXReshaped};\n const transposeAttrs:\n   TransposeAttrs = {perm: permutedReshapedPaddedPermutation};\n const paddedXT =\n   transpose({inputs: transposeInputs, backend, attrs: transposeAttrs});\n\n const resultReshapeInputs: ReshapeInputs = {x: paddedXT};\n const resultReshapeAttrs: ReshapeAttrs = {shape: flattenShape};\n const result = reshape(\n   {inputs: resultReshapeInputs, backend, attrs: resultReshapeAttrs});\n\n backend.disposeData(paddedX.dataId);\n backend.disposeData(paddedXReshaped.dataId);\n backend.disposeData(paddedXT.dataId);\n\n return result;\n}\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n kernelName: SpaceToBatchND,\n backendName: 'wasm',\n kernelFunc: spaceToBatchND as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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*/\n\nimport {KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, util} from '@tensorflow/tfjs-core';\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {slice} from './Slice';\n\nexport function splitV(\n   args: {inputs: SplitVInputs, attrs: SplitVAttrs, backend: BackendWasm}) {\n const {inputs,
  attrs, backend} = args;\n const {x} = inputs;\n const {numOrSizeSplits, axis} = attrs;\n\n const $axis = util.parseAxisParam(axis, x.shape)[0];\n\n const splitSizes = backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n const begin = new Array(x.shape.length).fill(0);\n const size = x.shape.slice();\n return splitSizes.map(s => {\n   const xSliceSize = [...size];\n   xSliceSize[$axis] = s;\n   const xSlice =\n   slice({inputs: {x}, attrs: {begin, size: xSliceSize}, backend});\n   begin[$axis] += s;\n   return xSlice;\n });\n}\n\nexport const splitVConfig: KernelConfig = {\n kernelName: SplitV,\n backendName: 'wasm',\n kernelFunc: splitV as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {KernelConfig, Sqrt} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const sqrtConfig: KernelConfig = createUnaryKernelConfig(Sqrt);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n
 * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n*/\nimport {KernelConfig, Square} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const squareConfig: KernelConfig = createUnaryKernelConfig(Square);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n*/\nimport {KernelConfig, SquaredDifference} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = true;\nexport const squaredDifferenceConfig: KernelConfig =\n   createBinaryKernelConfig(SquaredDifference, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on
 an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n*/\n\nimport {KernelConfig, KernelFunc, Step, StepAttrs, StepInputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmStep: (xId: number, alpha: number, dtype: number, outId: number) =>\n   void;\n\nfunction setup(backend: BackendWasm): void {\n wasmStep = backend.wasm.cwrap(Step, null /*void*/, [\n   'number', // x_id\n   'number', // alpha\n   'number', // dtype\n   'number', // out_id\n]);\n}\n\nfunction step(\n   args: {backend: BackendWasm, inputs: StepInputs, attrs: StepAttrs}):\n   TensorInfo {\n const {backend, inputs, attrs} = args;\n const {alpha} = attrs;\n const {x} = inputs;\n const xId
 = backend.dataIdMap.get(x.dataId).id;\n\n const out = backend.makeOutput(x.shape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmStep(xId, alpha, CppDType[x.dtype], outId);\n return out;\n}\n\nexport const stepConfig: KernelConfig = {\n kernelName: Step,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: step as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under

the License.\n *
==========\n*/\n\nimport {KernelConfig, KernelFunc, slice_util, StridedSlice, StridedSliceAttrs, StridedSliceInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {reshape} from './Reshape';\nimport {slice} from './Slice';\n\nlet wasmStridedSlice: (\n xId: number, xStridesBytes: Uint8Array, xRank: number,\n beginBytes: Uint8Array, endBytes: Uint8Array, stridesBytes: Uint8Array,\n outShapeBytes: Uint8Array, outStridesBytes: Uint8Array,\n outShapeLength: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmStridedSlice = backend.wasm.cwrap(StridedSlice, null /*void*/, [\n 'number', // xId\n 'array', // xStrides\n 'number', // xRank\n 'array', // beginBytes\n 'array', // endBytes\n 'array', // stridesBytes\n 'array', // outShapeBytes\n 'array', // outStridesBytes\n 'number', // outShapeLength\n 'number', // outId\n]);\n}\n\nexport function stridedSlice(args: {\n backend: BackendWasm,\n inputs: StridedSliceInputs,\n attrs: StridedSliceAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n const {x} = inputs;\n\n const {\n begin,\n end,\n strides,\n beginMask,\n endMask,\n ellipsisMask,\n newAxisMask,\n shrinkAxisMask\n } = attrs;\n\n const {\n finalShapeSparse,\n finalShape,\n isIdentity,\n sliceDim0,\n isSimpleSlice,\n begin: $begin,\n end: $end,\n strides: $strides\n } =\n slice_util.sliceInfo(\n x.shape, begin, end, strides, beginMask, endMask, ellipsisMask,\n newAxisMask, shrinkAxisMask);\n\n let result;\n if (isIdentity) {\n // Optimization #1, slice is a no-op plus reshape\n result = reshape({inputs: {x}, backend, attrs: {shape: finalShape}});\n } else if (sliceDim0 || isSimpleSlice) {\n // Optimization #2, slice is memory contiguous (only occurs in dim 0)\n util.assert(\n x.shape.length >= 1,\n () => `Input must have rank at least 1, got: ${x.shape.length}`);\n\n const size = slice_util.computeOutShape($begin, $end, $strides);\n // To tolerate begin[0] > end[0] (a 0-output slice), we min(begin, end).\n const sliced = slice({inputs: {x}, backend, attrs: {begin: $begin, size}});\n result =\n reshape({inputs: {x: sliced}, backend, attrs: {shape: finalShape}});\n backend.disposeData(sliced.dataId);\n } else {\n const out = backend.makeOutput(finalShapeSparse, 'float32');\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const xStridesBytes =\n new Uint8Array(new Int32Array(util.computeStrides(x.shape)).buffer);\n const beginBytes = new Uint8Array(new Int32Array($begin).buffer);\n const endBytes = new Uint8Array(new Int32Array($end).buffer);\n const stridesBytes = new Uint8Array(new Int32Array($strides).buffer);\n\n const outputShapeBytes =\n new Uint8Array(new Int32Array(finalShapeSparse).buffer);\n const outStridesBytes = new Uint8Array(\n new Int32Array(util.computeStrides(finalShapeSparse)).buffer);\n const outId =\n backend.dataIdMap.get(out.dataId).id;\n\n wasmStridedSlice(\n xId, xStridesBytes, x.shape.length,\n beginBytes, endBytes, stridesBytes,\n outputShapeBytes, outStridesBytes, finalShapeSparse.length, outId);\n\n result = reshape({inputs: {x: out}, backend, attrs: {shape: finalShape}});\n\n backend.disposeData(out.dataId);\n }\n\n return result;\n}\n\nexport const stridedSliceConfig: KernelConfig = {\n kernelName: StridedSlice,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: stridedSlice as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n*/\nimport {KernelConfig, Sub} from '@tensorflow/tfjs-core';\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = true;\n\nexport const subConfig: KernelConfig =\n createBinaryKernelConfig(Sub, supportsFullBroadcast);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *

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==========\n
*/\n\nimport {backend_util, KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {permuteAxesAndTranspose} from './kernel_utils';\nimport {CppDType} from './types';\n\nlet wasmSum: (xId: number, reduceSize: number, dtype: number, outId: number) =>\n void;\n\nfunction setup(backend: BackendWasm): void {\n wasmSum = backend.wasm.cwrap(Sum, null /*void*/, [\n   'number', // input_id\n   'number', // reduce_size\n   'number', // dtype\n
    'number', // out_id\n]);\n}\n\nfunction sum(args: {backend: BackendWasm, inputs: SumInputs, attrs: SumAttrs}):\n   TensorInfo {\n const {backend, inputs, attrs} = args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n   permuteAxesAndTranspose(x, axis, backend);\n\n let reductionAxes = axes;\n if (inputWasTransposed) {\n   const transposedId =
backend.dataIdMap.get(transposed.dataId).id;\n   if (transposedId !== xId) {\n   // transpose was not a no-op. We will need to dispose of this\n   // once we are done.\n   input = transposed;\n   inputId = transposedId;\n   reductionAxes = backend_util.getInnerMostAxes(\n   reductionAxes.length, input.shape.length);\n   }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n   'sum', reductionAxes, input.shape.length);\n const [outShape,
  reduceShape] =\n   backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n   wasmSum(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n return out;\n}\n\nexport const sumConfig: KernelConfig = {\n kernelName: Sum,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: sum as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\nimport {KernelConfig, Tan} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const tanConfig: KernelConfig = createUnaryKernelConfig(Tan);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n
  * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from

'./unary_kernel';\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n*/\n\nimport {KernelConfig, KernelFunc, Tile, TileAttrs, TileInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nlet wasmTile: (\n xId: number, xShape: Uint8Array, xShapeSize: number, newShape: Uint8Array,\n newShapeSize: number, dtype: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTile = backend.wasm.cwrap(Tile, null /* void */, [\n 'number', // x_id\n 'array', // x_shape\n 'number', // x_shape.length\n 'array', // new_shape\n 'number', // new_shape.length\n 'number' // out_id\n]);\n}\n\nfunction tile(\n args: {inputs: TileInputs, backend: BackendWasm, attrs: TileAttrs}) {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const {reps} = attrs;\n\n const newShape: number[] = new Array(x.shape.length);\n for (let i = 0; i < newShape.length; i++) {\n newShape[i] = x.shape[i] * reps[i];\n }\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n const newShapeBytes = new Uint8Array(new Int32Array(newShape).buffer);\n\n const out = backend.makeOutput(newShape, x.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmTile(\n xId, xShapeBytes, x.shape.length, newShapeBytes, newShape.length,\n CppDType[out.dtype], outId);\n return out;\n}\n\nexport const tileConfig: KernelConfig = {\n kernelName: Tile,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: tile as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n*/\n\nimport {KernelConfig, KernelFunc, TensorInfo, TopK, TopKAttrs, TopKInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\nimport {CppDType} from './types';\n\nlet wasmTopK: (\n xId: number, xShapeBytes: Uint8Array, xShapeLength: number,\n xDtype: CppDType, k: number, sorted: boolean,\n outValuesId: number,\n outIndicesId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmTopK = backend.wasm.cwrap(TopK, null /* void */, [\n 'number', // xId\n 'array', // x.shape\n 'number', // x.shape.length\n 'number', // x.dtype\n 'number', // k\n 'bool', // sorted\n 'number', // outValuesId\n 'number', // outIndicesId\n]);\n}\n\nexport const topk:\n (args: {inputs: TopKInputs, backend: BackendWasm, attrs: TopKAttrs}) =>\n TensorInfo[] | TensorInfo = ({inputs, backend, attrs}) => {\n const {x} = inputs;\n const {k, sorted} = attrs;\n\n const xId = backend.dataIdMap.get(x.dataId).id;\n const xShapeBytes = new Uint8Array(new Int32Array(x.shape).buffer);\n const outputShape = x.shape.slice();\n outputShape[outputShape.length - 1] = k;\n const outValues = backend.makeOutput(outputShape, x.dtype);\n const outValuesId = backend.dataIdMap.get(outValues.dataId).id;\n\n const outIndices = backend.makeOutput(outputShape, 'int32');\n const outIndicesId = backend.dataIdMap.get(outIndices.dataId).id;\n\n wasmTopK(\n xId, xShapeBytes, x.shape.length,\n CppDType[x.dtype], k, sorted,\n outValuesId, outIndicesId);\n\n return [outValues, outIndices];\n};\n\nexport const topKConfig: KernelConfig = {\n kernelName: TopK,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: topk as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2021 Google LLC. All

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CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transform, TransformAttrs, TransformInputs, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmTransform: (\n imageId: number, transformsId: number, isBatchTransform: boolean,\n batch: number, outHeight: number, outWidth: number, numChannels: number,\n imageWidth: number, imageHeight: number, strides: Uint8Array,\n stridesLength: number, interpolationModeId: number, fillModeId: number,\n fillValue: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmTransform = backend.wasm.cwrap(Transform, null /*void*/, [\n 'number', // imageId\n 'number', // transformsId\n 'bool', // isBatchTransform\n 'number', // batch\n 'number', // outHeight\n 'number', // outWidth\n 'number', // numChannels\n 'number', // imageWidth\n 'number', // imageHeight\n 'array', // strides\n 'number', // stridesLength\n 'number', // interpolationModeId\n 'number', // fillModeId\n 'number', // fillValue\n 'number' // outId\n]);\n}\n\nfunction transform(\n args:\n {backend: BackendWasm, inputs: TransformInputs, attrs: TransformAttrs}):\n TensorInfo {\n const {backend, inputs, attrs} = args;\n const {image, transforms} = inputs;\n const {interpolation, fillMode, fillValue, outputShape} = attrs;\n\n const [batch, imageHeight, imageWidth, numChannels] = image.shape;\n const [outHeight, outWidth] =\n outputShape != null ? outputShape : [imageHeight, imageWidth];\n const outShape =\n [batch, outHeight, outWidth,\n numChannels] as [number, number, number, number];\n const strides =\n new Uint8Array(new Int32Array(util.computeStrides(image.shape)).buffer);\n\n
const out = backend.makeOutput(outShape, image.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const imageData = backend.dataIdMap.get(image.dataId);\n const imageId = imageData.id;\n\n const transformsData = backend.dataIdMap.get(transforms.dataId);\n const transformsId = transformsData.id;\n\n const interpolationModeId = interpolation === 'nearest' ? 1 : 2;\n let fillModeId;\n switch (fillMode) {\n case 'constant':\n fillModeId = 1;\n break;\n case 'reflect':\n fillModeId = 2;\n break;\n case 'wrap':\n fillModeId = 3;\n break;\n case 'nearest':\n fillModeId = 4;\n break;\n default:\n fillModeId = 1;\n break;\n }\n\n wasmTransform(\n imageId, transformsId, (transforms.shape[0] > 1), batch, outHeight,\n outWidth, numChannels, imageWidth, imageHeight, strides,\n image.shape.length - 1, interpolationModeId, fillModeId, fillValue,\n outId);\n\n
return out;\n}\n\nexport const transformConfig: KernelConfig = {\n kernelName: Transform,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: transform as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, ZerosLike, ZerosLikeInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nfunction zerosLike(args: {inputs: ZerosLikeInputs, backend: BackendWasm}) {\n const {inputs: {x}, backend} = args;\n const out = backend.makeOutput(x.shape, x.dtype);\n const outVals = backend.typedArrayFromHeap(out);\n outVals.fill(0);\n return out;\n}\n\nexport const zerosLikeConfig: KernelConfig = {\n kernelName: ZerosLike,\n backendName: 'wasm',\n kernelFunc: zerosLike

as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n
 * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n// We explicitly import the modular kernels so they get registered in the\n// global registry when we compile the library. A modular build would replace\n// the contents of this file and import only the kernels that are needed.\nimport {KernelConfig, registerKernel} from '@tensorflow/tfjs-core';\n\nimport {fusedMatMulConfig} from './kernels/_FusedMatMul';\nimport {absConfig} from './kernels/Abs';\nimport {addConfig} from './kernels/Add';\nimport {addNConfig} from './kernels/AddN';\nimport {allConfig} from './kernels/All';\nimport {anyConfig} from './kernels/Any';\nimport {argMaxConfig} from './kernels/ArgMax';\nimport {avgPoolConfig} from './kernels/AvgPool';\nimport {batchMatMulConfig} from './kernels/BatchMatMul';\nimport {batchToSpaceNDConfig} from './kernels/BatchToSpaceND';\nimport {castConfig} from './kernels/Cast';\nimport {ceilConfig} from './kernels/Ceil';\nimport {clipByValueConfig} from './kernels/ClipByValue';\nimport {concatConfig} from './kernels/Concat';\nimport {conv2DConfig} from './kernels/Conv2D';\nimport {conv2DBackpropInputConfig} from './kernels/Conv2DBackpropInput';\nimport {cosConfig} from './kernels/Cos';\nimport {coshConfig} from './kernels/Cosh';\nimport {cropAndResizeConfig} from './kernels/CropAndResize';\nimport {cumsumConfig} from './kernels/Cumsum';\nimport {depthToSpaceConfig} from './kernels/DepthToSpace';\nimport {depthwiseConv2dNativeConfig} from './kernels/DepthwiseConv2dNative';\nimport {eluConfig} from './kernels/Elu';\nimport {equalConfig} from './kernels/Equal';\nimport {expConfig} from './kernels/Exp';\nimport {expandDimsConfig} from './kernels/ExpandDims';\nimport {fillConfig} from './kernels/Fill';\nimport {flipLeftRightConfig} from './kernels/FlipLeftRight';\nimport {floorConfig} from './kernels/Floor';\nimport {floorDivConfig} from './kernels/FloorDiv';\nimport {fusedBatchNormConfig} from './kernels/FusedBatchNorm';\nimport {fusedConv2DConfig} from './kernels/FusedConv2D';\nimport {fusedDepthwiseConv2DConfig} from './kernels/FusedDepthwiseConv2D';\nimport {gatherNdConfig} from './kernels/GatherNd';\nimport {gatherV2Config} from './kernels/GatherV2';\nimport {greaterConfig} from './kernels/Greater';\nimport {greaterEqualConfig} from './kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport {leakyReluConfig} from './kernels/LeakyRelu';\nimport {lessConfig} from './kernels/Less';\nimport {lessEqualConfig} from './kernels/LessEqual';\nimport {logConfig} from './kernels/Log';\nimport {logicalAndConfig} from './kernels/LogicalAnd';\nimport {maxConfig} from './kernels/Max';\nimport {maximumConfig} from './kernels/Maximum';\nimport {maxPoolConfig} from './kernels/MaxPool';\nimport {meanConfig} from './kernels/Mean';\nimport {minConfig} from './kernels/Min';\nimport {minimumConfig} from './kernels/Minimum';\nimport {mirrorPadConfig} from './kernels/MirrorPad';\nimport {multiplyConfig} from './kernels/Multiply';\nimport {negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from './kernels/NonMaxSuppressionV3';\nimport {nonMaxSuppressionV4Config} from './kernels/NonMaxSuppressionV4';\nimport {nonMaxSuppressionV5Config} from './kernels/NonMaxSuppressionV5';\nimport {notEqualConfig} from './kernels/NotEqual';\nimport {oneHotConfig} from './kernels/OneHot';\nimport {onesLikeConfig} from './kernels/OnesLike';\nimport {packConfig} from './kernels/Pack';\nimport {padV2Config} from './kernels/PadV2';\nimport {powConfig} from './kernels/Pow';\nimport {preluConfig} from './kernels/Prelu';\nimport {prodConfig} from './kernels/Prod';\nimport {rangeConfig} from './kernels/Range';\nimport {realDivConfig} from './kernels/RealDiv';\nimport {reluConfig} from './kernels/Relu';\nimport {relu6Config} from './kernels/Relu6';\nimport {reshapeConfig} from './kernels/Reshape';\nimport

{resizeBilinearConfig} from './kernels/ResizeBilinear';\nimport {reverseConfig} from './kernels/Reverse';\nimport {rotateWithOffsetConfig} from './kernels/RotateWithOffset';\nimport {roundConfig} from './kernels/Round';\nimport {rsqrtConfig} from './kernels/Rsqrt';\nimport {scatterNdConfig} from './kernels/ScatterNd';\nimport {selectConfig} from './kernels/Select';\nimport {sigmoidConfig} from './kernels/Sigmoid';\nimport {sinConfig} from './kernels/Sin';\nimport {sliceConfig} from './kernels/Slice';\nimport {softmaxConfig} from './kernels/Softmax';\nimport {spaceToBatchNDConfig} from './kernels/SpaceToBatchND';\nimport {splitVConfig} from './kernels/SplitV';\nimport {sqrtConfig} from './kernels/Sqrt';\nimport {squareConfig} from './kernels/Square';\nimport {squaredDifferenceConfig} from './kernels/SquaredDifference';\nimport {stepConfig} from './kernels/Step';\nimport {stridedSliceConfig} from './kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig} from './kernels/Sum';\nimport {tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport {tileConfig} from './kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transformConfig} from './kernels/Transform';\nimport {transposeConfig} from './kernels/Transpose';\nimport {unpackConfig} from './kernels/Unpack';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst kernelConfigs: KernelConfig[] = [\n absConfig,\n addConfig,\n addNConfig,\n allConfig,\n anyConfig,\n argMaxConfig,\n avgPoolConfig,\n batchMatMulConfig,\n batchToSpaceNDConfig,\n castConfig,\n ceilConfig,\n clipByValueConfig,\n concatConfig,\n conv2DConfig,\n conv2DBackpropInputConfig,\n cosConfig,\n coshConfig,\n cropAndResizeConfig,\n cumsumConfig,\n depthToSpaceConfig,\n depthwiseConv2dNativeConfig,\n eluConfig,\n equalConfig,\n expConfig,\n expandDimsConfig,\n fillConfig,\n flipLeftRightConfig,\n floorConfig,\n floorDivConfig,\n fusedMatMulConfig,\n fusedBatchNormConfig,\n fusedConv2DConfig,\n fusedDepthwiseConv2DConfig,\n gatherNdConfig,\n gatherV2Config,\n greaterConfig,\n greaterEqualConfig,\n identityConfig,\n leakyReluConfig,\n lessConfig,\n lessEqualConfig,\n logConfig,\n logicalAndConfig,\n maxConfig,\n maximumConfig,\n maxPoolConfig,\n meanConfig,\n minConfig,\n minimumConfig,\n mirrorPadConfig,\n multiplyConfig,\n negConfig,\n nonMaxSuppressionV3Config,\n nonMaxSuppressionV4Config,\n nonMaxSuppressionV5Config,\n notEqualConfig,\n oneHotConfig,\n onesLikeConfig,\n packConfig,\n padV2Config,\n powConfig,\n preluConfig,\n prodConfig,\n rangeConfig,\n realDivConfig,\n reluConfig,\n relu6Config,\n reshapeConfig,\n resizeBilinearConfig,\n reverseConfig,\n rotateWithOffsetConfig,\n rsqrtConfig,\n roundConfig,\n scatterNdConfig,\n selectConfig,\n sigmoidConfig,\n sinConfig,\n sliceConfig,\n softmaxConfig,\n spaceToBatchNDConfig,\n splitVConfig,\n sqrtConfig,\n squareConfig,\n squaredDifferenceConfig,\n stepConfig,\n stridedSliceConfig,\n subConfig,\n sumConfig,\n tanConfig,\n tanhConfig,\n tileConfig,\n topKConfig,\n transformConfig,\n transposeConfig,\n unpackConfig,\n zerosLikeConfig\n];\n\nfor (const kernelConfig of kernelConfigs) {\n registerKernel(kernelConfig);\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {slice} from './Slice';\n\nfunction unpack(\n args: {inputs: UnpackInputs, backend: BackendWasm, attrs: UnpackAttrs}):\n TensorInfo[] {\n const {inputs, backend, attrs} = args;\n const {value} = inputs;\n let {axis} = attrs;\n\n if (axis < 0) {\n axis += value.shape.length;\n }\n\n const numOutputs = value.shape[axis];\n const rank = value.shape.length;\n const outShape: number[] = new Array(rank - 1);\n let outIndex = 0;\n for (let i = 0; i < rank; i++) {\n if (i !== axis) {\n outShape[outIndex++] = value.shape[i];\n }\n }\n const outs: TensorInfo[] = new

Array(numOutputs);\n const begin = new Array(rank).fill(0);\n const size = value.shape.slice();\n size[axis] = 1;\n for (let i = 0; i < outs.length;
 i++) {\n   begin[axis] = i;\n   outs[i] = slice({inputs: {x: value}, attrs: {begin, size}, backend});\n }\n return outs.map(({dataId, dtype}) => ({dataId, dtype, shape: outShape}));\n}\n\nexport const unpackConfig: KernelConfig = {\n kernelName: Unpack,\n backendName: 'wasm',\n kernelFunc: unpack as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
 */\n\nimport {env} from '@tensorflow/tfjs-core';\n\nconst ENV = env();\n\n/**\n * True if SIMD is supported.\n */\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag(\n   // This typed array passed in to WebAssembly.validate is WebAssembly binary\n   // code. In this case it is a small program that contains SIMD\n   // instructions.\n   'WASM_HAS_SIMD_SUPPORT', async () => WebAssembly.validate(new Uint8Array([\n   0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1,   96, 0, 0, 3,\n   2, 1, 0,   10, 9, 1, 7, 0, 65, 0, 253, 15, 26, 11\n   ])));\n\n/**\n * True if threads are supported.\n */\n// From: https://github.com/GoogleChromeLabs/wasm-feature-detect\nENV.registerFlag('WASM_HAS_MULTITHREAD_SUPPORT', async () => {\n // TODO(annxingyuan): Enable node support once this is resolved:\n // https://github.com/tensorflow/tfjs/issues/3830\n if (ENV.get('IS_NODE')) {\n   return false;\n }\n\n try {\n   // Test for transferability of SABs (needed for Firefox)\n   // https://groups.google.com/forum/#!msg/mozilla.dev.platform/IHkBZlHETpA/dwsMNchWEQAJ\n   new MessageChannel().port1.postMessage(new SharedArrayBuffer(1));\n   // This typed array is a WebAssembly program containing threaded\n   // instructions.\n   return WebAssembly.validate(new Uint8Array([\n   0, 97, 115, 109, 1, 0, 0, 0, 1, 4, 1, 96, 0,   0, 3, 2, 1, 0, 5,\n   4, 1, 3,   1,   1, 10, 11, 1, 9, 0, 65, 0, 254, 16, 2, 0, 26, 11\n   ]));\n } catch (e) {\n   return false;\n }\n});\n","\nvar WasmBackendModuleThreadedSimd = (function() {\n var _scriptDir = typeof document !== 'undefined' && document.currentScript ? document.currentScript.src : undefined;\n if (typeof __filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return (\nfunction(WasmBackendModuleThreadedSimd) {\n WasmBackendModuleThreadedSimd = WasmBackendModuleThreadedSimd || {};\n\nfunction GROWABLE_HEAP_I8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return
 HEAP8}function GROWABLE_HEAP_U8(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAPU8}function GROWABLE_HEAP_I32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAP32}function GROWABLE_HEAP_U32(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAPU32}function GROWABLE_HEAP_F64(){if(wasmMemory.buffer!=buffer){updateGlobalBufferAndViews(wasmMemory.buffer)}return HEAPF64}var Module=typeof WasmBackendModuleThreadedSimd!==\"undefined\"?WasmBackendModuleThreadedSimd:{};var readyPromiseResolve,readyPromiseReject;Module[\"ready\"]=new Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var moduleOverrides={};var key;for(key in Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var thisProgram=\"./this.program\";var quit_=function(status,toThrow){throw

toThrow};var ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof window===\"object\";ENVIRONMENT_IS_WORKER=typeof importScripts===\"function\";ENVIRONMENT_IS_NODE=typeof process===\"object\"&&typeof process.versions===\"object\"&&typeof process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONMENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var ENVIRONMENT_IS_PTHREAD=Module[\"ENVIRONMENT_IS_PTHREAD\"]||false;if(ENVIRONMENT_IS_PTHREAD){buffer=Module[\"buffer\"]}var scriptDirectory=\"\";function locateFile(path){if(Module[\"locateFile\"]){return Module[\"locateFile\"](path,scriptDirectory)}return scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\"path\").dirname(scriptDirectory)+\"/\"}else{scriptDirectory=__dirname+\"/\"}read_=function shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=nodePath[\"normalize\"](filename);return nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\")};readBinary=function readBinary(filename){var ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return ret};if(process[\"argv\"].length>1){thisProgram=process[\"argv\"][1].replace(/\\\\/g,\"/\")}arguments_=process[\"argv\"].slice(2);process[\"on\"](\"uncaughtException\",function(ex){if(!(ex instanceof ExitStatus)){throw ex}});process[\"on\"](\"unhandledRejection\",abort);quit_=function(status){process[\"exit\"](status)};Module[\"inspect\"]=function(){return\"[Emscripten Module object]\"};var nodeWorkerThreads;try{nodeWorkerThreads=require(\"worker_threads\")}catch(e){console.error('The \"worker_threads\" module is not supported in this node.js build - perhaps a newer version is needed?');throw e}global.Worker=nodeWorkerThreads.Worker}else if(ENVIRONMENT_IS_SHELL){if(typeof read!=\"undefined\"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var data;if(typeof readbuffer===\"function\"){return new Uint8Array(readbuffer(f))}data=read(f,\"binary\");assert(typeof data===\"object\");return data};if(typeof scriptArgs!=\"undefined\"){arguments_=scriptArgs}else if(typeof arguments!=\"undefined\"){arguments_=arguments}if(typeof quit===\"function\"){quit_=function(status){quit(status)}}if(typeof print!==\"undefined\"){if(typeof console===\"undefined\")console={};console.log=print;console.warn=console.error=typeof printErr!==\"undefined\"?printErr:print}}else if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDirectory=self.location.href}else if(typeof document!==\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(typeof _scriptDir !== \"undefined\" && _scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf(\"blob:\")!==0){scriptDirectory=scriptDirectory.substr(0,scriptDirectory.lastIndexOf(\"/\")+1)}else{scriptDirectory=\"\"}if(ENVIRONMENT_IS_NODE){read_=function shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=nodePath[\"normalize\"](filename);return nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\")};readBinary=function readBinary(filename){var ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return ret}}else{read_=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.send(null);return xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.responseType=\"arraybuffer\";xhr.send(null);return new Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,true);xhr.responseType=\"arraybuffer\";xhr.onload=function(){if(xhr.status

==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror()};xhr.onerror=onerror;xhr.send(null)}
}setWindowTitle=function(title){document.title=title}}else{}if(ENVIRONMENT_IS_NODE){if(typeof
performance===\"undefined\"){global.performance=require(\"perf_hooks\").performance}}var
out=Module[\"print\"]||console.log.bind(console);var err=Module[\"printErr\"]||console.warn.bind(console);for(key
in
moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverr
ides=null;if(Module[\"arguments\"])arguments_=Module[\"arguments\"];if(Module[\"thisProgram\"])thisProgram=
Module[\"thisProgram\"];if(Module[\"quit\"])quit_=Module[\"quit\"];function
warnOnce(text){if(!warnOnce.shown)warnOnce.shown={};if(!warnOnce.shown[text]){warnOnce.shown[text]=1;er
r(text)}}var Atomics_load=Atomics.load;var Atomics_store=Atomics.store;var
Atomics_compareExchange=Atomics.compareExchange;var
wasmBinary;if(Module[\"wasmBinary\"])wasmBinary=Module[\"wasmBinary\"];var
noExitRuntime=Module[\"noExitRuntime\"]||true;if(typeof WebAssembly!==\"object\"){abort(\"no
native wasm support detected\")}var wasmMemory;var wasmModule;var ABORT=false;var
EXITSTATUS;function assert(condition,text){if(!condition){abort(\"Assertion failed: \"+text)}}function
getCFunc(ident){var func=Module[\"_\"+ident];assert(func,\"Cannot call unknown function \"+ident+\", make sure
it is exported\");return func}function ccall(ident,returnType,argTypes,args,opts){var
toC={\"string\":function(str){var ret=0;if(str!==null&&str!==undefined&&str!==0){var
len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\"array\":function(arr){var
ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function
convertReturnValue(ret){if(returnType===\"string\")return UTF8ToString(ret);if(returnType===\"boolean\")return
Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var
i=0;i<args.length;i++){var
converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i
]=args[i]}}}var
ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return ret}function
cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var
numericArgs=argTypes.every(function(type){return type===\"number\"});var
numericRet=returnType!==\"string\";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return
function(){return ccall(ident,returnType,argTypes,arguments,opts)}}function
UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var
str=\"\";while(!(idx>=endIdx)){var u0=heap[idx++];if(!u0)return
str;if(!(u0&128)){str+=String.fromCharCode(u0);continue}var
u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var
u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[id
x++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-
65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}return str}function
UTF8ToString(ptr,maxBytesToRead){return
ptr?UTF8ArrayToString(GROWABLE_HEAP_U8(),ptr,maxBytesToRead):\"\"}function
stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var
endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var
u=str.charCodeAt(i);if(u>=55296&&u<=57343){var
u1=str.charCodeAt(++i);u=65536+((u&1023)<<10)|u1&1023}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]
=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else
if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx
++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[
outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function
stringToUTF8(str,outPtr,maxBytesToWrite){return

stringToUTF8Array(str,GROWABLE_HEAP_U8(),outPtr,maxBytesToWrite)}function lengthBytesUTF8(str){var len=0;for(var i=0;i<str.length;++i){var u=str.charCodeAt(i);if(u>=55296&&u<=57343)u=65536+((u&1023)<<10)|str.charCodeAt(++i)&1023;if(u<=127)++len;else if(u<=2047)len+=2;else if(u<=65535)len+=3;else len+=4}return len}function writeArrayToMemory(array,buffer){GROWABLE_HEAP_I8().set(array,buffer)}function alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function updateGlobalBufferAndViews(buf){buffer=buf;Module[\"HEAP8\"]=HEAP8=new Int8Array(buf);Module[\"HEAP16\"]=HEAP16=new Int16Array(buf);Module[\"HEAP32\"]=HEAP32=new Int32Array(buf);Module[\"HEAPU8\"]=HEAPU8=new Uint8Array(buf);Module[\"HEAPU16\"]=HEAPU16=new Uint16Array(buf);Module[\"HEAPU32\"]=HEAPU32=new Uint32Array(buf);Module[\"HEAPF32\"]=HEAPF32=new Float32Array(buf);Module[\"HEAPF64\"]=HEAPF64=new Float64Array(buf)}var INITIAL_MEMORY=Module[\"INITIAL_MEMORY\"]||16777216;if(ENVIRONMENT_IS_PTHREAD){wasmMemory=Module[\"wasmMemory\"];buffer=Module[\"buffer\"]}else{if(Module[\"wasmMemory\"]){wasmMemory=Module[\"wasmMemory\"]}else{wasmMemory=new WebAssembly.Memory({\"initial\":INITIAL_MEMORY/65536,\"maximum\":2147483648/65536,\"shared\":true});if(!(wasmMemory.buffer instanceof SharedArrayBuffer)){err(\"requested a shared WebAssembly.Memory but the returned buffer is not a SharedArrayBuffer, indicating that while the browser has SharedArrayBuffer it does not have WebAssembly threads support - you may need to set a flag\");if(ENVIRONMENT_IS_NODE){console.log(\"(on node you may need: --experimental-wasm-threads --experimental-wasm-bulk-memory and also use a recent version)\")}throw Error(\"bad memory\")}}}if(wasmMemory){buffer=wasmMemory.buffer}INITIAL_MEMORY=buffer.byteLength;updateGlobalBufferAndViews(buffer);var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var __ATEXIT__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;var runtimeExited=false;if(!ENVIRONMENT_IS_PTHREAD)__ATINIT__.push({func:function(){___wasm_call_ctors()}});function preRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module[\"preRun\"]){if(typeof Module[\"preRun\"]==\"function\")Module[\"preRun\"]=[Module[\"preRun\"]];while(Module[\"preRun\"].length){addOnPreRun(Module[\"preRun\"].shift())}}callRuntimeCallbacks(__ATPRERUN__)}function initRuntime(){runtimeInitialized=true;if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATINIT__)}function preMain(){if(ENVIRONMENT_IS_PTHREAD)return;callRuntimeCallbacks(__ATMAIN__)}function exitRuntime(){if(ENVIRONMENT_IS_PTHREAD)return;runtimeExited=true}function postRun(){if(ENVIRONMENT_IS_PTHREAD)return;if(Module[\"postRun\"]){if(typeof Module[\"postRun\"]==\"function\")Module[\"postRun\"]=[Module[\"postRun\"]];while(Module[\"postRun\"].length){addOnPostRun(Module[\"postRun\"].shift())}}callRuntimeCallbacks(__ATPOSTRUN__)}function addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function addRunDependency(id){assert(!ENVIRONMENT_IS_PTHREAD,\"addRunDependency cannot be used in a pthread worker\");runDependencies++;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}}function removeRunDependency(id){runDependencies--;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}if(runDependencies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}if(dependenciesFulfilled){var callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}}Module[\"preloadedImages\"]={};Module[\"preloadedAudios\"]={};function

abort(what){if(Module[\"onAbort\"]){Module[\"onAbort\"](what)}if(ENVIRONMENT_IS_PTHREAD)console.error(\"Pthread aborting at \"+(new Error).stack);what+=\"\";err(what);ABORT=true;EXITSTATUS=1;what=\"abort(\"+what+\"). Build with -s ASSERTIONS=1 for more info.\";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var dataURIPrefix=\"data:application/octet-stream; base64,\";function isDataURI(filename){return hasPrefix(filename,dataURIPrefix)}var fileURIPrefix=\"file://\";function isFileURI(filename){return hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile=\"tfjs-backend-wasm-threaded-simd.wasm\";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function getBinary(file){try{if(file==wasmBinaryFile&&wasmBinary){return new Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw\"both async and sync fetching of the wasm failed\"}}catch(err){abort(err)}}function getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof fetch===\"function\"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){if(!response[\"ok\"]){throw\"failed to load wasm binary file at '\"+wasmBinaryFile+\"'\"}return response[\"arrayBuffer\"]()}).catch(function(){return getBinary(wasmBinaryFile)})}else{if(readAsync){return new Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new Uint8Array(response))},reject)})}}}return Promise.resolve().then(function(){return getBinary(wasmBinaryFile)})}function createWasm(){var info={\"a\":asmLibraryArg};function receiveInstance(instance,module){var exports=instance.exports;Module[\"asm\"]=exports;wasmTable=Module[\"asm\"][\"I\"];wasmModule=module;if(!ENVIRONMENT_IS_PTHREAD){var numWorkersToLoad=PThread.unusedWorkers.length;PThread.unusedWorkers.forEach(function(w){PThread.loadWasmModuleToWorker(w,function(){if(!--numWorkersToLoad)removeRunDependency(\"wasm-instantiate\")})})}if(!ENVIRONMENT_IS_PTHREAD){addRunDependency(\"wasm-instantiate\")}function receiveInstantiatedSource(output){receiveInstance(output[\"instance\"],output[\"module\"])}function instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err(\"failed to asynchronously prepare wasm: \"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof WebAssembly.instantiateStreaming===\"function\"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFile)&&typeof fetch===\"function\"){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return result.then(receiveInstantiatedSource,function(reason){err(\"wasm streaming compile failed: \"+reason);err(\"falling back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)})})}else{return instantiateArrayBuffer(receiveInstantiatedSource)}}if(Module[\"instantiateWasm\"]){try{var exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports}catch(e){err(\"Module.instantiateWasm callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}var ASM_CONSTS={10520:function(){throw\"Canceled!\"},10538:function($0,$1){setTimeout(function(){__emscripten_do_dispatch_to_thread($0,$1)},0)}};function initPthreadsJS(){PThread.initRuntime()}function callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof callback==\"function\"){callback(Module);continue}var func=callback.func;if(typeof func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)()}else{wasmTable.get(func)(callback.arg)}}else{func(callback.arg===undefined?null:callback.arg)}}}var ERRNO_CODES={EPERM:63,ENOENT:44,ESRCH:71,EINTR:27,EIO:29,ENXIO:60,E2BIG:1,ENOEXEC:45,EBADF:8,ECHILD:12,EAGAIN:6,EWOULDBLOCK:6,ENOMEM:48,EACCES:2,EFAULT:21,ENOTBLK:105,EBUSY:10,EEXIST:20,EXDEV:75,ENODEV:43,ENOTDIR:54,EISDIR:31,EINVAL:28,ENFILE:41,EMFILE:33,EN

OTTY:59,ETXTBSY:74,EFBIG:22,ENOSPC:51,ESPIPE:70,EROFS:69,EMLINK:34,EPIPE:64,EDOM:18,ERANGE:68,ENOMSG:49,EIDRM:24,ECHRNG:106,EL2NSYNC:156,EL3HLT:107,EL3RST:108,ELNRNG:109,EUNATCH:110,ENOCSI:111,EL2HLT:112,EDEADLK:16,ENOLCK:46,EBADE:113,EBADR:114,EXFULL:115,ENOANO:104,EBADRQC:103,EBADSLT:102,EDEADLOCK:16,EBFONT:101,ENOSTR:100,ENODATA:116,ETIME:117,ENOSR:118,ENONET:119,ENOPKG:120,EREMOTE:121,ENOLINK:47,EADV:122,ESRMNT:123,ECOMM:124,EPROTO:65,EMULTIHOP:36,EDOTDOT:125,EBADMSG:9,ENOTUNIQ:126,EBADFD:127,EREMCHG:128,ELIBACC:129,ELIBBAD:130,ELIBSCN:131,ELIBMAX:132,ELIBEXEC:133,ENOSYS:52,ENOTEMPTY:55,ENAMETOOLONG:37,ELOOP:32,EOPNOTSUPP:138,EPFNOSUPPORT:139,ECONNRESET:15,ENOBUFS:42,EAFNOSUPPORT:5,EPROTOTYPE:67,ENOTSOCK:57,ENOPROTOOPT:50,ESHUTDOWN:140,ECONNREFUSED:14,EADDRINUSE:3,ECONNABORTED:13,ENETUNREACH:40,ENETDOWN:38,ETIMEDOUT:73,EHOSTDOWN:142,EHOSTUNREACH:23,EINPROGRESS:26,EALREADY:7,EDESTADDRREQ:17,EMSGSIZE:35,EPROTONOSUPPORT:66,ESOCKTNOSUPPORT:137,EADDRNOTAVAIL:4,ENETRESET:39,EISCONN:30,ENOTCONN:53,ETOOMANYREFS:141,EUSERS:136,EDQUOT:19,ESTALE:72,ENOTSUP:138,ENOMEDIUM:148,EILSEQ:25,EOVERFLOW:61,ECANCELED:11,ENOTRECOVERABLE:56,EOWNERDEAD:62,ESTRPIPE:135};function
_emscripten_futex_wake(addr,count){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0||count<0)return-28;if(count==0)return 0;if(count>=2147483647)count=Infinity;var
mainThreadWaitAddress=Atomics.load(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2);var
mainThreadWoken=0;if(mainThreadWaitAddress==addr){var
loadedAddr=Atomics.compareExchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,mainThreadWaitAddress,0);if(loadedAddr==mainThreadWaitAddress){--count;mainThreadWoken=1;if(count<=0)return 1}}var ret=Atomics.notify(GROWABLE_HEAP_I32(),addr>>2,count);if(ret>=0)return
ret+mainThreadWoken;throw\"Atomics.notify returned an unexpected value
\"+ret}Module[\"_emscripten_futex_wake\"]=_emscripten_futex_wake;function
killThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! killThread() can only ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in killThread!\";GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
pthread=PThread.pthreads[pthread_ptr];pthread.worker.terminate();PThread.freeThreadData(pthread);PThread.runningWorkers.splice(PThread.runningWorkers.indexOf(pthread.worker),1);pthread.worker.pthread=undefined}function cancelThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cancelThread() can only ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in cancelThread!\";var
pthread=PThread.pthreads[pthread_ptr];pthread.worker.postMessage({\"cmd\":\"cancel\"})}function
cleanupThread(pthread_ptr){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! cleanupThread() can only ever be called from main application thread!\";if(!pthread_ptr)throw\"Internal Error! Null pthread_ptr in cleanupThread!\";var
pthread=PThread.pthreads[pthread_ptr];if(pthread){GROWABLE_HEAP_I32()[pthread_ptr+12>>2]=0;var
worker=pthread.worker;PThread.returnWorkerToPool(worker)}}var
PThread={unusedWorkers:[],runningWorkers:[],initMainThreadBlock:function(){var
pthreadPoolSize=8;for(var
i=0;i<pthreadPoolSize;++i){PThread.allocateUnusedWorker()}},initRuntime:function(){var
tb=_malloc(228);for(var
i=0;i<228/4;++i)GROWABLE_HEAP_U32()[tb/4+i]=0;GROWABLE_HEAP_I32()[tb+12>>2]=tb;var
headPtr=tb+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var tlsMemory=_malloc(512);for(var
i=0;i<128;++i)GROWABLE_HEAP_U32()[tlsMemory/4+i]=0;Atomics.store(GROWABLE_HEAP_U32(),tb+100>>2,tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tb+40>>2,tb);__emscripten_thread_init(tb,!ENVIRONMENT_IS_WORKER,1);_emscripten_register_main_browser_thread_id(tb)},initWorker:function(){},pthreads:{},threadExitHandlers:[],setThreadStatus:function(){},runExitHandlers:function(){while(PThread.threadExitHandlers.l

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ength>0){PThread.threadExitHandlers.pop()()}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self())___pthread
_tsd_run_dtors()},runExitHandlersAndDeinitThread:function(tb,exitCode){Atomics.store(GROWABLE_HEAP_U
32(),tb+56>>2,1);Atomics.store(GROWABLE_HEAP_U32(),tb+60>>2,0);PThread.runExitHandlers();Atomics.stor
e(GROWABLE_HEAP_U32(),tb+4>>2,exitCode);Atomics.store(GROWABLE_HEAP_U32(),tb+0>>2,1);_emscri
pten_futex_wake(tb+0,2147483647);__emscripten_thread_init(0,0,0)},threadExit:function(exitCode){var
tb=_pthread_self();if(tb){PThread.runExitHandlersAndDeinitThread(tb,exitCode);if(ENVIRONMENT_IS_PTHRE
AD){postMessage({\"cmd\":\"exit\"})}}},threadCancel:function(){PThread.runExitHandlersAndDeinitThread(_pthr
ead_self(),-1);postMessage({\"cmd\":\"cancelDone\"})},terminateAllThreads:function(){for(var t in
PThread.pthreads){var
pthread=PThread.pthreads[t];if(pthread&&pthread.worker){PThread.returnWorkerToPool(pthread.worker)}}PThre
ad.pthreads={};for(var i=0;i<PThread.unusedWorkers.length;++i){var
worker=PThread.unusedWorkers[i];worker.terminate()}PThread.unusedWorkers=[];for(var
i=0;i<PThread.runningWorkers.length;++i){var worker=PThread.runningWorkers[i];var
pthread=worker.pthread;PThread.freeThreadData(pthread);worker.terminate()}PThread.runningWorkers=[]},freeTh
readData:function(pthread){if(!pthread)return;if(pthread.threadInfoStruct){var
tlsMemory=GROWABLE_HEAP_I32()[pthread.threadInfoStruct+100>>2];GROWABLE_HEAP_I32()[pthread.thr
eadInfoStruct+100>>2]=0;_free(tlsMemory);_free(pthread.threadInfoStruct)}pthread.threadInfoStruct=0;if(pthread.
allocatedOwnStack&&pthread.stackBase)_free(pthread.stackBase);pthread.stackBase=0;if(pthread.worker)pthread.
worker.pthread=null},returnWorkerToPool:function(worker){PThread.runWithoutMainThreadQueuedCalls(functio
n(){delete
PThread.pthreads[worker.pthread.threadInfoStruct];PThread.unusedWorkers.push(worker);PThread.runningWorker
s.splice(PThread.runningWorkers.indexOf(worker),1);PThread.freeThreadData(worker.pthread);worker.pthread=un
defined})},runWithoutMainThreadQueuedCalls:function(func){GROWABLE_HEAP_I32()[__emscripten_allow_m
ain_runtime_queued_calls>>2]=0;try{func()}finally{GROWABLE_HEAP_I32()[__emscripten_allow_main_runti
me_queued_calls>>2]=1}},receiveObjectTransfer:function(data){},loadWasmModuleToWorker:function(worker,o
nFinishedLoading){worker.onmessage=function(e){var
 d=e[\"data\"];var
cmd=d[\"cmd\"];if(worker.pthread)PThread.currentProxiedOperationCallerThread=worker.pthread.threadInfoStruct;
if(d[\"targetThread\"]&&d[\"targetThread\"]!=_pthread_self()){var
thread=PThread.pthreads[d.targetThread];if(thread){thread.worker.postMessage(e.data,d[\"transferList\"])}else{con
sole.error('Internal error! Worker sent a message \"'+cmd+'\" to target pthread '+d[\"targetThread\"]+\", but that
thread no longer
exists!\")}PThread.currentProxiedOperationCallerThread=undefined;return}if(cmd===\"processQueuedMainThread
Work\"){_emscripten_main_thread_process_queued_calls()}else
if(cmd===\"spawnThread\"){spawnThread(e.data)}else
if(cmd===\"cleanupThread\"){cleanupThread(d[\"thread\"])}else
if(cmd===\"killThread\"){killThread(d[\"thread\"])}else
if(cmd===\"cancelThread\"){cancelThread(d[\"thread\"])}else
if(cmd===\"loaded\"){worker.loaded=true;if(onFinishedLoading)onFinishedLoading(worker);if(worker.runPthread)
{worker.runPthread();delete
 worker.runPthread}}else if(cmd===\"print\"){out(\"Thread \"+d[\"threadId\"]+\": \"+d[\"text\"])}else
if(cmd===\"printErr\"){err(\"Thread \"+d[\"threadId\"]+\": \"+d[\"text\"])}else if(cmd===\"alert\"){alert(\"Thread
\"+d[\"threadId\"]+\": \"+d[\"text\"])}else if(cmd===\"exit\"){var
detached=worker.pthread&&Atomics.load(GROWABLE_HEAP_U32(),worker.pthread.threadInfoStruct+64>>2);if
(detached){PThread.returnWorkerToPool(worker)}}else
if(cmd===\"exitProcess\"){try{exit(d[\"returnCode\"])}catch(e){if(e instanceof ExitStatus)return;throw e}}else
if(cmd===\"cancelDone\"){PThread.returnWorkerToPool(worker)}else
if(cmd===\"objectTransfer\"){PThread.receiveObjectTransfer(e.data)}else
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if(e.data.target===\"setimmediate\"){worker.postMessage(e.data)}else{err(\"worker sent an unknown command \"+cmd)}PThread.currentProxiedOperationCallerThread=undefined};worker.onerror=function(e){err(\"pthread sent an error! \"+e.filename+\":\"+e.lineno+\": \"+e.message)};if(ENVIRONMENT_IS_NODE){worker.on(\"message\",function(data){worker.onmessage({data:data})});worker.on(\"error\",function(data){worker.onerror(data)});worker.on(\"exit\",function(data){})}worker.postMessage({\"cmd\":\"load\",\"urlOrBlob\":Module[\"mainScriptUrlOrBlob\"]||_scriptDir,\"wasmMemory\":wasmMemory,\"wasmModule\":wasmModule})},allocateUnusedWorker:function(){var pthreadMainJs=locateFile(\"tfjs-backend-wasm-threaded-simd.worker.js\");PThread.unusedWorkers.push(new Worker(pthreadMainJs))},getNewWorker:function(){if(PThread.unusedWorkers.length==0){PThread.allocateUnusedWorker();PThread.loadWasmModuleToWorker(PThread.unusedWorkers[0])}if(PThread.unusedWorkers.length>0)return PThread.unusedWorkers.pop();else return null},busySpinWait:function(msecs){var t=performance.now()+msecs;while(performance.now()<t){}}};function establishStackSpace(stackTop,stackMax){_emscripten_stack_set_limits(stackTop,stackMax);stackRestore(stackTop)}Module[\"establishStackSpace\"]=establishStackSpace;function getNoExitRuntime(){return noExitRuntime}Module[\"getNoExitRuntime\"]=getNoExitRuntime;function invokeEntryPoint(ptr,arg){return wasmTable.get(ptr)(arg)}Module[\"invokeEntryPoint\"]=invokeEntryPoint;function ___assert_fail(condition,filename,line,func){abort(\"Assertion failed: \"+UTF8ToString(condition)+\", at: \"+[filename?UTF8ToString(filename):\"unknown filename\",line,func?UTF8ToString(func):\"unknown function\"])}function ___call_main(argc,argv){var returnCode=_main(argc,argv)}var _emscripten_get_now;if(ENVIRONMENT_IS_NODE){_emscripten_get_now=function(){var t=process[\"hrtime\"]();return t[0]*1e3+t[1]/1e6}}else if(ENVIRONMENT_IS_PTHREAD){_emscripten_get_now=function(){return performance.now()-Module[\"__performance_now_clock_drift\"]}}else if(typeof dateNow!==\"undefined\"){_emscripten_get_now=dateNow}else _emscripten_get_now=function(){return performance.now()};function setErrNo(value){GROWABLE_HEAP_I32()[___errno_location()>>2]=value;return value}function _atexit(func,arg){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(1,1,func,arg)}function __emscripten_notify_thread_queue(targetThreadId,mainThreadId){if(targetThreadId==mainThreadId){postMessage({\"cmd\":\"processQueuedMainThreadWork\"})}else if(ENVIRONMENT_IS_PTHREAD){postMessage({\"targetThread\":targetThreadId,\"cmd\":\"processThreadQueue\"})}else{var pthread=PThread.pthreads[targetThreadId];var worker=pthread&&pthread.worker;if(!worker){return}worker.postMessage({\"cmd\":\"processThreadQueue\"})}return 1}function _abort(){abort()}function _emscripten_asm_const_int(code,sigPtr,argbuf){var args=readAsmConstArgs(sigPtr,argbuf);return ASM_CONSTS[code].apply(null,args)}function _emscripten_conditional_set_current_thread_status(expectedStatus,newStatus){}function _emscripten_futex_wait(addr,val,timeout){if(addr<=0||addr>GROWABLE_HEAP_I8().length||addr&3!=0)return-28;if(!ENVIRONMENT_IS_WEB){var ret=Atomics.wait(GROWABLE_HEAP_I32(),addr>>2,val,timeout);if(ret===\"timed-out\")return-73;if(ret===\"not-equal\")return-6;if(ret===\"ok\")return 0;throw\"Atomics.wait returned an unexpected value \"+ret}else{if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!=val){return-6}var tNow=performance.now();var tEnd=tNow+timeout;var lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr);while(1){tNow=performance.now();if(tNow>tEnd){lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,0);return-73}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,0);if(lastAddr==0){break}_emscripten_main_thread_process_queued_calls();if(Atomics.load(GROWABLE_HEAP_I32(),addr>>2)!

=val){return-
6}lastAddr=Atomics.exchange(GROWABLE_HEAP_I32(),__emscripten_main_thread_futex>>2,addr)}return
0}}function
_emscripten_memcpy_big(dest,src,num){GROWABLE_HEAP_U8().copyWithin(dest,src,src+num)}function
_emscripten_num_logical_cores(){if(ENVIRONMENT_IS_NODE)return require(\"os\").cpus().length;return
navigator[\"hardwareConcurrency\"]}function
_emscripten_proxy_to_main_thread_js(index,sync){var numCallArgs=arguments.length-2;var
stack=stackSave();var serializedNumCallArgs=numCallArgs;var args=stackAlloc(serializedNumCallArgs*8);var
b=args>>3;for(var i=0;i<numCallArgs;i++){var arg=arguments[2+i];GROWABLE_HEAP_F64()[b+i]=arg}var
ret=_emscripten_run_in_main_runtime_thread_js(index,serializedNumCallArgs,args,sync);stackRestore(stack);retur
n ret}var _emscripten_receive_on_main_thread_js_callArgs=[];var readAsmConstArgsArray=[];function
readAsmConstArgs(sigPtr,buf){readAsmConstArgsArray.length=0;var
ch;buf>>=2;while(ch=GROWABLE_HEAP_U8()[sigPtr++]){var
double=ch<105;if(double&&buf&1)buf++;readAsmConstArgsArray.push(double?GROWABLE_HEAP_F64()[buf
++>>1]:GROWABLE_HEAP_I32()[buf]);++buf}return readAsmConstArgsArray}function
_emscripten_receive_on_main_thread_js(index,numCallArgs,args){_emscripten_receive_on_main_thread_js_callA
rgs.length=numCallArgs;var b=args>>3;for(var
i=0;i<numCallArgs;i++){_emscripten_receive_on_main_thread_js_callArgs[i]=GROWABLE_HEAP_F64()[b+i]}v
ar
isEmAsmConst=index<0;var func=!isEmAsmConst?proxiedFunctionTable[index]:ASM_CONSTS[-index-
1];return func.apply(null,_emscripten_receive_on_main_thread_js_callArgs)}function
_emscripten_get_heap_size(){return GROWABLE_HEAP_U8().length}function
emscripten_realloc_buffer(size){try{wasmMemory.grow(size-
buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return
1}catch(e){}}function _emscripten_resize_heap(requestedSize){var
oldSize=_emscripten_get_heap_size();if(requestedSize<=oldSize){return false}var
maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var
cutDown=1;cutDown<=4;cutDown*=2){var
overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize
+100663296);var
newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var
replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var
JSEvents={inEventHandler:0,removeAllEventListeners:function(){for(var
i=JSEvents.eventHandlers.length-1;i>=0;--
i){JSEvents._removeHandler(i)}JSEvents.eventHandlers=[];JSEvents.deferredCalls=[]},registerRemoveEventListen
ers:function(){if(!JSEvents.removeEventListenersRegistered){__ATEXIT__.push(JSEvents.removeAllEventListene
rs);JSEvents.removeEventListenersRegistered=true}},deferredCalls:[],deferCall:function(targetFunction,precedence
,argsList){function arraysHaveEqualContent(arrA,arrB){if(arrA.length!=arrB.length)return false;for(var i in
arrA){if(arrA[i]!=arrB[i])return false}return true}for(var i in JSEvents.deferredCalls){var
call=JSEvents.deferredCalls[i];if(call.targetFunction==targetFunction&&arraysHaveEqualContent(call.argsList,args
List)){return}}JSEvents.deferredCalls.push({targetFunction:targetFunction,precedence:precedence,argsList:argsList
});JSEvents.deferredCalls.sort(function(x,y){return
x.precedence<y.precedence})},removeDeferredCalls:function(targetFunction){for(var
i=0;i<JSEvents.deferredCalls.length;++i){if(JSEvents.deferredCalls[i].targetFunction==targetFunction){JSEvents.d
eferredCalls.splice(i,1);--i}}},canPerformEventHandlerRequests:function(){return
JSEvents.inEventHandler&&JSEvents.currentEventHandler.allowsDeferredCalls},runDeferredCalls:function(){if(!J
SEvents.canPerformEventHandlerRequests()){return}for(var i=0;i<JSEvents.deferredCalls.length;++i){var
call=JSEvents.deferredCalls[i];JSEvents.deferredCalls.splice(i,1);--

i;call.targetFunction.apply(null,call.argsList)}},eventHandlers:[],removeAllHandlersOnTarget:function(target,event
TypeString){for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==target&&(!eventTypeString||event
TypeString==JSEvents.eventHandlers[i].eventTypeString)){JSEvents._removeHandler(i--
)}}},_removeHandler:function(i){var
h=JSEvents.eventHandlers[i];h.target.removeEventListener(h.eventTypeString,h.eventListenerFunc,h.useCapture);J
SEvents.eventHandlers.splice(i,1)},registerOrRemoveHandler:function(eventHandler){var
jsEventHandler=function
jsEventHandler(event){++JSEvents.inEventHandler;JSEvents.currentEventHandler=eventHandler;JSEvents.runDef
erredCalls();eventHandler.handlerFunc(event);JSEvents.runDeferredCalls();--
JSEvents.inEventHandler};if(eventHandler.callbackfunc){eventHandler.eventListenerFunc=jsEventHandler;eventH
andler.target.addEventListener(eventHandler.eventTypeString,jsEventHandler,eventHandler.useCapture);JSEvents.e
ventHandlers.push(eventHandler);JSEvents.registerRemoveEventListeners()}else{for(var
i=0;i<JSEvents.eventHandlers.length;++i){if(JSEvents.eventHandlers[i].target==eventHandler.target&&JSEvents.e
ventHandlers[i].eventTypeString==eventHandler.eventTypeString){JSEvents._removeHandler(i--
)}}}},queueEventHandlerOnThread_iiii:function(targetThread,eventHandlerFunc,eventTypeId,eventData,userData)
{var stackTop=stackSave();var
varargs=stackAlloc(12);GROWABLE_HEAP_I32()[varargs>>2]=eventTypeId;GROWABLE_HEAP_I32()[varargs
+4>>2]=eventData;GROWABLE_HEAP_I32()[varargs+8>>2]=userData;__emscripten_call_on_thread(0,targetThr
ead,637534208,eventHandlerFunc,eventData,varargs);stackRestore(stackTop)},getTargetThreadForEventCallback:f
unction(targetThread){switch(targetThread){case
1:return 0;case 2:return PThread.currentProxiedOperationCallerThread;default:return
targetThread}},getNodeNameForTarget:function(target){if(!target)return\"\";if(target==window)return\"#window\";
if(target==screen)return\"#screen\";return
target&&target.nodeName?target.nodeName:\"\"},fullscreenEnabled:function(){return
document.fullscreenEnabled||document.webkitFullscreenEnabled}};function stringToNewUTF8(jsString){var
length=lengthBytesUTF8(jsString)+1;var cString=_malloc(length);stringToUTF8(jsString,cString,length);return
cString}function
_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThread,targetCanvas,width,height){var
stackTop=stackSave();var varargs=stackAlloc(12);var
targetCanvasPtr=0;if(targetCanvas){targetCanvasPtr=stringToNewUTF8(targetCanvas)}GROWABLE_HEAP_I32(
)[varargs>>2]=targetCanvasPtr;GROWABLE_HEAP_I32()[varargs+4>>2]=width;GROWABLE_HEAP_I32()[var
args+8>>2]=height;__emscripten_call_on_thread(0,targetThread,657457152,0,targetCanvasPtr,varargs);stackRestor
e(stackTop)}function
_emscripten_set_offscreencanvas_size_on_target_thread(targetThread,targetCanvas,width,height){targetCanvas=tar
getCanvas?UTF8ToString(targetCanvas):\"\";_emscripten_set_offscreencanvas_size_on_target_thread_js(targetThr
ead,targetCanvas,width,height)}function maybeCStringToJsString(cString){return
cString>2?UTF8ToString(cString):cString}var specialHTMLTargets=[0,typeof
document!==\"undefined\"?document:0,typeof window!==\"undefined\"?window:0];function
findEventTarget(target){target=maybeCStringToJsString(target);var
domElement=specialHTMLTargets[target]||(typeof
document!==\"undefined\"?document.querySelector(target):undefined);return domElement}function
findCanvasEventTarget(target){return findEventTarget(target)}function
_emscripten_set_canvas_element_size_calling_thread(target,width,height){var
canvas=findCanvasEventTarget(target);if(!canvas)return-
4;if(canvas.canvasSharedPtr){GROWABLE_HEAP_I32()[canvas.canvasSharedPtr>>2]=width;GROWABLE_HEA
P_I32()[canvas.canvasSharedPtr+4>>2]=height}if(canvas.offscreenCanvas||!canvas.controlTransferredOffscreen){if
(canvas.offscreenCanvas)canvas=canvas.offscreenCanvas;var

autoResizeViewport=false;if(canvas.GLctxObject&&canvas.GLctxObject.GLctx){var
prevViewport=canvas.GLctxObject.GLctx.getParameter(2978);autoResizeViewport=prevViewport[0]===0&&prev
Viewport[1]===0&&prevViewport[2]===canvas.width&&prevViewport[3]===canvas.height}canvas.width=width;
canvas.height=height;if(autoResizeViewport){canvas.GLctxObject.GLctx.viewport(0,0,width,height)}}else
if(canvas.canvasSharedPtr){var
targetThread=GROWABLE_HEAP_I32()[canvas.canvasSharedPtr+8>>2];_emscripten_set_offscreencanvas_size_o
n_target_thread(targetThread,target,width,height);return 1}else{return-4}return 0}function
_emscripten_set_canvas_element_size_main_thread(target,width,height){if(ENVIRONMENT_IS_PTHREAD)retur
n
_emscripten_proxy_to_main_thread_js(2,1,target,width,height);return
_emscripten_set_canvas_element_size_calling_thread(target,width,height)}function
_emscripten_set_canvas_element_size(target,width,height){var
canvas=findCanvasEventTarget(target);if(canvas){return
_emscripten_set_canvas_element_size_calling_thread(target,width,height)}else{return
_emscripten_set_canvas_element_size_main_thread(target,width,height)}}function
_emscripten_set_current_thread_status(newStatus){}function
_emscripten_set_thread_name(threadId,name){}function __webgl_enable_ANGLE_instanced_arrays(ctx){var
ext=ctx.getExtension(\"ANGLE_instanced_arrays\");if(ext){ctx[\"vertexAttribDivisor\"]=function(index,divisor){ex
t[\"vertexAttribDivisorANGLE\"](index,divisor)};ctx[\"drawArraysInstanced\"]=function(mode,first,count,primcou
nt){ext[\"drawArraysInstancedANGLE\"](mode,first,count,primcount)};ctx[\"drawElementsInstanced\"]=function(
mode,count,type,indices,primcount){ext[\"drawElementsInstancedANGLE\"](mode,count,type,indices,primcount)};
return
1}}function __webgl_enable_OES_vertex_array_object(ctx){var
ext=ctx.getExtension(\"OES_vertex_array_object\");if(ext){ctx[\"createVertexArray\"]=function(){return
ext[\"createVertexArrayOES\"]()};ctx[\"deleteVertexArray\"]=function(vao){ext[\"deleteVertexArrayOES\"](vao)};
ctx[\"bindVertexArray\"]=function(vao){ext[\"bindVertexArrayOES\"](vao)};ctx[\"isVertexArray\"]=function(vao)
{return ext[\"isVertexArrayOES\"](vao)};return 1}}function __webgl_enable_WEBGL_draw_buffers(ctx){var
ext=ctx.getExtension(\"WEBGL_draw_buffers\");if(ext){ctx[\"drawBuffers\"]=function(n,bufs){ext[\"drawBuffers
WEBGL\"](n,bufs)};return 1}}function
__webgl_enable_WEBGL_multi_draw(ctx){return!!(ctx.multiDrawWebgl=ctx.getExtension(\"WEBGL_multi_dra
w\"))}var
GL={counter:1,buffers:[],programs:[],framebuffers:[],renderbuffers:[],textures:[],uniforms:[],shaders:[],vaos:[],cont
exts:{},offscreenCanvases:{},timerQueriesEXT:[],programInfos:{},stringCache:{},unpackAlignment:4,recordError:
function
recordError(errorCode){if(!GL.lastError){GL.lastError=errorCode}},getNewId:function(table){var
ret=GL.counter++;for(var i=table.length;i<ret;i++){table[i]=null}return
ret},getSource:function(shader,count,string,length){var source=\"\";for(var i=0;i<count;++i){var
len=length?GROWABLE_HEAP_I32()[length+i*4>>2]:-
1;source+=UTF8ToString(GROWABLE_HEAP_I32()[string+i*4>>2],len<0?undefined:len)}return
source},createContext:function(canvas,webGLContextAttributes){var
ctx=canvas.getContext(\"webgl\",webGLContextAttributes);if(!ctx)return 0;var
handle=GL.registerContext(ctx,webGLContextAttributes);return
handle},registerContext:function(ctx,webGLContextAttributes){var
handle=_malloc(8);GROWABLE_HEAP_I32()[handle+4>>2]=_pthread_self();var
context={handle:handle,attributes:webGLContextAttributes,version:webGLContextAttributes.majorVersion,GLctx:
ctx};if(ctx.canvas)ctx.canvas.GLctxObject=context;GL.contexts[handle]=context;if(typeof
webGLContextAttributes.enableExtensionsByDefault===\"undefined\"||webGLContextAttributes.enableExtensions
ByDefault){GL.initExtensions(context)}return

handle},makeContextCurrent:function(contextHandle){GL.currentContext=GL.contexts[contextHandle];Module.ctx
=GLctx=GL.currentContext&&GL.currentContext.GLctx;return!(contextHandle&&!GLctx)},getContext:function(c
ontextHandle){return
GL.contexts[contextHandle]},deleteContext:function(contextHandle){if(GL.currentContext===GL.contexts[context
Handle])GL.currentContext=null;if(typeof
JSEvents===\"object\")JSEvents.removeAllHandlersOnTarget(GL.contexts[contextHandle].GLctx.canvas);if(GL.co
ntexts[contextHandle]&&GL.contexts[contextHandle].GLctx.canvas)GL.contexts[contextHandle].GLctx.canvas.GL
ctxObject=undefined;_free(GL.contexts[contextHandle].handle);GL.contexts[contextHandle]=null},initExtensions:f
unction(context){if(!context)context=GL.currentContext;if(context.initExtensionsDone)return;context.initExtension
sDone=true;var
GLctx=context.GLctx;__webgl_enable_ANGLE_instanced_arrays(GLctx);__webgl_enable_OES_vertex_array_obj
ect(GLctx);__webgl_enable_WEBGL_draw_buffers(GLctx);GLctx.disjointTimerQueryExt=GLctx.getExtension(\"
EXT_disjoint_timer_query\");__webgl_enable_WEBGL_multi_draw(GLctx);var
exts=GLctx.getSupportedExtensions()||[];exts.forEach(function(ext){if(ext.indexOf(\"lose_context\")<0&&ext.inde
xOf(\"debug\")<0){GLctx.getExtension(ext)}})},populateUniformTable:function(program){var
p=GL.programs[program];var
ptable=GL.programInfos[program]={uniforms:{},maxUniformLength:0,maxAttributeLength:-
1,maxUniformBlockNameLength:-1};var utable=ptable.uniforms;var
numUniforms=GLctx.getProgramParameter(p,35718);for(var i=0;i<numUniforms;++i){var
u=GLctx.getActiveUniform(p,i);var
name=u.name;ptable.maxUniformLength=Math.max(ptable.maxUniformLength,name.length+1);if(name.slice(-
1)==\"]\"){name=name.slice(0,name.lastIndexOf(\"[\"))}var loc=GLctx.getUniformLocation(p,name);if(loc){var
id=GL.getNewId(GL.uniforms);utable[name]=[u.size,id];GL.uniforms[id]=loc;for(var
j=1;j<u.size;++j){var
n=name+\"[\"+j+\"]\";loc=GLctx.getUniformLocation(p,n);id=GL.getNewId(GL.uniforms);GL.uniforms[id]=loc}}
}};var __emscripten_webgl_power_preferences=[\"default\",\"low-power\",\"high-performance\"];function
_emscripten_webgl_do_create_context(target,attributes){var a=attributes>>2;var
powerPreference=GROWABLE_HEAP_I32()[a+(24>>2)];var
contextAttributes={\"alpha\":!!GROWABLE_HEAP_I32()[a+(0>>2)],\"depth\":!!GROWABLE_HEAP_I32()[a+(4
>>2)],\"stencil\":!!GROWABLE_HEAP_I32()[a+(8>>2)],\"antialias\":!!GROWABLE_HEAP_I32()[a+(12>>2)],\"p
remultipliedAlpha\":!!GROWABLE_HEAP_I32()[a+(16>>2)],\"preserveDrawingBuffer\":!!GROWABLE_HEAP_
I32()[a+(20>>2)],\"powerPreference\":__emscripten_webgl_power_preferences[powerPreference],\"failIfMajorPerf
ormanceCaveat\":!!GROWABLE_HEAP_I32()[a+(28>>2)],majorVersion:GROWABLE_HEAP_I32()[a+(32>>2)],
minorVersion:GROWABLE_HEAP_I32()[a+(36>>2)],enableExtensionsByDefault:GROWABLE_HEAP_I32()[a+(
40>>2)],explicitSwapControl:GROWABLE_HEAP_I32()[a+(44>>2)],proxyContextToMainThread:GROWABLE_
HEAP_I32()[a+(48>>2)],renderViaOffscreenBackBuffer:GROWABLE_HEAP_I32()[a+(52>>2)]};var
canvas=findCanvasEventTarget(target);if(!canvas){return 0}if(contextAttributes.explicitSwapControl){return
0}var contextHandle=GL.createContext(canvas,contextAttributes);return contextHandle}function
_emscripten_webgl_create_context(a0,a1){return _emscripten_webgl_do_create_context(a0,a1)}var
SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var
buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));
buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var
ret=GROWABLE_HEAP_I32()[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var
ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function
_fd_close(fd){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(3,1,fd);return
0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){if(ENVIRONMENT_IS_PTHREAD)return
_emscripten_proxy_to_main_thread_js(4,1,fd,offset_low,offset_high,whence,newOffset)}function
_fd_write(fd,iov,iovcnt,pnum){if(ENVIRONMENT_IS_PTHREAD)return

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_emscripten_proxy_to_main_thread_js(5,1,fd,iov,iovcnt,pnum);var num=0;for(var i=0;i<iovcnt;i++){var
ptr=GROWABLE_HEAP_I32()[iov+i*8>>2];var len=GROWABLE_HEAP_I32()[iov+(i*8+4)>>2];for(var
j=0;j<len;j++){SYSCALLS.printChar(fd,GROWABLE_HEAP_U8()[ptr+j])}num+=len}GROWABLE_HEAP_I32
()[pnum>>2]=num;return 0}function _pthread_cleanup_pop(execute){var
routine=PThread.threadExitHandlers.pop();if(execute)routine()}function
_pthread_cleanup_push(routine,arg){PThread.threadExitHandlers.push(function(){wasmTable.get(routine)(arg)})}f
unction spawnThread(threadParams){if(ENVIRONMENT_IS_PTHREAD)throw\"Internal Error! spawnThread()
can only ever be called from main application thread!\";var
worker=PThread.getNewWorker();if(worker.pthread!==undefined)throw\"Internal
error!\";if(!threadParams.pthread_ptr)throw\"Internal
 error, no pthread ptr!\";PThread.runningWorkers.push(worker);var tlsMemory=_malloc(128*4);for(var
i=0;i<128;++i){GROWABLE_HEAP_I32()[tlsMemory+i*4>>2]=0}var
stackHigh=threadParams.stackBase+threadParams.stackSize;var
pthread=PThread.pthreads[threadParams.pthread_ptr]={worker:worker,stackBase:threadParams.stackBase,stackSize
:threadParams.stackSize,allocatedOwnStack:threadParams.allocatedOwnStack,threadInfoStruct:threadParams.pthrea
d_ptr};var
tis=pthread.threadInfoStruct>>2;Atomics.store(GROWABLE_HEAP_U32(),tis+(64>>2),threadParams.detached);A
tomics.store(GROWABLE_HEAP_U32(),tis+(100>>2),tlsMemory);Atomics.store(GROWABLE_HEAP_U32(),tis
+(40>>2),pthread.threadInfoStruct);Atomics.store(GROWABLE_HEAP_U32(),tis+(80>>2),threadParams.stackSiz
e);Atomics.store(GROWABLE_HEAP_U32(),tis+(76>>2),stackHigh);Atomics.store(GROWABLE_HEAP_U32(),t
is+(104>>2),threadParams.stackSize);Atomics.store(GROWABLE_HEAP_U32(),tis+(104+8>>2),stackHigh);Atom
ics.store(GROWABLE_HEAP_U32(),tis+(104+12>>2),threadParams.detached);var
 global_libc=_emscripten_get_global_libc();var
global_locale=global_libc+40;Atomics.store(GROWABLE_HEAP_U32(),tis+(172>>2),global_locale);worker.pthr
ead=pthread;var
msg={\"cmd\":\"run\",\"start_routine\":threadParams.startRoutine,\"arg\":threadParams.arg,\"threadInfoStruct\":thre
adParams.pthread_ptr,\"stackBase\":threadParams.stackBase,\"stackSize\":threadParams.stackSize};worker.runPthre
ad=function(){msg.time=performance.now();worker.postMessage(msg,threadParams.transferList)};if(worker.loaded
){worker.runPthread();delete worker.runPthread}}function
_pthread_create(pthread_ptr,attr,start_routine,arg){if(typeof SharedArrayBuffer===\"undefined\"){err(\"Current
environment does not support SharedArrayBuffer, pthreads are not available!\");return
6}if(!pthread_ptr){err(\"pthread_create called with a null thread pointer!\");return 28}var transferList=[];var
error=0;if(ENVIRONMENT_IS_PTHREAD&&(transferList.length===0||error)){return
_emscripten_sync_run_in_main_thread_4(687865856,pthread_ptr,attr,start_routine,arg)}if(error)return
 error;var stackSize=0;var stackBase=0;var detached=0;if(attr&&attr!=-
1){stackSize=GROWABLE_HEAP_I32()[attr>>2];stackSize+=81920;stackBase=GROWABLE_HEAP_I32()[attr+
8>>2];detached=GROWABLE_HEAP_I32()[attr+12>>2]!==0}else{stackSize=2097152}var
allocatedOwnStack=stackBase==0;if(allocatedOwnStack){stackBase=_memalign(16,stackSize)}else{stackBase-
=stackSize;assert(stackBase>0)}var threadInfoStruct=_malloc(228);for(var
i=0;i<228>>2;++i)GROWABLE_HEAP_U32()[(threadInfoStruct>>2)+i]=0;GROWABLE_HEAP_I32()[pthread_p
tr>>2]=threadInfoStruct;GROWABLE_HEAP_I32()[threadInfoStruct+12>>2]=threadInfoStruct;var
headPtr=threadInfoStruct+152;GROWABLE_HEAP_I32()[headPtr>>2]=headPtr;var
threadParams={stackBase:stackBase,stackSize:stackSize,allocatedOwnStack:allocatedOwnStack,detached:detached
,startRoutine:start_routine,pthread_ptr:threadInfoStruct,arg:arg,transferList:transferList};if(ENVIRONMENT_IS_P
THREAD){threadParams.cmd=\"spawnThread\";postMessage(threadParams,transferList)}else{spawnThread(thread
Params)}return
 0}function __pthread_testcancel_js(){if(!ENVIRONMENT_IS_PTHREAD)return;var
tb=_pthread_self();if(!tb)return;var
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cancelDisabled=Atomics.load(GROWABLE_HEAP_U32(),tb+56>>2);if(cancelDisabled)return;var canceled=Atomics.load(GROWABLE_HEAP_U32(),tb+0>>2);if(canceled==2)throw\"Canceled!\"}function _emscripten_check_blocking_allowed(){if(ENVIRONMENT_IS_NODE)return;if(ENVIRONMENT_IS_WORKER)return;warnOnce(\"Blocking on the main thread is very dangerous, see https://emscripten.org/docs/porting/pthreads.html#blocking-on-the-main-browser-thread\")}function __emscripten_do_pthread_join(thread,status,block){if(!thread){err(\"pthread_join attempted on a null thread pointer!\");return ERRNO_CODES.ESRCH}if(ENVIRONMENT_IS_PTHREAD&&_pthread_self()==thread){err(\"PThread \"+thread+\" is attempting to join to itself!\");return ERRNO_CODES.EDEADLK}else if(!ENVIRONMENT_IS_PTHREAD&&_emscripten_main_browser_thread_id()==thread){err(\"Main thread \"+thread+\" is attempting to join to itself!\");return ERRNO_CODES.EDEADLK}var self=GROWABLE_HEAP_I32()[thread+12>>2];if(self!==thread){err(\"pthread_join attempted on thread \"+thread+\", which does not point to a valid thread, or does not exist anymore!\");return ERRNO_CODES.ESRCH}var detached=Atomics.load(GROWABLE_HEAP_U32(),thread+64>>2);if(detached){err(\"Attempted to join thread \"+thread+\", which was already detached!\");return ERRNO_CODES.EINVAL}if(block){_emscripten_check_blocking_allowed()}for(;;){var threadStatus=Atomics.load(GROWABLE_HEAP_U32(),thread+0>>2);if(threadStatus==1){var threadExitCode=Atomics.load(GROWABLE_HEAP_U32(),thread+4>>2);if(status)GROWABLE_HEAP_I32()[status>>2]=threadExitCode;Atomics.store(GROWABLE_HEAP_U32(),thread+64>>2,1);if(!ENVIRONMENT_IS_PTHREAD)cleanupThread(thread);else postMessage({\"cmd\":\"cleanupThread\",\"thread\":thread});return 0}if(!block){return ERRNO_CODES.EBUSY}__pthread_testcancel_js();if(!ENVIRONMENT_IS_PTHREAD)_emscripten_main_thread_process_queued_calls();_emscripten_futex_wait(thread+0,threadStatus,ENVIRONMENT_IS_PTHREAD?100:1)}}function _pthread_join(thread,status){return __emscripten_do_pthread_join(thread,status,true)}function _sysconf(name){if(ENVIRONMENT_IS_PTHREAD)return _emscripten_proxy_to_main_thread_js(6,1,name);switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return-1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return-1}if(!ENVIRONMENT_IS_PTHREAD)PThread.initMainThreadBlock();var GLctx;var proxiedFunctionTable=[null,_atexit,_emscripten_set_canvas_element_size_main_thread,_fd_close,_fd_seek,_fd_write,_sysconf];var asmLibraryArg={\"e\":___assert_fail,\"r\":___call_main,\"x\":__emscripten_notify_thread_queue,\"b\":_abort,\"y\":_emscripten_asm_const_int,\"j\":_emscripten_conditional_set_current_thread_status,\"d\":_emscripten_futex_wait,\"c\":_emscripten_futex_wake,\"f\":_emscripten_get_now,\"p\":_emscripten_memcpy_big,\"A\":_emscripten_num_l

ogical_cores,\"u\":_emscripten_receive_on_main_thread_js,\"q\":_emscripten_resize_heap,\"v\":_emscripten_set_canvas_element_size,\"i\":_emscripten_set_current_thread_status,\"s\":_emscripten_set_thread_name,\"w\":_emscripten_webgl_create_context,\"l\":_fd_close,\"n\":_fd_seek,\"g\":_fd_write,\"o\":initPthreadsJS,\"a\":wasmMemory||Module[\"wasmMemory\"],\"z\":_pthread_cleanup_pop,\"k\":_pthread_cleanup_push,\"h\":_pthread_create,\"m\":_pthread_join,\"t\":_sysconf};var asm=createWasm();var
___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=function(){return(___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=Module[\"asm\"][\"B\"]).apply(null,arguments)};var
_init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"C\"]).apply(null,arguments)};var
_init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Module[\"_init_with_threads_count\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var
_get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads_count\"]=Module[\"asm\"][\"E\"]).apply(null,arguments)};var
_register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=Module[\"asm\"][\"F\"]).apply(null,arguments)};var
_dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"asm\"][\"G\"]).apply(null,arguments)};var
_dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"H\"]).apply(null,arguments)};var
_Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"J\"]).apply(null,arguments)};var
_Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"K\"]).apply(null,arguments)};var
_AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"L\"]).apply(null,arguments)};var
_All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"M\"]).apply(null,arguments)};var
_Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"N\"]).apply(null,arguments)};var
_ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"O\"]).apply(null,arguments)};var
_AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"P\"]).apply(null,arguments)};var
_BatchMatMul=Module[\"_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\"_BatchMatMul\"]=Module[\"asm\"][\"Q\"]).apply(null,arguments)};var
_Ceil=Module[\"_Ceil\"]=function(){return(_Ceil=Module[\"_Ceil\"]=Module[\"asm\"][\"R\"]).apply(null,arguments)};var
_ClipByValue=Module[\"_ClipByValue\"]=function(){return(_ClipByValue=Module[\"_ClipByValue\"]=Module[\"asm\"][\"S\"]).apply(null,arguments)};var
_Conv2D=Module[\"_Conv2D\"]=function(){return(_Conv2D=Module[\"_Conv2D\"]=Module[\"asm\"][\"T\"]).apply(null,arguments)};var
_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=function(){return(_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=Module[\"asm\"][\"U\"]).apply(null,arguments)};var
_Cos=Module[\"_Cos\"]=function(){return(_Cos=Module[\"_Cos\"]=Module[\"asm\"][\"V\"]).apply(null,arguments)};var
_Cosh=Module[\"_Cosh\"]=function(){return(_Cosh=Module[\"_Cosh\"]=Module[\"asm\"][\"W\"]).apply(null,arguments)};var
_CropAndResize=Module[\"_CropAndResize\"]=function(){return(_CropAndResize=Module[\"_CropAndResize\"]

=Module[\"asm\"][\"X\"]).apply(null,arguments)};var
_Cumsum=Module[\"_Cumsum\"]=function(){return(_Cumsum=Module[\"_Cumsum\"]=Module[\"asm\"][\"Y\"]).apply(null,arguments)};var
_DepthToSpace=Module[\"_DepthToSpace\"]=function(){return(_DepthToSpace=Module[\"_DepthToSpace\"]=Module[\"asm\"][\"Z\"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=function(){return(_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=Module[\"asm\"][\"_\"]).apply(null,arguments)};var
_Elu=Module[\"_Elu\"]=function(){return(_Elu=Module[\"_Elu\"]=Module[\"asm\"][\"$\"]).apply(null,arguments)};var
_Equal=Module[\"_Equal\"]=function(){return(_Equal=Module[\"_Equal\"]=Module[\"asm\"][\"aa\"]).apply(null,arguments)};var
_Exp=Module[\"_Exp\"]=function(){return(_Exp=Module[\"_Exp\"]=Module[\"asm\"][\"ba\"]).apply(null,arguments)};var
_FlipLeftRight=Module[\"_FlipLeftRight\"]=function(){return(_FlipLeftRight=Module[\"_FlipLeftRight\"]=Module[\"asm\"][\"ca\"]).apply(null,arguments)};var
_Floor=Module[\"_Floor\"]=function(){return(_Floor=Module[\"_Floor\"]=Module[\"asm\"][\"da\"]).apply(null,arguments)};var
_FloorDiv=Module[\"_FloorDiv\"]=function(){return(_FloorDiv=Module[\"_FloorDiv\"]=Module[\"asm\"][\"ea\"]).apply(null,arguments)};var
_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=function(){return(_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=Module[\"asm\"][\"fa\"]).apply(null,arguments)};var
_FusedConv2D=Module[\"_FusedConv2D\"]=function(){return(_FusedConv2D=Module[\"_FusedConv2D\"]=Module[\"asm\"][\"ga\"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=function(){return(_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=Module[\"asm\"][\"ha\"]).apply(null,arguments)};var
_Gather=Module[\"_Gather\"]=function(){return(_Gather=Module[\"_Gather\"]=Module[\"asm\"][\"ia\"]).apply(null,arguments)};var
_GatherNd=Module[\"_GatherNd\"]=function(){return(_GatherNd=Module[\"_GatherNd\"]=Module[\"asm\"][\"ja\"]).apply(null,arguments)};var
_Greater=Module[\"_Greater\"]=function(){return(_Greater=Module[\"_Greater\"]=Module[\"asm\"][\"ka\"]).apply(null,arguments)};var
_GreaterEqual=Module[\"_GreaterEqual\"]=function(){return(_GreaterEqual=Module[\"_GreaterEqual\"]=Module[\"asm\"][\"la\"]).apply(null,arguments)};var
_LeakyRelu=Module[\"_LeakyRelu\"]=function(){return(_LeakyRelu=Module[\"_LeakyRelu\"]=Module[\"asm\"][\"ma\"]).apply(null,arguments)};var
_Less=Module[\"_Less\"]=function(){return(_Less=Module[\"_Less\"]=Module[\"asm\"][\"na\"]).apply(null,arguments)};var
_LessEqual=Module[\"_LessEqual\"]=function(){return(_LessEqual=Module[\"_LessEqual\"]=Module[\"asm\"][\"oa\"]).apply(null,arguments)};var
_Log=Module[\"_Log\"]=function(){return(_Log=Module[\"_Log\"]=Module[\"asm\"][\"pa\"]).apply(null,arguments)};var
_LogicalAnd=Module[\"_LogicalAnd\"]=function(){return(_LogicalAnd=Module[\"_LogicalAnd\"]=Module[\"asm\"][\"qa\"]).apply(null,arguments)};var
_Max=Module[\"_Max\"]=function(){return(_Max=Module[\"_Max\"]=Module[\"asm\"][\"ra\"]).apply(null,arguments)};var
_MaxPool=Module[\"_MaxPool\"]=function(){return(_MaxPool=Module[\"_MaxPool\"]=Module[\"asm\"][\"sa\"]).apply(null,arguments)};var
_Maximum=Module[\"_Maximum\"]=function(){return(_Maximum=Module[\"_Maximum\"]=Module[\"asm\"][\"t

a\"]).apply(null,arguments)};var
_Mean=Module[\"_Mean\"]=function(){return(_Mean=Module[\"_Mean\"]=Module[\"asm\"][\"ua\"]).apply(null,arguments)};var
_Min=Module[\"_Min\"]=function(){return(_Min=Module[\"_Min\"]=Module[\"asm\"][\"va\"]).apply(null,arguments)};var
_Minimum=Module[\"_Minimum\"]=function(){return(_Minimum=Module[\"_Minimum\"]=Module[\"asm\"][\"wa\"]).apply(null,arguments)};var
_MirrorPad=Module[\"_MirrorPad\"]=function(){return(_MirrorPad=Module[\"_MirrorPad\"]=Module[\"asm\"][\"xa\"]).apply(null,arguments)};var
_Multiply=Module[\"_Multiply\"]=function(){return(_Multiply=Module[\"_Multiply\"]=Module[\"asm\"][\"ya\"]).apply(null,arguments)};var
_Neg=Module[\"_Neg\"]=function(){return(_Neg=Module[\"_Neg\"]=Module[\"asm\"][\"za\"]).apply(null,arguments)};var
_NonMaxSuppressionV3=Module[\"_NonMaxSuppressionV3\"]=function(){return(_NonMaxSuppressionV3=Module[\"_NonMaxSuppressionV3\"]=Module[\"asm\"][\"Aa\"]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module[\"_NonMaxSuppressionV4\"]=function(){return(_NonMaxSuppressionV4=Module[\"_NonMaxSuppressionV4\"]=Module[\"asm\"][\"Ba\"]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module[\"_NonMaxSuppressionV5\"]=function(){return(_NonMaxSuppressionV5=Module[\"_NonMaxSuppressionV5\"]=Module[\"asm\"][\"Ca\"]).apply(null,arguments)};var
_NotEqual=Module[\"_NotEqual\"]=function(){return(_NotEqual=Module[\"_NotEqual\"]=Module[\"asm\"][\"Da\"]).apply(null,arguments)};var
_OneHot=Module[\"_OneHot\"]=function(){return(_OneHot=Module[\"_OneHot\"]=Module[\"asm\"][\"Ea\"]).apply(null,arguments)};var
_PadV2=Module[\"_PadV2\"]=function(){return(_PadV2=Module[\"_PadV2\"]=Module[\"asm\"][\"Fa\"]).apply(null,arguments)};var
_Pow=Module[\"_Pow\"]=function(){return(_Pow=Module[\"_Pow\"]=Module[\"asm\"][\"Ga\"]).apply(null,arguments)};var
_Prelu=Module[\"_Prelu\"]=function(){return(_Prelu=Module[\"_Prelu\"]=Module[\"asm\"][\"Ha\"]).apply(null,arguments)};var
_Prod=Module[\"_Prod\"]=function(){return(_Prod=Module[\"_Prod\"]=Module[\"asm\"][\"Ia\"]).apply(null,arguments)};var
_RealDiv=Module[\"_RealDiv\"]=function(){return(_RealDiv=Module[\"_RealDiv\"]=Module[\"asm\"][\"Ja\"]).apply(null,arguments)};var
_Relu=Module[\"_Relu\"]=function(){return(_Relu=Module[\"_Relu\"]=Module[\"asm\"][\"Ka\"]).apply(null,arguments)};var
_Relu6=Module[\"_Relu6\"]=function(){return(_Relu6=Module[\"_Relu6\"]=Module[\"asm\"][\"La\"]).apply(null,arguments)};var
_ResizeBilinear=Module[\"_ResizeBilinear\"]=function(){return(_ResizeBilinear=Module[\"_ResizeBilinear\"]=Module[\"asm\"][\"Ma\"]).apply(null,arguments)};var
_Reverse=Module[\"_Reverse\"]=function(){return(_Reverse=Module[\"_Reverse\"]=Module[\"asm\"][\"Na\"]).apply(null,arguments)};var
_RotateWithOffset=Module[\"_RotateWithOffset\"]=function(){return(_RotateWithOffset=Module[\"_RotateWithOffset\"]=Module[\"asm\"][\"Oa\"]).apply(null,arguments)};var
_Round=Module[\"_Round\"]=function(){return(_Round=Module[\"_Round\"]=Module[\"asm\"][\"Pa\"]).apply(null,arguments)};var
_Rsqrt=Module[\"_Rsqrt\"]=function(){return(_Rsqrt=Module[\"_Rsqrt\"]=Module[\"asm\"][\"Qa\"]).apply(null,arguments)};var
_ScatterNd=Module[\"_ScatterNd\"]=function(){return(_ScatterNd=Module[\"_ScatterNd\"]=Module[\"asm\"][\"Ra

\"]).apply(null,arguments)};var
_SelectV2=Module[\"_SelectV2\"]=function(){return(_SelectV2=Module[\"_SelectV2\"]=Module[\"asm\"][\"Sa\"]).apply(null,arguments)};var
_Sigmoid=Module[\"_Sigmoid\"]=function(){return(_Sigmoid=Module[\"_Sigmoid\"]=Module[\"asm\"][\"Ta\"]).apply(null,arguments)};var
_Sin=Module[\"_Sin\"]=function(){return(_Sin=Module[\"_Sin\"]=Module[\"asm\"][\"Ua\"]).apply(null,arguments)};var
_Softmax=Module[\"_Softmax\"]=function(){return(_Softmax=Module[\"_Softmax\"]=Module[\"asm\"][\"Va\"]).apply(null,arguments)};var
_Sqrt=Module[\"_Sqrt\"]=function(){return(_Sqrt=Module[\"_Sqrt\"]=Module[\"asm\"][\"Wa\"]).apply(null,arguments)};var
_Square=Module[\"_Square\"]=function(){return(_Square=Module[\"_Square\"]=Module[\"asm\"][\"Xa\"]).apply(null,arguments)};var
_SquaredDifference=Module[\"_SquaredDifference\"]=function(){return(_SquaredDifference=Module[\"_SquaredDifference\"]=Module[\"asm\"][\"Ya\"]).apply(null,arguments)};var
_Step=Module[\"_Step\"]=function(){return(_Step=Module[\"_Step\"]=Module[\"asm\"][\"Za\"]).apply(null,arguments)};var
_StridedSlice=Module[\"_StridedSlice\"]=function(){return(_StridedSlice=Module[\"_StridedSlice\"]=Module[\"asm\"][\"_a\"]).apply(null,arguments)};var
_Sub=Module[\"_Sub\"]=function(){return(_Sub=Module[\"_Sub\"]=Module[\"asm\"][\"$a\"]).apply(null,arguments)};var
_Sum=Module[\"_Sum\"]=function(){return(_Sum=Module[\"_Sum\"]=Module[\"asm\"][\"ab\"]).apply(null,arguments)};var
_Tan=Module[\"_Tan\"]=function(){return(_Tan=Module[\"_Tan\"]=Module[\"asm\"][\"bb\"]).apply(null,arguments)};var
_Tanh=Module[\"_Tanh\"]=function(){return(_Tanh=Module[\"_Tanh\"]=Module[\"asm\"][\"cb\"]).apply(null,arguments)};var
_Tile=Module[\"_Tile\"]=function(){return(_Tile=Module[\"_Tile\"]=Module[\"asm\"][\"db\"]).apply(null,arguments)};var
_TopK=Module[\"_TopK\"]=function(){return(_TopK=Module[\"_TopK\"]=Module[\"asm\"][\"eb\"]).apply(null,arguments)};var
_Transform=Module[\"_Transform\"]=function(){return(_Transform=Module[\"_Transform\"]=Module[\"asm\"][\"fb\"]).apply(null,arguments)};var
_Transpose=Module[\"_Transpose\"]=function(){return(_Transpose=Module[\"_Transpose\"]=Module[\"asm\"][\"gb\"]).apply(null,arguments)};var
__FusedMatMul=Module[\"__FusedMatMul\"]=function(){return(__FusedMatMul=Module[\"__FusedMatMul\"]=Module[\"asm\"][\"hb\"]).apply(null,arguments)};var
_malloc=Module[\"_malloc\"]=function(){return(_malloc=Module[\"_malloc\"]=Module[\"asm\"][\"ib\"]).apply(null,arguments)};var
_free=Module[\"_free\"]=function(){return(_free=Module[\"_free\"]=Module[\"asm\"][\"jb\"]).apply(null,arguments)};var
___errno_location=Module[\"___errno_location\"]=function(){return(___errno_location=Module[\"___errno_location\"]=Module[\"asm\"][\"kb\"]).apply(null,arguments)};var
_emscripten_get_global_libc=Module[\"_emscripten_get_global_libc\"]=function(){return(_emscripten_get_global_libc=Module[\"_emscripten_get_global_libc\"]=Module[\"asm\"][\"lb\"]).apply(null,arguments)};var
_pthread_self=Module[\"_pthread_self\"]=function(){return(_pthread_self=Module[\"_pthread_self\"]=Module[\"asm\"][\"mb\"]).apply(null,arguments)};var
___pthread_tsd_run_dtors=Module[\"___pthread_tsd_run_dtors\"]=function(){return(___pthread_tsd_run_dtors=M

odule[\"___pthread_tsd_run_dtors\"]=Module[\"asm\"][\"nb\"]).apply(null,arguments)};var
_emscripten_main_thread_process_queued_calls=Module[\"_emscripten_main_thread_process_queued_calls\"]=fu
nction(){return(_emscripten_main_thread_process_queued_calls=Module[\"_emscripten_main_thread_process_que
ued_calls\"]=Module[\"asm\"][\"ob\"]).apply(null,arguments)};var
_emscripten_current_thread_process_queued_calls=Module[\"_emscripten_current_thread_process_queued_calls\"]
=function(){return(_emscripten_current_thread_process_queued_calls=Module[\"_emscripten_current_thread_proc
ess_queued_calls\"]=Module[\"asm\"][\"pb\"]).apply(null,arguments)};var
_emscripten_register_main_browser_thread_id=Module[\"_emscripten_register_main_browser_thread_id\"]=functi
on(){return(_emscripten_register_main_browser_thread_id=Module[\"_emscripten_register_main_browser_thread_
id\"]=Module[\"asm\"][\"qb\"]).apply(null,arguments)};var
_emscripten_main_browser_thread_id=Module[\"_emscripten_main_browser_thread_id\"]=function(){return(_ems
cripten_main_browser_thread_id=Module[\"_emscripten_main_browser_thread_id\"]=Module[\"asm\"][\"rb\"]).app
ly(null,arguments)};var
__emscripten_do_dispatch_to_thread=Module[\"__emscripten_do_dispatch_to_thread\"]=function(){return(__emsc
ripten_do_dispatch_to_thread=Module[\"__emscripten_do_dispatch_to_thread\"]=Module[\"asm\"][\"sb\"]).apply(n
ull,arguments)};var
_emscripten_sync_run_in_main_thread_4=Module[\"_emscripten_sync_run_in_main_thread_4\"]=function(){retur
n(_emscripten_sync_run_in_main_thread_4=Module[\"_emscripten_sync_run_in_main_thread_4\"]=Module[\"asm\
"][\"tb\"]).apply(null,arguments)};var
_emscripten_run_in_main_runtime_thread_js=Module[\"_emscripten_run_in_main_runtime_thread_js\"]=function(
){return(_emscripten_run_in_main_runtime_thread_js=Module[\"_emscripten_run_in_main_runtime_thread_js\"]=
Module[\"asm\"][\"ub\"]).apply(null,arguments)};var
__emscripten_call_on_thread=Module[\"__emscripten_call_on_thread\"]=function(){return(__emscripten_call_on_t
hread=Module[\"__emscripten_call_on_thread\"]=Module[\"asm\"][\"vb\"]).apply(null,arguments)};var
_emscripten_tls_init=Module[\"_emscripten_tls_init\"]=function(){return(_emscripten_tls_init=Module[\"_emscript
en_tls_init\"]=Module[\"asm\"][\"wb\"]).apply(null,arguments)};var
__emscripten_thread_init=Module[\"__emscripten_thread_init\"]=function(){return(__emscripten_thread_init=Mod
ule[\"__emscripten_thread_init\"]=Module[\"asm\"][\"xb\"]).apply(null,arguments)};var
stackSave=Module[\"stackSave\"]=function(){return(stackSave=Module[\"stackSave\"]=Module[\"asm\"][\"yb\"]).a
pply(null,arguments)};var
stackRestore=Module[\"stackRestore\"]=function(){return(stackRestore=Module[\"stackRestore\"]=Module[\"asm\"
][\"zb\"]).apply(null,arguments)};var
stackAlloc=Module[\"stackAlloc\"]=function(){return(stackAlloc=Module[\"stackAlloc\"]=Module[\"asm\"][\"Ab\"
]).apply(null,arguments)};var
_emscripten_stack_set_limits=Module[\"_emscripten_stack_set_limits\"]=function(){return(_emscripten_stack_set_
limits=Module[\"_emscripten_stack_set_limits\"]=Module[\"asm\"][\"Bb\"]).apply(null,arguments)};var
_memalign=Module[\"_memalign\"]=function(){return(_memalign=Module[\"_memalign\"]=Module[\"asm\"][\"Cb
\"]).apply(null,arguments)};var
__emscripten_allow_main_runtime_queued_calls=Module[\"__emscripten_allow_main_runtime_queued_calls\"]=1
0512;var
__emscripten_main_thread_futex=Module[\"__emscripten_main_thread_futex\"]=12148;Module[\"cwrap\"]=cwrap
;Module[\"PThread\"]=PThread;Module[\"PThread\"]=PThread;Module[\"wasmMemory\"]=wasmMemory;Module
[\"ExitStatus\"]=ExitStatus;var
calledRun;function ExitStatus(status){this.name=\"ExitStatus\";this.message=\"Program terminated with
exit(\"+status+\")\";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}if(ENVIRONMENT_IS_PTHREAD){readyPromis
eResolve(Module);initRuntime();postMessage({\"cmd\":\"loaded\"});return}preRun();if(runDependencies>0){retur

n}function
doRun(){if(calledRun)return;calledRun=true;Module[\"calledRun\"]=true;if(ABORT)return;initRuntime();preMain(
);readyPromiseResolve(Module);if(Module[\"onRuntimeInitialized\"])Module[\"onRuntimeInitialized\"]();postRun(
)}if(Module[\"setStatus\"]){Module[\"setStatus\"](\"Running...\");setTimeout(function(){setTimeout(function(){Mo
dule[\"setStatus\"](\"\")},1);doRun()},1)}else{doRun()}}Module[\"run\"]=run;function
exit(status,implicit){if(implicit&&noExitRuntime&&status===0){return}if(!implicit){if(ENVIRONMENT_IS_PT
HREAD){postMessage({\"cmd\":\"exitProcess\",\"returnCode\":status});throw
new
ExitStatus(status)}else{}}if(noExitRuntime){}else{PThread.terminateAllThreads();EXITSTATUS=status;exitRunti
me();if(Module[\"onExit\"])Module[\"onExit\"](status);ABORT=true}quit_(status,new
ExitStatus(status))}if(Module[\"preInit\"]){if(typeof
Module[\"preInit\"]==\"function\")Module[\"preInit\"]=[Module[\"preInit\"]];while(Module[\"preInit\"].length>0){
Module[\"preInit\"].pop()()}}if(ENVIRONMENT_IS_PTHREAD){noExitRuntime=false;PThread.initWorker()}run
();\n\n\n return WasmBackendModuleThreadedSimd.ready\n}\n);\n})();\nif (typeof exports === 'object' && typeof
module === 'object')\n module.exports = WasmBackendModuleThreadedSimd;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModuleThreadedSimd; });\nelse if
(typeof exports === 'object')\n exports[\"WasmBackendModuleThreadedSimd\"]
= WasmBackendModuleThreadedSimd;\n","\nvar WasmBackendModule = (function() {\n var _scriptDir = typeof
document !== 'undefined' && document.currentScript ? document.currentScript.src : undefined;\n if (typeof
__filename !== 'undefined') _scriptDir = _scriptDir || __filename;\n return (\nfunction(WasmBackendModule) {\n
WasmBackendModule = WasmBackendModule || {};\n\nvar Module=typeof
WasmBackendModule!==\"undefined\"?WasmBackendModule:{};var
readyPromiseResolve,readyPromiseReject;Module[\"ready\"]=new
Promise(function(resolve,reject){readyPromiseResolve=resolve;readyPromiseReject=reject});var
moduleOverrides={};var key;for(key in
Module){if(Module.hasOwnProperty(key)){moduleOverrides[key]=Module[key]}}var arguments_=[];var
thisProgram=\"./this.program\";var quit_=function(status,toThrow){throw toThrow};var
ENVIRONMENT_IS_WEB=false;var ENVIRONMENT_IS_WORKER=false;var
ENVIRONMENT_IS_NODE=false;var ENVIRONMENT_IS_SHELL=false;ENVIRONMENT_IS_WEB=typeof
window===\"object\";ENVIRONMENT_IS_WORKER=typeof
importScripts===\"function\";ENVIRONMENT_IS_NODE=typeof process===\"object\"&&typeof
process.versions===\"object\"&&typeof
process.versions.node===\"string\";ENVIRONMENT_IS_SHELL=!ENVIRONMENT_IS_WEB&&!ENVIRONM
ENT_IS_NODE&&!ENVIRONMENT_IS_WORKER;var scriptDirectory=\"\";function
locateFile(path){if(Module[\"locateFile\"]){return Module[\"locateFile\"](path,scriptDirectory)}return
scriptDirectory+path}var read_,readAsync,readBinary,setWindowTitle;var nodeFS;var
nodePath;if(ENVIRONMENT_IS_NODE){if(ENVIRONMENT_IS_WORKER){scriptDirectory=require(\"path\").
dirname(scriptDirectory)+\"/\"}else{scriptDirectory=__dirname+\"/\"}read_=function
shell_read(filename,binary){if(!nodeFS)nodeFS=require(\"fs\");if(!nodePath)nodePath=require(\"path\");filename=n
odePath[\"normalize\"](filename);return
nodeFS[\"readFileSync\"](filename,binary?null:\"utf8\")};readBinary=function readBinary(filename){var
ret=read_(filename,true);if(!ret.buffer){ret=new Uint8Array(ret)}assert(ret.buffer);return
ret};if(process[\"argv\"].length>1){thisProgram=process[\"argv\"][1].replace(/\\\\/g,\"/\")}arguments_=process[\"arg
v\"].slice(2);process[\"on\"](\"uncaughtException\",function(ex){if(!(ex instanceof ExitStatus)){throw
ex}});process[\"on\"](\"unhandledRejection\",abort);quit_=function(status){process[\"exit\"](status)};Module[\"insp
ect\"]=function(){return\"[Emscripten Module object]\"}}else if(ENVIRONMENT_IS_SHELL){if(typeof
read!=\"undefined\"){read_=function shell_read(f){return read(f)}}readBinary=function readBinary(f){var
data;if(typeof readbuffer===\"function\"){return new

Uint8Array(readbuffer(f))}data=read(f,\"binary\");assert(typeof data===\"object\");return data};if(typeof scriptArgs!=\"undefined\"){arguments_=scriptArgs}else if(typeof arguments!=\"undefined\"){arguments_=arguments}if(typeof quit===\"function\"){quit_=function(status){quit(status)}}if(typeof print!==\"undefined\"){if(typeof console===\"undefined\")console={};console.log=print;console.warn=console.error=typeof printErr!==\"undefined\"?printErr:print}}else if(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER){if(ENVIRONMENT_IS_WORKER){scriptDirectory=self.location.href}else if(typeof document!==\"undefined\"&&document.currentScript){scriptDirectory=document.currentScript.src}if(_scriptDir){scriptDirectory=_scriptDir}if(scriptDirectory.indexOf(\"blob:\")!==0){scriptDirectory=scriptDirectory.substr(0,scriptDirectory.lastIndexOf(\"/\")+1)}else{scriptDirectory=\"\"}{read_=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.send(null);return xhr.responseText};if(ENVIRONMENT_IS_WORKER){readBinary=function(url){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,false);xhr.responseType=\"arraybuffer\";xhr.send(null);return new Uint8Array(xhr.response)}}readAsync=function(url,onload,onerror){var xhr=new XMLHttpRequest;xhr.open(\"GET\",url,true);xhr.responseType=\"arraybuffer\";xhr.onload=function(){if(xhr.status==200||xhr.status==0&&xhr.response){onload(xhr.response);return}onerror()};xhr.onerror=onerror;xhr.send(null)}}setWindowTitle=function(title){document.title=title}}else{}var out=Module[\"print\"]||console.log.bind(console);var err=Module[\"printErr\"]||console.warn.bind(console);for(key in moduleOverrides){if(moduleOverrides.hasOwnProperty(key)){Module[key]=moduleOverrides[key]}}moduleOverrides=null;if(Module[\"arguments\"])arguments_=Module[\"arguments\"];if(Module[\"thisProgram\"])thisProgram=Module[\"thisProgram\"];if(Module[\"quit\"])quit_=Module[\"quit\"];var wasmBinary;if(Module[\"wasmBinary\"])wasmBinary=Module[\"wasmBinary\"];var noExitRuntime=Module[\"noExitRuntime\"]||true;if(typeof WebAssembly!==\"object\"){abort(\"no native wasm support detected\")}var wasmMemory;var ABORT=false;var EXITSTATUS;function assert(condition,text){if(!condition){abort(\"Assertion failed: \"+text)}}function getCFunc(ident){var func=Module[\"_\"+ident];assert(func,\"Cannot call unknown function \"+ident+\", make sure it is exported\");return func}function ccall(ident,returnType,argTypes,args,opts){var toC={\"string\":function(str){var ret=0;if(str!==null&&str!==undefined&&str!==0){var len=(str.length<<2)+1;ret=stackAlloc(len);stringToUTF8(str,ret,len)}return ret},\"array\":function(arr){var ret=stackAlloc(arr.length);writeArrayToMemory(arr,ret);return ret}};function convertReturnValue(ret){if(returnType===\"string\")return UTF8ToString(ret);if(returnType===\"boolean\")return Boolean(ret);return ret}var func=getCFunc(ident);var cArgs=[];var stack=0;if(args){for(var i=0;i<args.length;i++){var converter=toC[argTypes[i]];if(converter){if(stack===0)stack=stackSave();cArgs[i]=converter(args[i])}else{cArgs[i]=args[i]}}}var ret=func.apply(null,cArgs);ret=convertReturnValue(ret);if(stack!==0)stackRestore(stack);return ret}function cwrap(ident,returnType,argTypes,opts){argTypes=argTypes||[];var numericArgs=argTypes.every(function(type){return type===\"number\"});var numericRet=returnType!==\"string\";if(numericRet&&numericArgs&&!opts){return getCFunc(ident)}return function(){return ccall(ident,returnType,argTypes,arguments,opts)}}var UTF8Decoder=typeof TextDecoder!==\"undefined\"?new TextDecoder(\"utf8\"):undefined;function UTF8ArrayToString(heap,idx,maxBytesToRead){var endIdx=idx+maxBytesToRead;var endPtr=idx;while(heap[endPtr]&&!(endPtr>=endIdx))++endPtr;if(endPtr-idx>16&&heap.subarray&&UTF8Decoder){return UTF8Decoder.decode(heap.subarray(idx,endPtr))}else{var str=\"\";while(idx<endPtr){var u0=heap[idx++];if(!(u0&128)){str+=String.fromCharCode(u0);continue}var u1=heap[idx++]&63;if((u0&224)==192){str+=String.fromCharCode((u0&31)<<6|u1);continue}var

u2=heap[idx++]&63;if((u0&240)==224){u0=(u0&15)<<12|u1<<6|u2}else{u0=(u0&7)<<18|u1<<12|u2<<6|heap[idx++]&63}if(u0<65536){str+=String.fromCharCode(u0)}else{var ch=u0-65536;str+=String.fromCharCode(55296|ch>>10,56320|ch&1023)}}}return str}function UTF8ToString(ptr,maxBytesToRead){return ptr?UTF8ArrayToString(HEAPU8,ptr,maxBytesToRead):\"\"}function stringToUTF8Array(str,heap,outIdx,maxBytesToWrite){if(!(maxBytesToWrite>0))return 0;var startIdx=outIdx;var endIdx=outIdx+maxBytesToWrite-1;for(var i=0;i<str.length;++i){var u=str.charCodeAt(i);if(u>=55296&&u<=57343){var u1=str.charCodeAt(++i);u=65536+((u&1023)<<10)|u1&1023}if(u<=127){if(outIdx>=endIdx)break;heap[outIdx++]=u}else if(u<=2047){if(outIdx+1>=endIdx)break;heap[outIdx++]=192|u>>6;heap[outIdx++]=128|u&63}else if(u<=65535){if(outIdx+2>=endIdx)break;heap[outIdx++]=224|u>>12;heap[outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}else{if(outIdx+3>=endIdx)break;heap[outIdx++]=240|u>>18;heap[outIdx++]=128|u>>12&63;heap[outIdx++]=128|u>>6&63;heap[outIdx++]=128|u&63}}heap[outIdx]=0;return outIdx-startIdx}function stringToUTF8(str,outPtr,maxBytesToWrite){return stringToUTF8Array(str,HEAPU8,outPtr,maxBytesToWrite)}function writeArrayToMemory(array,buffer){HEAP8.set(array,buffer)}function alignUp(x,multiple){if(x%multiple>0){x+=multiple-x%multiple}return x}var buffer,HEAP8,HEAPU8,HEAP16,HEAPU16,HEAP32,HEAPU32,HEAPF32,HEAPF64;function updateGlobalBufferAndViews(buf){buffer=buf;Module[\"HEAP8\"]=HEAP8=new Int8Array(buf);Module[\"HEAP16\"]=HEAP16=new Int16Array(buf);Module[\"HEAP32\"]=HEAP32=new Int32Array(buf);Module[\"HEAPU8\"]=HEAPU8=new Uint8Array(buf);Module[\"HEAPU16\"]=HEAPU16=new Uint16Array(buf);Module[\"HEAPU32\"]=HEAPU32=new Uint32Array(buf);Module[\"HEAPF32\"]=HEAPF32=new Float32Array(buf);Module[\"HEAPF64\"]=HEAPF64=new Float64Array(buf)}var INITIAL_MEMORY=Module[\"INITIAL_MEMORY\"]||16777216;var wasmTable;var __ATPRERUN__=[];var __ATINIT__=[];var __ATMAIN__=[];var __ATPOSTRUN__=[];var runtimeInitialized=false;__ATINIT__.push({func:function(){___wasm_call_ctors()}});function preRun(){if(Module[\"preRun\"]){if(typeof Module[\"preRun\"]==\"function\")Module[\"preRun\"]=[Module[\"preRun\"]];while(Module[\"preRun\"].length){addOnPreRun(Module[\"preRun\"].shift())}}callRuntimeCallbacks(__ATPRERUN__)}function initRuntime(){runtimeInitialized=true;callRuntimeCallbacks(__ATINIT__)}function preMain(){callRuntimeCallbacks(__ATMAIN__)}function postRun(){if(Module[\"postRun\"]){if(typeof Module[\"postRun\"]==\"function\")Module[\"postRun\"]=[Module[\"postRun\"]];while(Module[\"postRun\"].length){addOnPostRun(Module[\"postRun\"].shift())}}callRuntimeCallbacks(__ATPOSTRUN__)}function addOnPreRun(cb){__ATPRERUN__.unshift(cb)}function addOnPostRun(cb){__ATPOSTRUN__.unshift(cb)}var runDependencies=0;var runDependencyWatcher=null;var dependenciesFulfilled=null;function addRunDependency(id){runDependencies++;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}}function removeRunDependency(id){runDependencies--;if(Module[\"monitorRunDependencies\"]){Module[\"monitorRunDependencies\"](runDependencies)}if(runDependencies==0){if(runDependencyWatcher!==null){clearInterval(runDependencyWatcher);runDependencyWatcher=null}if(dependenciesFulfilled){var callback=dependenciesFulfilled;dependenciesFulfilled=null;callback()}}}Module[\"preloadedImages\"]={};Module[\"preloadedAudios\"]={};function abort(what){if(Module[\"onAbort\"]){Module[\"onAbort\"](what)}what+=\"\";err(what);ABORT=true;EXITSTATUS=1;what=\"abort(\"+what+\"). Build with -s ASSERTIONS=1 for more info.\";var e=new WebAssembly.RuntimeError(what);readyPromiseReject(e);throw e}function hasPrefix(str,prefix){return String.prototype.startsWith?str.startsWith(prefix):str.indexOf(prefix)===0}var

dataURIPrefix=\"data:application/octet-stream; base64,\";function isDataURI(filename){return hasPrefix(filename,dataURIPrefix)}var fileURIPrefix=\"file://\";function isFileURI(filename){return hasPrefix(filename,fileURIPrefix)}var wasmBinaryFile=\"tfjs-backend-wasm.wasm\";if(!isDataURI(wasmBinaryFile)){wasmBinaryFile=locateFile(wasmBinaryFile)}function getBinary(file){try{if(file==wasmBinaryFile&&wasmBinary){return new Uint8Array(wasmBinary)}if(readBinary){return readBinary(file)}else{throw\"both async and sync fetching of the wasm failed\"}}catch(err){abort(err)}}function getBinaryPromise(){if(!wasmBinary&&(ENVIRONMENT_IS_WEB||ENVIRONMENT_IS_WORKER)){if(typeof fetch===\"function\"&&!isFileURI(wasmBinaryFile)){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){if(!response[\"ok\"]){throw\"failed to load wasm binary file at '\"+wasmBinaryFile+\"'\"}return response[\"arrayBuffer\"]()}).catch(function(){return getBinary(wasmBinaryFile)})}else{if(readAsync){return new Promise(function(resolve,reject){readAsync(wasmBinaryFile,function(response){resolve(new Uint8Array(response))},reject)})}}}return Promise.resolve().then(function(){return getBinary(wasmBinaryFile)})}function createWasm(){var info={\"a\":asmLibraryArg};function receiveInstance(instance,module){var exports=instance.exports;Module[\"asm\"]=exports;wasmMemory=Module[\"asm\"][\"j\"];updateGlobalBufferAndViews(wasmMemory.buffer);wasmTable=Module[\"asm\"][\"r\"];removeRunDependency(\"wasm-instantiate\")}addRunDependency(\"wasm-instantiate\");function receiveInstantiatedSource(output){receiveInstance(output[\"instance\"])}function instantiateArrayBuffer(receiver){return getBinaryPromise().then(function(binary){return WebAssembly.instantiate(binary,info)}).then(receiver,function(reason){err(\"failed to asynchronously prepare wasm: \"+reason);abort(reason)})}function instantiateAsync(){if(!wasmBinary&&typeof WebAssembly.instantiateStreaming===\"function\"&&!isDataURI(wasmBinaryFile)&&!isFileURI(wasmBinaryFile)&&typeof fetch===\"function\"){return fetch(wasmBinaryFile,{credentials:\"same-origin\"}).then(function(response){var result=WebAssembly.instantiateStreaming(response,info);return result.then(receiveInstantiatedSource,function(reason){err(\"wasm streaming compile failed: \"+reason);err(\"falling back to ArrayBuffer instantiation\");return instantiateArrayBuffer(receiveInstantiatedSource)})})}else{return instantiateArrayBuffer(receiveInstantiatedSource)}}if(Module[\"instantiateWasm\"]){try{var exports=Module[\"instantiateWasm\"](info,receiveInstance);return exports}catch(e){err(\"Module.instantiateWasm callback failed with error: \"+e);return false}}instantiateAsync().catch(readyPromiseReject);return{}}function callRuntimeCallbacks(callbacks){while(callbacks.length>0){var callback=callbacks.shift();if(typeof callback==\"function\"){callback(Module);continue}var func=callback.func;if(typeof func===\"number\"){if(callback.arg===undefined){wasmTable.get(func)()}else{wasmTable.get(func)(callback.arg)}}else{func(callback.arg===undefined?null:callback.arg)}}}function _abort(){abort()}function _emscripten_memcpy_big(dest,src,num){HEAPU8.copyWithin(dest,src,src+num)}function _emscripten_get_heap_size(){return HEAPU8.length}function emscripten_realloc_buffer(size){try{wasmMemory.grow(size-buffer.byteLength+65535>>>16);updateGlobalBufferAndViews(wasmMemory.buffer);return 1}catch(e){}}function _emscripten_resize_heap(requestedSize){var oldSize=_emscripten_get_heap_size();var maxHeapSize=2147483648;if(requestedSize>maxHeapSize){return false}for(var cutDown=1;cutDown<=4;cutDown*=2){var overGrownHeapSize=oldSize*(1+.2/cutDown);overGrownHeapSize=Math.min(overGrownHeapSize,requestedSize+100663296);var newSize=Math.min(maxHeapSize,alignUp(Math.max(requestedSize,overGrownHeapSize),65536));var replacement=emscripten_realloc_buffer(newSize);if(replacement){return true}}return false}var SYSCALLS={mappings:{},buffers:[null,[],[]],printChar:function(stream,curr){var buffer=SYSCALLS.buffers[stream];if(curr===0||curr===10){(stream===1?out:err)(UTF8ArrayToString(buffer,0));

buffer.length=0}else{buffer.push(curr)}},varargs:undefined,get:function(){SYSCALLS.varargs+=4;var ret=HEAP32[SYSCALLS.varargs-4>>2];return ret},getStr:function(ptr){var ret=UTF8ToString(ptr);return ret},get64:function(low,high){return low}};function _fd_close(fd){return 0}function _fd_seek(fd,offset_low,offset_high,whence,newOffset){}function _fd_write(fd,iov,iovcnt,pnum){var num=0;for(var i=0;i<iovcnt;i++){var ptr=HEAP32[iov+i*8>>2];var len=HEAP32[iov+(i*8+4)>>2];for(var j=0;j<len;j++){SYSCALLS.printChar(fd,HEAPU8[ptr+j])}num+=len}HEAP32[pnum>>2]=num;return 0}function _pthread_create(){return 6}function _pthread_join(){return 28}function setErrNo(value){HEAP32[___errno_location()>>2]=value;return value}function _sysconf(name){switch(name){case 30:return 16384;case 85:var maxHeapSize=2147483648;return maxHeapSize/16384;case 132:case 133:case 12:case 137:case 138:case 15:case 235:case 16:case 17:case 18:case 19:case 20:case 149:case 13:case 10:case 236:case 153:case 9:case 21:case 22:case 159:case 154:case 14:case 77:case 78:case 139:case 82:case 68:case 67:case 164:case 11:case 29:case 47:case 48:case 95:case 52:case 51:case 46:return 200809;case 27:case 246:case 127:case 128:case 23:case 24:case 160:case 161:case 181:case 182:case 242:case 183:case 184:case 243:case 244:case 245:case 165:case 178:case 179:case 49:case 50:case 168:case 169:case 175:case 170:case 171:case 172:case 97:case 76:case 32:case 173:case 35:case 80:case 81:case 79:return -1;case 176:case 177:case 7:case 155:case 8:case 157:case 125:case 126:case 92:case 93:case 129:case 130:case 131:case 94:case 91:return 1;case 74:case 60:case 69:case 70:case 4:return 1024;case 31:case 42:case 72:return 32;case 87:case 26:case 33:return 2147483647;case 34:case 1:return 47839;case 38:case 36:return 99;case 43:case 37:return 2048;case 0:return 2097152;case 3:return 65536;case 28:return 32768;case 44:return 32767;case 75:return 16384;case 39:return 1e3;case 89:return 700;case 71:return 256;case 40:return 255;case 2:return 100;case 180:return 64;case 25:return 20;case 5:return 16;case 6:return 6;case 73:return 4;case 84:{if(typeof navigator===\"object\")return navigator[\"hardwareConcurrency\"]||1;return 1}}setErrNo(28);return -1}var asmLibraryArg={\"a\":_abort,\"d\":_emscripten_memcpy_big,\"e\":_emscripten_resize_heap,\"f\":_fd_close,\"c\":_fd_seek,\"b\":_fd_write,\"h\":_pthread_create,\"g\":_pthread_join,\"i\":_sysconf};var asm=createWasm();var ___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=function(){return(___wasm_call_ctors=Module[\"___wasm_call_ctors\"]=Module[\"asm\"][\"k\"]).apply(null,arguments)};var _init=Module[\"_init\"]=function(){return(_init=Module[\"_init\"]=Module[\"asm\"][\"l\"]).apply(null,arguments)};var _init_with_threads_count=Module[\"_init_with_threads_count\"]=function(){return(_init_with_threads_count=Module[\"_init_with_threads_count\"]=Module[\"asm\"][\"m\"]).apply(null,arguments)};var _get_threads_count=Module[\"_get_threads_count\"]=function(){return(_get_threads_count=Module[\"_get_threads_count\"]=Module[\"asm\"][\"n\"]).apply(null,arguments)};var _register_tensor=Module[\"_register_tensor\"]=function(){return(_register_tensor=Module[\"_register_tensor\"]=Module[\"asm\"][\"o\"]).apply(null,arguments)};var _dispose_data=Module[\"_dispose_data\"]=function(){return(_dispose_data=Module[\"_dispose_data\"]=Module[\"asm\"][\"p\"]).apply(null,arguments)};var _dispose=Module[\"_dispose\"]=function(){return(_dispose=Module[\"_dispose\"]=Module[\"asm\"][\"q\"]).apply(null,arguments)};var _Abs=Module[\"_Abs\"]=function(){return(_Abs=Module[\"_Abs\"]=Module[\"asm\"][\"s\"]).apply(null,arguments)};var _Add=Module[\"_Add\"]=function(){return(_Add=Module[\"_Add\"]=Module[\"asm\"][\"t\"]).apply(null,arguments)};var _AddN=Module[\"_AddN\"]=function(){return(_AddN=Module[\"_AddN\"]=Module[\"asm\"][\"u\"]).apply(null,arguments)};var _All=Module[\"_All\"]=function(){return(_All=Module[\"_All\"]=Module[\"asm\"][\"v\"]).apply(null,arguments)};var _Any=Module[\"_Any\"]=function(){return(_Any=Module[\"_Any\"]=Module[\"asm\"][\"w\"]).apply(null,argumen

ts)};var
_ArgMax=Module[\"_ArgMax\"]=function(){return(_ArgMax=Module[\"_ArgMax\"]=Module[\"asm\"][\"x\"]).apply(null,arguments)};var
_AvgPool=Module[\"_AvgPool\"]=function(){return(_AvgPool=Module[\"_AvgPool\"]=Module[\"asm\"][\"y\"]).apply(null,arguments)};var
_BatchMatMul=Module[\"_BatchMatMul\"]=function(){return(_BatchMatMul=Module[\"_BatchMatMul\"]=Module[\"asm\"][\"z\"]).apply(null,arguments)};var
_Ceil=Module[\"_Ceil\"]=function(){return(_Ceil=Module[\"_Ceil\"]=Module[\"asm\"][\"A\"]).apply(null,arguments)};var
_ClipByValue=Module[\"_ClipByValue\"]=function(){return(_ClipByValue=Module[\"_ClipByValue\"]=Module[\"asm\"][\"B\"]).apply(null,arguments)};var
_Conv2D=Module[\"_Conv2D\"]=function(){return(_Conv2D=Module[\"_Conv2D\"]=Module[\"asm\"][\"C\"]).apply(null,arguments)};var
_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=function(){return(_Conv2DBackpropInput=Module[\"_Conv2DBackpropInput\"]=Module[\"asm\"][\"D\"]).apply(null,arguments)};var
_Cos=Module[\"_Cos\"]=function(){return(_Cos=Module[\"_Cos\"]=Module[\"asm\"][\"E\"]).apply(null,arguments)};var
_Cosh=Module[\"_Cosh\"]=function(){return(_Cosh=Module[\"_Cosh\"]=Module[\"asm\"][\"F\"]).apply(null,arguments)};var
_CropAndResize=Module[\"_CropAndResize\"]=function(){return(_CropAndResize=Module[\"_CropAndResize\"]=Module[\"asm\"][\"G\"]).apply(null,arguments)};var
_Cumsum=Module[\"_Cumsum\"]=function(){return(_Cumsum=Module[\"_Cumsum\"]=Module[\"asm\"][\"H\"]).apply(null,arguments)};var
_DepthToSpace=Module[\"_DepthToSpace\"]=function(){return(_DepthToSpace=Module[\"_DepthToSpace\"]=Module[\"asm\"][\"I\"]).apply(null,arguments)};var
_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=function(){return(_DepthwiseConv2dNative=Module[\"_DepthwiseConv2dNative\"]=Module[\"asm\"][\"J\"]).apply(null,arguments)};var
_Elu=Module[\"_Elu\"]=function(){return(_Elu=Module[\"_Elu\"]=Module[\"asm\"][\"K\"]).apply(null,arguments)};var
_Equal=Module[\"_Equal\"]=function(){return(_Equal=Module[\"_Equal\"]=Module[\"asm\"][\"L\"]).apply(null,arguments)};var
_Exp=Module[\"_Exp\"]=function(){return(_Exp=Module[\"_Exp\"]=Module[\"asm\"][\"M\"]).apply(null,arguments)};var
_FlipLeftRight=Module[\"_FlipLeftRight\"]=function(){return(_FlipLeftRight=Module[\"_FlipLeftRight\"]=Module[\"asm\"][\"N\"]).apply(null,arguments)};var
_Floor=Module[\"_Floor\"]=function(){return(_Floor=Module[\"_Floor\"]=Module[\"asm\"][\"O\"]).apply(null,arguments)};var
_FloorDiv=Module[\"_FloorDiv\"]=function(){return(_FloorDiv=Module[\"_FloorDiv\"]=Module[\"asm\"][\"P\"]).apply(null,arguments)};var
_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=function(){return(_FusedBatchNorm=Module[\"_FusedBatchNorm\"]=Module[\"asm\"][\"Q\"]).apply(null,arguments)};var
_FusedConv2D=Module[\"_FusedConv2D\"]=function(){return(_FusedConv2D=Module[\"_FusedConv2D\"]=Module[\"asm\"][\"R\"]).apply(null,arguments)};var
_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=function(){return(_FusedDepthwiseConv2D=Module[\"_FusedDepthwiseConv2D\"]=Module[\"asm\"][\"S\"]).apply(null,arguments)};var
_Gather=Module[\"_Gather\"]=function(){return(_Gather=Module[\"_Gather\"]=Module[\"asm\"][\"T\"]).apply(null,arguments)};var
_GatherNd=Module[\"_GatherNd\"]=function(){return(_GatherNd=Module[\"_GatherNd\"]=Module[\"asm\"][\"U\"

]).apply(null,arguments)};var
_Greater=Module[\"_Greater\"]=function(){return(_Greater=Module[\"_Greater\"]=Module[\"asm\"][\"V\"]).apply(
null,arguments)};var
_GreaterEqual=Module[\"_GreaterEqual\"]=function(){return(_GreaterEqual=Module[\"_GreaterEqual\"]=Module[\
"asm\"][\"W\"]).apply(null,arguments)};var
_LeakyRelu=Module[\"_LeakyRelu\"]=function(){return(_LeakyRelu=Module[\"_LeakyRelu\"]=Module[\"asm\"][\
"X\"]).apply(null,arguments)};var
_Less=Module[\"_Less\"]=function(){return(_Less=Module[\"_Less\"]=Module[\"asm\"][\"Y\"]).apply(null,argume
nts)};var
_LessEqual=Module[\"_LessEqual\"]=function(){return(_LessEqual=Module[\"_LessEqual\"]=Module[\"asm\"][\"
Z\"]).apply(null,arguments)};var
_Log=Module[\"_Log\"]=function(){return(_Log=Module[\"_Log\"]=Module[\"asm\"][\"_\"]).apply(null,arguments
)};var
_LogicalAnd=Module[\"_LogicalAnd\"]=function(){return(_LogicalAnd=Module[\"_LogicalAnd\"]=Module[\"asm
\"][\"$\"]).apply(null,arguments)};var
_Max=Module[\"_Max\"]=function(){return(_Max=Module[\"_Max\"]=Module[\"asm\"][\"aa\"]).apply(null,argume
nts)};var
_MaxPool=Module[\"_MaxPool\"]=function(){return(_MaxPool=Module[\"_MaxPool\"]=Module[\"asm\"][\"ba\"]).
apply(null,arguments)};var
_Maximum=Module[\"_Maximum\"]=function(){return(_Maximum=Module[\"_Maximum\"]=Module[\"asm\"][\"ca\"]).apply(null,arguments)};var
_Mean=Module[\"_Mean\"]=function(){return(_Mean=Module[\"_Mean\"]=Module[\"asm\"][\"da\"]).apply(null,ar
guments)};var
_Min=Module[\"_Min\"]=function(){return(_Min=Module[\"_Min\"]=Module[\"asm\"][\"ea\"]).apply(null,argumen
ts)};var
_Minimum=Module[\"_Minimum\"]=function(){return(_Minimum=Module[\"_Minimum\"]=Module[\"asm\"][\"fa\
"]).apply(null,arguments)};var
_MirrorPad=Module[\"_MirrorPad\"]=function(){return(_MirrorPad=Module[\"_MirrorPad\"]=Module[\"asm\"][\"g
a\"]).apply(null,arguments)};var
_Multiply=Module[\"_Multiply\"]=function(){return(_Multiply=Module[\"_Multiply\"]=Module[\"asm\"][\"ha\"]).a
pply(null,arguments)};var
_Neg=Module[\"_Neg\"]=function(){return(_Neg=Module[\"_Neg\"]=Module[\"asm\"][\"ia\"]).apply(null,argument
s)};var
_NonMaxSuppressionV3=Module[\"_NonMaxSuppressionV3\"]=function(){return(_NonMaxSuppressionV3=Mod
ule[\"_NonMaxSuppressionV3\"]=Module[\"asm\"][\"ja\"]).apply(null,arguments)};var
_NonMaxSuppressionV4=Module[\"_NonMaxSuppressionV4\"]=function(){return(_NonMaxSuppressionV4=Mod
ule[\"_NonMaxSuppressionV4\"]=Module[\"asm\"][\"ka\"]).apply(null,arguments)};var
_NonMaxSuppressionV5=Module[\"_NonMaxSuppressionV5\"]=function(){return(_NonMaxSuppressionV5=Mod
ule[\"_NonMaxSuppressionV5\"]=Module[\"asm\"][\"la\"]).apply(null,arguments)};var
_NotEqual=Module[\"_NotEqual\"]=function(){return(_NotEqual=Module[\"_NotEqual\"]=Module[\"asm\"][\"ma\"
]).apply(null,arguments)};var
_OneHot=Module[\"_OneHot\"]=function(){return(_OneHot=Module[\"_OneHot\"]=Module[\"asm\"][\"na\"]).appl
y(null,arguments)};var
_PadV2=Module[\"_PadV2\"]=function(){return(_PadV2=Module[\"_PadV2\"]=Module[\"asm\"][\"oa\"]).apply(nul
l,arguments)};var
_Pow=Module[\"_Pow\"]=function(){return(_Pow=Module[\"_Pow\"]=Module[\"asm\"][\"pa\"]).apply(null,argume
nts)};var
_Prelu=Module[\"_Prelu\"]=function(){return(_Prelu=Module[\"_Prelu\"]=Module[\"asm\"][\"qa\"]).apply(null,argu

ments)};var
_Prod=Module[\"_Prod\"]=function(){return(_Prod=Module[\"_Prod\"]=Module[\"asm\"][\"ra\"]).apply(null,argum
ents)};var
_RealDiv=Module[\"_RealDiv\"]=function(){return(_RealDiv=Module[\"_RealDiv\"]=Module[\"asm\"][\"sa\"]).app
ly(null,arguments)};var
_Relu=Module[\"_Relu\"]=function(){return(_Relu=Module[\"_Relu\"]=Module[\"asm\"][\"ta\"]).apply(null,argume
nts)};var
_Relu6=Module[\"_Relu6\"]=function(){return(_Relu6=Module[\"_Relu6\"]=Module[\"asm\"][\"ua\"]).apply(null,ar
guments)};var
_ResizeBilinear=Module[\"_ResizeBilinear\"]=function(){return(_ResizeBilinear=Module[\"_ResizeBilinear\"]=Mo
dule[\"asm\"][\"va\"]).apply(null,arguments)};var
_Reverse=Module[\"_Reverse\"]=function(){return(_Reverse=Module[\"_Reverse\"]=Module[\"asm\"][\"wa\"]).app
ly(null,arguments)};var
_RotateWithOffset=Module[\"_RotateWithOffset\"]=function(){return(_RotateWithOffset=Module[\"_RotateWith
Offset\"]=Module[\"asm\"][\"xa\"]).apply(null,arguments)};var
_Round=Module[\"_Round\"]=function(){return(_Round=Module[\"_Round\"]=Module[\"asm\"][\"ya\"]).apply(nul
l,arguments)};var
_Rsqrt=Module[\"_Rsqrt\"]=function(){return(_Rsqrt=Module[\"_Rsqrt\"]=Module[\"asm\"][\"za\"]).apply(null,arg
uments)};var
_ScatterNd=Module[\"_ScatterNd\"]=function(){return(_ScatterNd=Module[\"_ScatterNd\"]=Module[\"asm\"][\"Aa
\"]).apply(null,arguments)};var
_SelectV2=Module[\"_SelectV2\"]=function(){return(_SelectV2=Module[\"_SelectV2\"]=Module[\"asm\"][\"Ba\"])
.apply(null,arguments)};var
_Sigmoid=Module[\"_Sigmoid\"]=function(){return(_Sigmoid=Module[\"_Sigmoid\"]=Module[\"asm\"][\"Ca\"]).ap
ply(null,arguments)};var
_Sin=Module[\"_Sin\"]=function(){return(_Sin=Module[\"_Sin\"]=Module[\"asm\"][\"Da\"]).apply(null,arguments)
};var
_Softmax=Module[\"_Softmax\"]=function(){return(_Softmax=Module[\"_Softmax\"]=Module[\"asm\"][\"Ea\"]).ap
ply(null,arguments)};var
_Sqrt=Module[\"_Sqrt\"]=function(){return(_Sqrt=Module[\"_Sqrt\"]=Module[\"asm\"][\"Fa\"]).apply(null,argumen
ts)};var
_Square=Module[\"_Square\"]=function(){return(_Square=Module[\"_Square\"]=Module[\"asm\"][\"Ga\"]).apply(n
ull,arguments)};var
_SquaredDifference=Module[\"_SquaredDifference\"]=function(){return(_SquaredDifference=Module[\"_Squared
Difference\"]=Module[\"asm\"][\"Ha\"]).apply(null,arguments)};var
_Step=Module[\"_Step\"]=function(){return(_Step=Module[\"_Step\"]=Module[\"asm\"][\"Ia\"]).apply(null,argume
nts)};var
_StridedSlice=Module[\"_StridedSlice\"]=function(){return(_StridedSlice=Module[\"_StridedSlice\"]=Module[\"as
m\"][\"Ja\"]).apply(null,arguments)};var
_Sub=Module[\"_Sub\"]=function(){return(_Sub=Module[\"_Sub\"]=Module[\"asm\"][\"Ka\"]).apply(null,argument
s)};var
_Sum=Module[\"_Sum\"]=function(){return(_Sum=Module[\"_Sum\"]=Module[\"asm\"][\"La\"]).apply(null,argum
ents)};var
_Tan=Module[\"_Tan\"]=function(){return(_Tan=Module[\"_Tan\"]=Module[\"asm\"][\"Ma\"]).apply(null,argumen
ts)};var
_Tanh=Module[\"_Tanh\"]=function(){return(_Tanh=Module[\"_Tanh\"]=Module[\"asm\"][\"Na\"]).apply(null,argu
ments)};var

_Tile=Module[\"_Tile\"]=function(){return(_Tile=Module[\"_Tile\"]=Module[\"asm\"][\"Oa\"]).apply(null,arguments)};var
_TopK=Module[\"_TopK\"]=function(){return(_TopK=Module[\"_TopK\"]=Module[\"asm\"][\"Pa\"]).apply(null,arguments)};var
_Transform=Module[\"_Transform\"]=function(){return(_Transform=Module[\"_Transform\"]=Module[\"asm\"][\"Qa\"]).apply(null,arguments)};var
_Transpose=Module[\"_Transpose\"]=function(){return(_Transpose=Module[\"_Transpose\"]=Module[\"asm\"][\"Ra\"]).apply(null,arguments)};var
__FusedMatMul=Module[\"__FusedMatMul\"]=function(){return(__FusedMatMul=Module[\"__FusedMatMul\"]=Module[\"asm\"][\"Sa\"]).apply(null,arguments)};var
_malloc=Module[\"_malloc\"]=function(){return(_malloc=Module[\"_malloc\"]=Module[\"asm\"][\"Ta\"]).apply(null,arguments)};var
_free=Module[\"_free\"]=function(){return(_free=Module[\"_free\"]=Module[\"asm\"][\"Ua\"]).apply(null,arguments)};var
___errno_location=Module[\"___errno_location\"]=function(){return(___errno_location=Module[\"___errno_location\"]=Module[\"asm\"][\"Va\"]).apply(null,arguments)};var
stackSave=Module[\"stackSave\"]=function(){return(stackSave=Module[\"stackSave\"]=Module[\"asm\"][\"Wa\"]).apply(null,arguments)};var
stackRestore=Module[\"stackRestore\"]=function(){return(stackRestore=Module[\"stackRestore\"]=Module[\"asm\"][\"Xa\"]).apply(null,arguments)};var
stackAlloc=Module[\"stackAlloc\"]=function(){return(stackAlloc=Module[\"stackAlloc\"]=Module[\"asm\"][\"Ya\"]).apply(null,arguments)};Module[\"cwrap\"]=cwrap;var calledRun;function
ExitStatus(status){this.name=\"ExitStatus\";this.message=\"Program terminated with
exit(\"+status+\")\";this.status=status}dependenciesFulfilled=function
runCaller(){if(!calledRun)run();if(!calledRun)dependenciesFulfilled=runCaller};function
run(args){args=args||arguments_;if(runDependencies>0){return}preRun();if(runDependencies>0){return}function
doRun(){if(calledRun)return;calledRun=true;Module[\"calledRun\"]=true;if(ABORT)return;initRuntime();preMain();readyPromiseResolve(Module);if(Module[\"onRuntimeInitialized\"])Module[\"onRuntimeInitialized\"]();postRun()}if(Module[\"setStatus\"]){Module[\"setStatus\"](\"Running...\");setTimeout(function(){setTimeout(function(){Module[\"setStatus\"](\"\")},1);doRun()},1)}else{doRun()}}Module[\"run\"]=run;if(Module[\"preInit\"]){if(typeof
Module[\"preInit\"]==\"function\")Module[\"preInit\"]=[Module[\"preInit\"]];while(Module[\"preInit\"].length>0){
Module[\"preInit\"].pop()()}}run();\n\n\n return WasmBackendModule.ready\n}\n);\n})();\nif (typeof exports ===
'object' && typeof module === 'object')\n module.exports = WasmBackendModule;\nelse if (typeof define ===
'function' && define['amd'])\n define([], function() { return WasmBackendModule; });\nelse if (typeof exports ===
'object')\n exports[\"WasmBackendModule\"] = WasmBackendModule;\n","/**\n * @license\n * Copyright 2019
Google LLC. All Rights Reserved.\n * Licensed under the
 Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
==\n
*/\nimport './flags_wasm';\n\nimport {backend_util, BackendTimingInfo, DataStorage, DataType, deprecationWarn,
engine, env, KernelBackend, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasmModule,
WasmFactoryConfig} from '../wasm-out/tfjs-backend-wasm';\nimport {BackendWasmThreadedSimdModule} from
'../wasm-out/tfjs-backend-wasm-threaded-simd';\nimport

```
wasmFactoryThreadedSimd from '../wasm-out/tfjs-backend-wasm-threaded-simd.js';\n// @ts-ignore\nimport {wasmWorkerContents} from '../wasm-out/tfjs-backend-wasm-threaded-simd.worker.js';\nimport wasmFactory from '../wasm-out/tfjs-backend-wasm.js';\n\ninterface TensorData {\n  id: number;\n  memoryOffset: number;\n  shape: number[];\n  dtype: DataType;\n  refCount: number;\n  /** Only used for string tensors, storing encoded bytes. */\n  stringBytes?: Uint8Array[];\n}\n\nexport type DataId = object;  // object instead of {} to force non-primitive.\n\nexport class BackendWasm extends KernelBackend {\n  // 0 is reserved for null data ids.\n  private dataIdNextNumber = 1;\n  dataIdMap: DataStorage<TensorData>;\n\n  constructor(public wasm: BackendWasmModule|BackendWasmThreadedSimdModule) {\n    super();\n    this.wasm.tfjs.initWithThreadsCount(threadsCount);\n    actualThreadsCount = this.wasm.tfjs.getThreadsCount();\n    this.dataIdMap = new DataStorage(this, engine());\n  }\n\n  write(values: backend_util.BackendValues, shape: number[], dtype: DataType):\n      DataId {\n    const dataId = {id: this.dataIdNextNumber++};\n    this.move(dataId, values, shape, dtype, 1);\n    return dataId;\n  }\n\n  numDataIds(): number {\n    return this.dataIdMap.numDataIds();\n  }\n\n  async time(f: () => void): Promise<BackendTimingInfo> {\n    const start = util.now();\n    f();\n    const kernelMs = util.now() - start;\n    return {kernelMs};\n  }\n\n  move(\n      dataId: DataId, values: backend_util.BackendValues, shape: number[],\n      dtype: DataType, refCount: number): void {\n    const id = this.dataIdNextNumber++;\n    if (dtype === 'string') {\n      const stringBytes = values as Uint8Array[];\n      this.dataIdMap.set(\n          dataId,\n          {id, stringBytes, shape, dtype, memoryOffset: null, refCount});\n      return;\n    }\n\n    const size = util.sizeFromShape(shape);\n    const numBytes = size * util.bytesPerElement(dtype);\n    const memoryOffset = this.wasm._malloc(numBytes);\n\n    this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount});\n\n    this.wasm.tfjs.registerTensor(id, size, memoryOffset);\n\n    if (values != null) {\n      this.wasm.HEAPU8.set(\n          new Uint8Array(\n              (values as backend_util.TypedArray).buffer,\n              (values as backend_util.TypedArray).byteOffset, numBytes),\n          memoryOffset);\n    }\n  }\n\n  async read(dataId: DataId): Promise<backend_util.BackendValues> {\n    return this.readSync(dataId);\n  }\n\n  readSync(dataId: DataId): backend_util.BackendValues {\n    const {memoryOffset, dtype, shape, stringBytes} =\n        this.dataIdMap.get(dataId);\n    if (dtype === 'string') {\n      return stringBytes;\n    }\n    const bytes = this.wasm.HEAPU8.slice(\n        memoryOffset,\n        memoryOffset + util.sizeFromShape(shape) * util.bytesPerElement(dtype));\n    return typedArrayFromBuffer(bytes.buffer, dtype);\n  }\n\n  /**\n   * Dispose the memory if the dataId has 0 refCount. Return true if the memory\n   * is released, false otherwise.\n   * @param dataId\n   * @oaram force Optional, remove the data regardless of refCount\n   */\n  disposeData(dataId: DataId, force = false): boolean {\n    if (this.dataIdMap.has(dataId)) {\n      const data = this.dataIdMap.get(dataId);\n      data.refCount--;\n      if (!force && data.refCount > 0) {\n        return false;\n      }\n\n      this.wasm._free(data.memoryOffset);\n      this.wasm.tfjs.disposeData(data.id);\n      this.dataIdMap.delete(dataId);\n    }\n    return true;\n  }\n\n  /** Return refCount of a `TensorData`. */\n  refCount(dataId: DataId): number {\n    if (this.dataIdMap.has(dataId)) {\n      const tensorData = this.dataIdMap.get(dataId);\n      return tensorData.refCount;\n    }\n    return 0;\n  }\n\n  incRef(dataId: DataId) {\n    const data = this.dataIdMap.get(dataId);\n    if (data != null) {\n      data.refCount++;\n    }\n  }\n\n  floatPrecision(): 32 {\n    return 32;\n  }\n\n  // Returns the memory offset of a tensor. Useful for debugging and unit\n  // testing.\n  getMemoryOffset(dataId: DataId): number {\n    return this.dataIdMap.get(dataId).memoryOffset;\n  }\n\n  dispose() {\n    this.wasm.tfjs.dispose();\n    if ('PThread' in this.wasm) {\n      this.wasm.PThread.terminateAllThreads();\n    }\n    this.wasm = null;\n  }\n\n  memory() {\n    return {unreliable: false};\n  }\n\n  /**\n   * Make a tensor info for the output of an op. If `memoryOffset` is not\n   * present, this method allocates memory on the WASM heap. If `memoryOffset`\n   * is present, the memory was allocated elsewhere (in c++) and we just record\n   * the pointer where that memory lives.\n   */\n  makeOutput(shape: number[], dtype: DataType, memoryOffset?: number):\n      TensorInfo {\n    let dataId: {};\n    if (memoryOffset == null) {\n      dataId = this.write(null /* values */, shape, dtype);\n    } else {\n      const id = this.dataIdNextNumber++;\n      dataId = {id};\n
```

```
    this.dataIdMap.set(dataId, {id, memoryOffset, shape, dtype, refCount: 1});\n      const size =
util.sizeFromShape(shape);\n      this.wasm.tfjs.registerTensor(id, size, memoryOffset);\n    }\n    return {dataId,
shape, dtype};\n  }\n\n  typedArrayFromHeap({shape, dtype, dataId}: TensorInfo):\n      backend_util.TypedArray
{\n    const buffer = this.wasm.HEAPU8.buffer;\n    const {memoryOffset} = this.dataIdMap.get(dataId);\n    const
size = util.sizeFromShape(shape);\n    switch (dtype) {\n      case 'float32':\n        return new Float32Array(buffer,
memoryOffset, size);\n      case 'int32':\n        return new Int32Array(buffer, memoryOffset, size);\n      case 'bool':\n
    return new Uint8Array(buffer, memoryOffset, size);\n      default:\n        throw new Error(`Unknown dtype
${dtype}`);\n    }\n  }\n}\n\nfunction createInstantiateWasmFunc(path: string) {\n  // this will be replace by rollup
plugin patchWechatWebAssembly in\n  // minprogram's output.\n  // tslint:disable-next-line:no-any\n
  return (imports: any, callback: any) => {\n    util.fetch(path, {credentials: 'same-origin'}).then((response) => {\n
if (!response['ok']) {\n        imports.env.a(`failed to load wasm binary file at '${path}'`);\n      }\n
response.arrayBuffer().then(binary => {\n        WebAssembly.instantiate(binary, imports).then(output => {\n
callback(output.instance, output.module);\n        });\n      });\n    });\n    return {};\n  };\n}\n\n/**\n * Returns the
path of the WASM binary.\n * @param simdSupported whether SIMD is supported\n * @param threadsSupported
whether multithreading is supported\n * @param wasmModuleFolder the directory containing the WASM
binaries.\n */\nfunction getPathToWasmBinary(\n    simdSupported: boolean, threadsSupported: boolean,\n
wasmModuleFolder: string) {\n  if (wasmPath != null) {\n    // If wasmPath is defined, the user has supplied a full
path to\n    // the vanilla .wasm binary.\n    return wasmPath;\n  }\n\n  let path:
 WasmBinaryName = 'tfjs-backend-wasm.wasm';\n  if (simdSupported && threadsSupported) {\n    path = 'tfjs-
backend-wasm-threaded-simd.wasm';\n  } else if (simdSupported) {\n    path = 'tfjs-backend-wasm-simd.wasm';\n
}\n\n  if (wasmFileMap != null) {\n    if (wasmFileMap[path] != null) {\n      return wasmFileMap[path];\n    }\n
}\n\n  return wasmModuleFolder + path;\n}\n\n/**\n * Initializes the wasm module and creates the js <--> wasm
bridge.\n *\n * NOTE: We wrap the wasm module in a object with property 'wasm' instead of\n * returning
Promise<BackendWasmModule> to avoid freezing Chrome (last tested\n * in Chrome 76).\n */\nexport async
function init(): Promise<{wasm: BackendWasmModule}> {\n  const [simdSupported, threadsSupported] = await
Promise.all([\n    env().getAsync('WASM_HAS_SIMD_SUPPORT'),\n
env().getAsync('WASM_HAS_MULTITHREAD_SUPPORT')\n  ]);\n\n  return new Promise((resolve, reject) =>
{\n    const factoryConfig: WasmFactoryConfig = {};\n\n    /**\n     * This function
 overrides the Emscripten module locateFile utility.\n     * @param path The relative path to the file that needs to be
loaded.\n     * @param prefix The path to the main JavaScript file's directory.\n     */\n    factoryConfig.locateFile =
(path, prefix) => {\n      if (path.endsWith('.worker.js')) {\n        const response = wasmWorkerContents;\n        const
blob = new Blob([response], {type: 'application/javascript'});\n        return URL.createObjectURL(blob);\n      }\n\n
  if (path.endsWith('.wasm')) {\n        return getPathToWasmBinary(\n            simdSupported as boolean,
threadsSupported as boolean,\n            wasmPathPrefix != null ? wasmPathPrefix : prefix);\n      }\n      return prefix
+ path;\n    };\n\n    // Use the instantiateWasm override when system fetch is not available.\n    // Reference:\n    //
https://github.com/emscripten-
core/emscripten/blob/2bca083cbbd5a4133db61fbd74d04f7feecfa907/tests/manual_wasm_instantiate.html#L170\n
if (customFetch) {\n
      factoryConfig.instantiateWasm =\n          createInstantiateWasmFunc(getPathToWasmBinary(\n
simdSupported as boolean, threadsSupported as boolean,\n              wasmPathPrefix != null ? wasmPathPrefix :
''));\n    }\n\n    let initialized = false;\n    factoryConfig.onAbort = () => {\n      if (initialized) {\n        // Emscripten
already called console.warn so no need to double log.\n        return;\n      }\n      if (initAborted) {\n        //
Emscripten calls `onAbort` twice, resulting in double error\n        // messages.\n        return;\n      }\n      initAborted
= true;\n      const rejectMsg =\n          'Make sure the server can serve the `.wasm` file relative to the ' +\n
'bundled js file. For more details see https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-
wasm/README.md#using-bundlers';\n      reject({message: rejectMsg});\n    };\n\n    let wasm:
Promise<BackendWasmModule>;\n    // If `wasmPath` has been defined we must initialize
```

```
 the vanilla module.\n    if (threadsSupported && simdSupported && wasmPath == null) {\n
factoryConfig.mainScriptUrlOrBlob = new Blob(\n          [`var WasmBackendModuleThreadedSimd = ` +\n
wasmFactoryThreadedSimd.toString()],\n          {type: 'text/javascript'});\n      wasm =
wasmFactoryThreadedSimd(factoryConfig);\n    } else {\n      // The wasmFactory works for both vanilla and SIMD
binaries.\n      wasm = wasmFactory(factoryConfig);\n    }\n\n    // The WASM module has been successfully
created by the factory.\n    // Any error will be caught by the onAbort callback defined above.\n
wasm.then((module) => {\n      initialized = true;\n      initAborted = false;\n\n      const voidReturnType: string =
null;\n      // Using the tfjs namespace to avoid conflict with emscripten's API.\n      module.tfjs = {\n        init:
module.cwrap('init', null, []),\n        initWithThreadsCount:\n            module.cwrap('init_with_threads_count', null,
['number']),\n        getThreadsCount:
 module.cwrap('get_threads_count', 'number', []),\n        registerTensor: module.cwrap(\n            'register_tensor',
null,\n            [\n              'number',  // id\n              'number',  // size\n              'number',  // memoryOffset\n
]),\n        disposeData: module.cwrap('dispose_data', voidReturnType, ['number']),\n        dispose:
module.cwrap('dispose', voidReturnType, []),\n      };\n\n      resolve({wasm: module});\n    });\n  });\n}\n\nfunction
typedArrayFromBuffer(\n    buffer: ArrayBuffer, dtype: DataType): backend_util.TypedArray {\n  switch (dtype)
{\n    case 'float32':\n      return new Float32Array(buffer);\n    case 'int32':\n      return new Int32Array(buffer);\n
case 'bool':\n      return new Uint8Array(buffer);\n    default:\n      throw new Error(`Unknown dtype ${dtype}`);\n
}\n}\n\nconst wasmBinaryNames = [\n  'tfjs-backend-wasm.wasm', 'tfjs-backend-wasm-simd.wasm',\n  'tfjs-
backend-wasm-threaded-simd.wasm'\n] as const
 ;\ntype WasmBinaryName = typeof wasmBinaryNames[number];\n\nlet wasmPath: string = null;\nlet
wasmPathPrefix: string = null;\nlet wasmFileMap: {[key in WasmBinaryName]?: string} = {};\nlet initAborted =
false;\nlet customFetch = false;\n\n/**\n * @deprecated Use `setWasmPaths` instead.\n * Sets the path to the
`.wasm` file which will be fetched when the wasm\n * backend is initialized. See\n *
https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers\n * for more
details.\n * @param path wasm file path or url\n * @param usePlatformFetch optional boolean to use platform fetch
to download\n *     the wasm file, default to false.\n *\n * @doc {heading: 'Environment', namespace: 'wasm'}\n
*/\nexport function setWasmPath(path: string, usePlatformFetch = false): void {\n  deprecationWarn(\n
'setWasmPath has been deprecated in favor of setWasmPaths and' +\n      ' will be removed in a future release.');\n  if
(initAborted) {\n    throw new Error(\n
 'The WASM backend was already initialized. Make sure you call ' +\n        '`setWasmPath()` before you call
`tf.setBackend()` or `tf.ready()`');\n  }\n  wasmPath = path;\n  customFetch = usePlatformFetch;\n}\n\n/**\n *
Configures the locations of the WASM binaries.\n *\n * ```js\n * setWasmPaths({\n *  'tfjs-backend-wasm.wasm':
'renamed.wasm',\n *  'tfjs-backend-wasm-simd.wasm': 'renamed-simd.wasm',\n *  'tfjs-backend-wasm-threaded-
simd.wasm': 'renamed-threaded-simd.wasm'\n * });\n * tf.setBackend('wasm');\n * ```\n *\n * @param
prefixOrFileMap This can be either a string or object:\n *  - (string) The path to the directory where the WASM
binaries are located.\n *     Note that this prefix will be used to load each binary (vanilla,\n *     SIMD-enabled,
threading-enabled, etc.).\n *  - (object) Mapping from names of WASM binaries to custom\n *     full paths
specifying the locations of those binaries. This is useful if\n *     your WASM binaries are not all located in the same
directory,
 or if your\n *     WASM binaries have been renamed.\n * @param usePlatformFetch optional boolean to use
platform fetch to download\n *     the wasm file, default to false.\n *\n * @doc {heading: 'Environment', namespace:
'wasm'}\n */\nexport function setWasmPaths(\n    prefixOrFileMap: string|{[key in WasmBinaryName]?: string},\n
usePlatformFetch = false): void {\n  if (initAborted) {\n    throw new Error(\n        'The WASM backend was already
initialized. Make sure you call ' +\n        '`setWasmPaths()` before you call `tf.setBackend()` or ' +\n
'`tf.ready()`');\n  }\n\n  if (typeof prefixOrFileMap === 'string') {\n    wasmPathPrefix = prefixOrFileMap;\n  } else
{\n    wasmFileMap = prefixOrFileMap;\n    const missingPaths =\n        wasmBinaryNames.filter(name =>
wasmFileMap[name] == null);\n    if (missingPaths.length > 0) {\n      throw new Error(\n          `There were no
entries found for the following binaries: ` +\n          `${missingPaths.join(',')}. Please either
```

call setWasmPaths with a ` +\n `map providing a path for each binary, or with a string indicating ` +\n `the directory where all the binaries can be found.`);\n }\n }\n\n customFetch = usePlatformFetch;\n}\n\n/** Used in unit tests. */\nexport function resetWasmPath(): void {\n wasmPath = null;\n wasmPathPrefix = null;\n wasmFileMap = {};\n customFetch = false;\n initAborted = false;\n}\n\nlet threadsCount = -1;\nlet actualThreadsCount = -1;\n\n/**\n * Sets the number of threads that will be used by XNNPACK to create\n * threadpool (default to the number of logical CPU cores).\n *\n * This must be called before calling `tf.setBackend('wasm')`.\n */\nexport function setThreadsCount(numThreads: number) {\n threadsCount = numThreads;\n}\n\n/**\n * Gets the actual threads count that is used by XNNPACK.\n *\n * It is set after the backend is intialized.\n */\nexport function getThreadsCount(): number {\n if (actualThreadsCount === -1) {\n throw new Error(`WASM
backend not initialized.`);\n }\n return actualThreadsCount;\n}\n","export const wasmWorkerContents = 'var Module={};function threadPrintErr(){var text=Array.prototype.slice.call(arguments).join(\" \");console.error(text)}function threadAlert(){var text=Array.prototype.slice.call(arguments).join(\" \");postMessage({cmd:\"alert\",text:text,threadId:Module[\"_pthread_self\"]()})}var err=threadPrintErr;this.alert=threadAlert;Module[\"instantiateWasm\"]=function(info,receiveInstance){var instance=new WebAssembly.Instance(Module[\"wasmModule\"],info);Module[\"wasmModule\"]=null;receiveInstance(instance);return instance.exports};function moduleLoaded(){}this.onmessage=function(e){try{if(e.data.cmd===\"load\"){Module[\"wasmModule\"]=e.data.wasmModule;Module[\"wasmMemory\"]=e.data.wasmMemory;Module[\"buffer\"]=Module[\"wasmMemory\"].buffer;Module[\"ENVIRONMENT_IS_PTHREAD\"]=true;if(typeof e.data.urlOrBlob===\"string\"){importScripts(e.data.urlOrBlob)}else{var objectUrl=URL.createObjectURL(e.data.urlOrBlob);importScripts(objectUrl);URL.revokeObjectURL(objectUrl)}WasmBackendModuleThreadedSimd(Module).then(function(instance){Module=instance;moduleLoaded()})}else if(e.data.cmd===\"objectTransfer\"){Module[\"PThread\"].receiveObjectTransfer(e.data)}else if(e.data.cmd===\"run\"){Module[\"__performance_now_clock_drift\"]=performance.now()-e.data.time;Module[\"__emscripten_thread_init\"](e.data.threadInfoStruct,0,0);var max=e.data.stackBase;var top=e.data.stackBase+e.data.stackSize;Module[\"establishStackSpace\"](top,max);Module[\"_emscripten_tls_init\"]();Module[\"PThread\"].receiveObjectTransfer(e.data);Module[\"PThread\"].setThreadStatus(Module[\"_pthread_self\"](),1);try{var result=Module[\"invokeEntryPoint\"](e.data.start_routine,e.data.arg);if(!Module[\"getNoExitRuntime\"]())Module[\"PThread\"].threadExit(result)}catch(ex){if(ex===\"Canceled!\"){Module[\"PThread\"].threadCancel()}else if(ex!=\"unwind\"){if(ex instanceof Module[\"ExitStatus\"]){if(Module[\"getNoExitRuntime\"]()){}else{Module[\"PThread\"].threadExit(ex.status)}}else{Module[\"PThread\"].threadExit(-2);throw ex}}}}else if(e.data.cmd===\"cancel\"){if(Module[\"_pthread_self\"]()){Module[\"PThread\"].threadCancel()}}else if(e.data.target===\"setimmediate\"){}else if(e.data.cmd===\"processThreadQueue\"){if(Module[\"_pthread_self\"]()){Module[\"_emscripten_current_thread_process_queued_calls\"]()}}else{err(\"worker.js received unknown command \"+e.data.cmd);err(e.data)}}catch(ex){err(\"worker.js onmessage() captured an uncaught exception: \"+ex);if(ex&&ex.stack)err(ex.stack);throw ex}};if(typeof process===\"object\"&&typeof process.versions===\"object\"&&typeof process.versions.node===\"string\"){self={location:{href:__filename}};var onmessage=this.onmessage;var nodeWorkerThreads=require(\"worker_threads\");global.Worker=nodeWorkerThreads.Worker;var parentPort=nodeWorkerThreads.parentPort;parentPort.on(\"message\",function(data){onmessage({data:data})});var nodeFS=require(\"fs\");var nodeRead=function(filename){return

nodeFS.readFileSync(filename,\"utf8\")};function globalEval(x){global.require=require;global.Module=Module;eval.call(null,x)}importScripts=function(f){globalEval(nodeRead(f))};postMessage=function(msg){parentPort.postMessage(msg)};if(typeof performance===\"undefined\"){performance={now:function(){return Date.now()}}}';","/** @license See the LICENSE file. */\n\n// This code is auto-generated, do not modify this file!\nconst version = '3.11.0';\nexport {version};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport './flags_wasm';\n\nimport {registerBackend} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm, init} from './backend_wasm';\n\nexport {BackendWasm, getThreadsCount, setThreadsCount, setWasmPath, setWasmPaths} from './backend_wasm';\nexport {version as version_wasm} from './version';\n\nconst WASM_PRIORITY = 2;\nregisterBackend('wasm', async () => {\n const {wasm} = await init();\n return new BackendWasm(wasm);\n}, WASM_PRIORITY);\n"],"names":["CppDType","FusableActivation","wasmFusedMatMul","fusedMatMulConfig","kernelName","_FusedMatMul","backendName","setupFunc","backend","wasm","cwrap","kernelFunc","args","inputs","attrs","a","b","bias","preluActivationWeights","dtype","Error","transposeA","transposeB","activation","leakyreluAlpha","aId","dataIdMap","get","dataId","id","bId","biasId","biasData","shape","length","preluActivationWeightsId","fusedActivation","leftDim","rightDim","batchDim","out","makeOutput","outId","aShapeBytes","Uint8Array","Int32Array","buffer","bShapeBytes","createUnaryKernelConfig","outType","wasmFunc","x","xId","util","sizeFromShape","absConfig","Abs","createBinaryKernelConfig","supportsFullBroadcast","outputType","newShape","backend_util","assertAndGetBroadcastShape","aBroadcastDims","getBroadcastDims","bBroadcastDims","loopsOverAllOfA","every","v","i","loopsOverAllOfB","addConfig","Add","addNConfig","AddN","inputIds","map","inputIdsBytes","identity","inVals","typedArrayFromHeap","set","identityConfig","Identity","wasmTranspose","transpose","reducedShape","perm","newPerm","push","minValIdx","j","removeOneSizeDims","permIsNoOp","outShape","inShape","Array","computeOutShape","cloned","permBytes","xShapeBytes","transposeConfig","Transpose","permuteAxesAndTranspose","axis","xShape","xRank","originalAxes","parseAxisParam","axes","permutedAxes","getAxesPermutation","xTransposed","inputWasTransposed","getInnerMostAxes","transposed","wasmAll","allConfig","All","keepDims","inputId","input","inputRank","assertAxesAreInnerMostDims","reduceShape","computeOutAndReduceShapes","reduceSize","disposeData","expandShapeToKeepDim","wasmAny","anyConfig","Any","argMaxConfig","ArgMax","transposedId","slice","outerSize","innerSize","wasmAvgPool","avgPoolConfig","AvgPool","filterSize","strides","pad","dimRoundingMode","convInfo","computePool2DInfo","filterHeight","filterWidth","padTop","padInfo","top","padRight","right","padBottom","bottom","padLeft","left","strideHeight","strideWidth","channels","inChannels","dataFormat","dilationWidth","dilationHeight","reshape","xSize","$shape","inferFromImplicitShape","assert","incRef","reshapeConfig","Reshape","wasmBatchMatMul","batchMatMulConfig","BatchMatMul","aRank","bRank","innerShapeA","innerShapeB","outerShapeA","outerShapeB","outerDimsA","outerDimsB","batchDimA","batchDimB","batchDimsCompatible","concat","b3dShape","a3d","b3d","a3dId","b3dId","Math","max","sliceImpl","vals","begin","size","isContinous","slice_util","isSliceContinous","xStrides","computeStrides","flatOffset","computeFlatOffset","subarray","decodedData","fromUint8ToStringArray","inBuf","outBuf","outLoc","indexToLoc","inLoc","idx","fromStringArrayToUint8","values","begin_","size_","parseSliceParams","xVals","readSync","outData","stringBytes","res","sliceImplCPU","outVals","rank","xStride","outOffset","beginI","beginJ","endI","xOffset","slice2d","xStride1","xStride2","beginK","endJ","slice3d","xStride3","endK","beginL","k","slice4d","sliceConfig","Slice","batchToSpaceNDConfig","BatchToSpaceND","blockShape","crops","prod","reduce","reshaped","getReshaped","permuted","getPermuted","reshapedPermuted","getReshapedPermuted","sliceBeginCoords","getSliceBeginCoords","sliceSiz

e","getSliceSize","xReshaped","result","cast","castConfig","Cast","ceilConfig","Ceil","wasmClip","clipByValueConfig","ClipByValue","clipValueMin","clipValueMax","t","$inputs","filter","shapes","assertParamsConsistent","inputs2D","inputsValShapes","simplyConcat","getArrayFromDType","offset","forEach","colOffset","tIdx","row","resIdx","col","concatImplCPU","finalOutShape","sumInnerDims","innerDims","innerDim","inOffset","concatConfig","Concat","wasmConv2d","conv2DConfig","Conv2D","filterId","dilations","$dataFormat","convertConv2DDataFormat","computeConv2DInfo","inputChannels","outputChannels","outChannels","isSamePad","type","wasmConv2DBackpropInput","conv2DBackpropInputConfig","Conv2DBackpropInput","dy","inputShape","batchSize","inHeight","inWidth","outHeight","outWidth","topPad","leftPad","isChannelsLast","dxStrides","dyStrides","fltS0","fltS1","fltS2","xBatchStride","xRowStride","xColStride","xChannelStride","yBatchStride","yRowStride","yColStride","yChannelStride","dyId","cosConfig","Cos","coshConfig","Cosh","InterpolationMethod","wasmCropAndResize","cropAndResizeConfig","CropAndResize","method","extrapolationValue","cropSize","image","boxes","boxInd","numBoxes","cropHeight","cropWidth","castedData","imagesData","imagesId","boxesId","boxIndId","imagesShapeBytes","wasmCumsum","cumsumConfig","Cumsum","exclusive","reverse","permutation","permutedX","permutedAxis","permutedOut","finalDim","permutedXId","permutedOutId","getUndoAxesPermutation","wasmDepthToSpace","depthToSpaceConfig","DepthToSpace","blockSize","outputHeight","outputWidth","outputDepth","outputShape","xStridesBytes","outputShapeBytes","outStridesBytes","wasmDepthwiseConv2d","depthwiseConv2dNativeConfig","DepthwiseConv2dNative","$dilations","eluConfig","Elu","equalConfig","Equal","expConfig","Exp","expandDims","dim","$dim","splice","expandDimsConfig","ExpandDims","fill","value","fillConfig","Fill","wasmFlipLeftRight","flipLeftRightConfig","FlipLeftRight","imageId","batch","imageHeight","imageWidth","numChannels","floorConfig","Floor","floorDivConfig","FloorDiv","wasmBatchNorm","fusedBatchNormConfig","FusedBatchNorm","varianceEpsilon","mean","variance","scale","meanId","varianceId","offsetId","scaleId","wasmFusedConv2d","fusedConv2DConfig","FusedConv2D","wasmFusedDepthwiseConv2d","fusedDepthwiseConv2DConfig","FusedDepthwiseConv2D","wasmGatherNd","gatherNdConfig","GatherNd","params","indices","resultShape","numSlices","gather_util","prepareAndValidate","indicesShape","sliceRank","indicesId","stridesBytes","wasmGather","gatherV2Config","GatherV2","batchDims","parsedAxis","indicesVals","axisDim","index","shapeInfo","segment_util","collectGatherOpShapeInfo","flattenX","dimSize","indicesSize","flattenIndex","flattenOutputShape","stridesSize","greaterConfig","Greater","greaterEqualConfig","GreaterEqual","leakyReluConfig","LeakyRelu","alpha","lessConfig","Less","lessEqualConfig","LessEqual","logConfig","Log","logicalAndConfig","LogicalAnd","wasmMax","maxConfig","Max","reductionIndices","maximumConfig","Maximum","wasmMaxPool","maxPoolConfig","MaxPool","wasmMean","meanConfig","Mean","reductionAxes","castedInput","wasmMin","minConfig","Min","minimumConfig","Minimum","MirrorPaddingMode","wasmMirrorPad","mirrorPadConfig","MirrorPad","paddings","mode","p","prePaddingsFlat","padTuple","postPaddingsFlat","prePaddingsBytes","postPaddingsBytes","multiplyConfig","Multiply","negConfig","Neg","parseResultStruct","resOffset","HEAPU8","pSelectedIndices","selectedSize","pSelectedScores","pValidOutputs","_free","nonMaxSuppressionV3Config","NonMaxSuppressionV3","iouThreshold","maxOutputSize","scoreThreshold","scores","scoresId","nonMaxSuppressionV4Config","NonMaxSuppressionV4","padToMaxOutputSize","nonMaxSuppressionV5Config","NonMaxSuppressionV5","softNmsSigma","notEqualConfig","NotEqual","wasmOneHot","oneHotConfig","OneHot","depth","onValue","offValue","onesLikeConfig","OnesLike","packConfig","Pack","assertShapesMatch","intermediateTensorInfos","expandedT","wasmPadV2","padV2Config","PadV2","constantValue","powConfig","Pow","wasmPrelu","preluConfig","Prelu","weightsId","wasmProd","prodConfig","Prod","rangeConfig","Range","start","stop","step","makeZerosTypedArray","numElements","abs","ceil","rangeImplCPU","realDivConfig","RealDiv","reluConfig","Relu","relu6Config","Relu6","wasmResizeBilinear","resizeBilinearConfig","ResizeBilinear","images","alignCorners","halfPixelCenters","newHeight","newWidth","oldHeight","oldWidth","xData","wasmReverse","reverseConfig","Reverse","dims","axesBytes","outShapeBytes","wasmRotate","rotateWithOffsetConfig","RotateWithOffset","radians","fillValue","center","centerX","centerY","getImageCenter","fillValues","fillBytes","roundConfig","Round","rsqrtConfig","Rsqrt","wasmScatterNd","scatterNdConfig","ScatterNd","updates","numUpdates","outputSize","scatter_util","calculateShapes","updatesId","wasmSelect","selectConfig","Select","condition","e","conditionId","tId","eId","cRank","tRank","sigmoidConfig","Sigmoid","sinConfig","Sin","softmaxConfig","So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dShape","permutedReshapedPaddedPermutation","flattenShape","paddedXReshaped","paddedXT","splitVConfig","SplitV","numOrSizeSplits","$axis","splitSizes","prepareSplitSize","s","xSliceSize","xSlice","sqrtConfig","Sqrt","squareConfig","Square","squaredDifferenceConfig","SquaredDifference","wasmStep","stepConfig","Step","wasmStridedSlice","stridedSliceConfig","StridedSlice","end","beginMask","endMask","ellipsisMask","newAxisMask","shrinkAxisMask","finalShapeSparse","finalShape","isIdentity","sliceDim0","isSimpleSlice","$begin","$end","$strides","sliceInfo","sliced","beginBytes","endBytes","subConfig","Sub","wasmSum","sumConfig","Sum","tanConfig","Tan","tanhConfig","Tanh","wasmTile","wasmTopK","wasmTransform","kernelConfigs","Tile","reps","newShapeBytes","TopK","sorted","outValues","outValuesId","outIndices","outIndicesId","Transform","transforms","interpolation","fillMode","transformsId","interpolationModeId","fillModeId","Unpack","numOutputs","outIndex","outs","ZerosLike","kernelConfig","registerKernel","ENV","env","registerFlag","async","WebAssembly","validate","MessageChannel","port1","postMessage","SharedArrayBuffer","_scriptDir","WasmBackendModuleThreadedSimd","document","currentScript","src","undefined","__filename","GROWABLE_HEAP_I8","wasmMemory","updateGlobalBufferAndViews","HEAP8","GROWABLE_HEAP_U8","GROWABLE_HEAP_I32","HEAP32","GROWABLE_HEAP_U32","HEAPU32","GROWABLE_HEAP_F64","HEAPF64","readyPromiseResolve","readyPromiseReject","Module","Promise","resolve","reject","key","moduleOverrides","hasOwnProperty","quit_","status","toThrow","ENVIRONMENT_IS_WEB","ENVIRONMENT_IS_WORKER","ENVIRONMENT_IS_NODE","ENVIRONMENT_IS_SHELL","window","importScripts","process","versions","node","ENVIRONMENT_IS_PTHREAD","read_","readAsync","readBinary","nodeFS","nodePath","scriptDirectory","locateFile","path","nodeWorkerThreads","require$$0","dirname","__dirname","filename","binary","require$$1","ret","replace","ex","ExitStatus","abort","require$$2","console","error","global","Worker","read","f","data","readbuffer","scriptArgs","quit","print","log","warn","printErr","self","location","href","indexOf","substr","lastIndexOf","url","xhr","XMLHttpRequest","open","send","responseText","responseType","response","onload","onerror","performance","require$$3","wasmBinary","bind","err","warnOnce","text","shown","wasmModule","noExitRuntime","ABORT","getCFunc","ident","func","ccall","returnType","argTypes","opts","toC","string","str","len","stringToUTF8","stackAlloc","array","arr","writeArrayToMemory","cArgs","stack","converter","stackSave","apply","UTF8ToString","Boolean","convertReturnValue","stackRestore","numericArgs","arguments","UTF8ArrayToString","heap","maxBytesToRead","endIdx","u0","u1","u2","String","fromCharCode","ch","ptr","stringToUTF8Array","outIdx","maxBytesToWrite","startIdx","u","charCodeAt","outPtr","lengthBytesUTF8","alignUp","multiple","buf","Int8Array","Int16Array","Uint16Array","Uint32Array","Float32Array","Float64Array","wasmTable","INITIAL_MEMORY","Memory","initial","maximum","shared","byteLength","__ATPRERUN__","__ATINIT__","__ATMAIN__","__ATPOSTRUN__","preRun","addOnPreRun","shift","callRuntimeCallbacks","initRuntime","preMain","postRun","addOnPostRun","cb","unshift","___wasm_call_ctors","runDependencies","dependenciesFulfilled","addRunDependency","removeRunDependency","callback","what","RuntimeError","hasPrefix","prefix","prototype","startsWith","dataURIPrefix","isDataURI","fileURIPrefix","isFileURI","wasmBinaryFile","getBinary","file","getBinaryPromise","fetch","credentials","then","catch","createWasm","info","asmLibraryArg","receiveInstance","instance","module","exports","numWorkersToLoad","PThread","unusedWorkers","w","loadWasmModuleToWorker","receiveInstantiatedSource","output","instantiateArrayBuffer","receiver","instantiate","reason","instantiateStreaming","ASM_CONSTS","10520","10538","$0","$1","setTimeout","__emscripten_do_dispatch_to_thread","initPthreadsJS","callbacks","arg","ERRNO_CODES","EPERM","ENOENT","ESRCH","EINTR","EIO","ENXIO","E2BIG","ENOEXEC","EBADF","ECHILD","EAGAIN","EWOULDBLOCK","ENOMEM","EACCES","EFAULT","ENOTBLK","EBUSY","EEXIST","EXDEV","ENODEV","ENOTDIR","EISDIR","EINVAL","ENFILE","EMFILE","ENOTTY","ETXTBSY","EFBIG","ENOSPC","ESPIPE","EROFS","EMLINK","EPIPE","EDOM","ERANGE","ENOMSG","EIDRM","ECHRNG","EL2NSYNC","EL3HLT","EL3RST","ELNRNG","EUNATCH","ENOCSI","EL2HLT","EDEADLK","ENOLCK","EBADE","EBADR","EXFULL","ENOANO","EBADRQC","EBADSLT","EDEADLOCK","EBFONT","ENOSTR","ENODATA","ETIME","ENOSR","ENONET","ENOPKG","EREMOTE","ENOLINK","EADV","ESRMNT","ECOMM","EPROTO","EMULTIHOP","EDOTDOT","EBADMSG","ENOTUNIQ","EBADFD","EREMCHG","ELIBACC","ELIBBAD","ELIBSCN","ELIBMAX","ELIBEXEC","ENOSYS","ENOTEMPTY","ENAMETOOLONG","ELOOP","EOPNOTSUPP","EPFNOSUPPORT","ECONNRESET","ENOBUFS","EAFNOSUPPORT","EPROTOTYPE","ENOTSOCK","ENOPROTOOPT","ESHUTDO

WN","ECONNREFUSED","EADDRINUSE","ECONNABORTED","ENETUNREACH","ENETDOWN","ETIMEDOUT","EHOSTDOWN","EHOSTUNREACH","EINPROGRESS","EALREADY","EDESTADDRREQ","EMSGSIZE","EPROTONOSUPPORT","ESOCKTNOSUPPORT","EADDRNOTAVAIL","ENETRESET","EISCONN","ENOTCONN","ETOOMANYREFS","EUSERS","EDQUOT","ESTALE","ENOTSUP","ENOMEDIUM","EILSEQ","EOVERFLOW","ECANCELED","ENOTRECOVERABLE","EOWNERDEAD","ESTRPIPE","_emscripten_futex_wake","addr","count","Infinity","mainThreadWaitAddress","Atomics","load","__emscripten_main_thread_futex","mainThreadWoken","compareExchange","notify","killThread","pthread_ptr","pthread","pthreads","worker","terminate","freeThreadData","runningWorkers","cancelThread","cmd","cleanupThread","returnWorkerToPool","_emscripten_get_now","initMainThreadBlock","allocateUnusedWorker","tb","_malloc","headPtr","tlsMemory","store","__emscripten_thread_init","_emscripten_register_main_browser_thread_id","initWorker","threadExitHandlers","setThreadStatus","runExitHandlers","pop","_pthread_self","___pthread_tsd_run_dtors","runExitHandlersAndDeinitThread","exitCode","threadExit","threadCancel","terminateAllThreads","threadInfoStruct","allocatedOwnStack","stackBase","runWithoutMainThreadQueuedCalls","__emscripten_allow_main_runtime_queued_calls","receiveObjectTransfer","onFinishedLoading","onmessage","d","currentProxiedOperationCallerThread","thread","targetThread","_emscripten_main_thread_process_queued_calls","spawnThread","loaded","runPthread","alert","exit","target","lineno","message","on","urlOrBlob","pthreadMainJs","getNewWorker","busySpinWait","msecs","now","establishStackSpace","stackTop","stackMax","_emscripten_stack_set_limits","getNoExitRuntime","invokeEntryPoint","___assert_fail","line","___call_main","argc","argv","_main","setErrNo","___errno_location","_atexit","_emscripten_proxy_to_main_thread_js","__emscripten_notify_thread_queue","targetThreadId","mainThreadId","_abort","_emscripten_asm_const_int","code","sigPtr","argbuf","readAsmConstArgs","_emscripten_conditional_set_current_thread_status","expectedStatus","newStatus","_emscripten_futex_wait","val","timeout","tNow","tEnd","exchange","wait","_emscripten_memcpy_big","dest","num","copyWithin","_emscripten_num_logical_cores","require$$4","cpus","navigator","sync","numCallArgs","serializedNumCallArgs","_emscripten_run_in_main_runtime_thread_js","dateNow","_emscripten_receive_on_main_thread_js_callArgs","readAsmConstArgsArray","double","_emscripten_receive_on_main_thread_js","proxiedFunctionTable","_emscripten_get_heap_size","emscripten_realloc_buffer","grow","_emscripten_resize_heap","requestedSize","oldSize","maxHeapSize","cutDown","overGrownHeapSize","min","JSEvents","inEventHandler","removeAllEventListeners","eventHandlers","_removeHandler","deferredCalls","registerRemoveEventListeners","removeEventListenersRegistered","deferCall","targetFunction","precedence","argsList","arraysHaveEqualContent","arrA","arrB","call","sort","y","removeDeferredCalls","canPerformEventHandlerRequests","currentEventHandler","allowsDeferredCalls","runDeferredCalls","removeAllHandlersOnTarget","eventTypeString","h","removeEventListener","eventListenerFunc","useCapture","registerOrRemoveHandler","eventHandler","jsEventHandler","event","handlerFunc","callbackfunc","addEventListener","queueEventHandlerOnThread_iiii","eventHandlerFunc","eventTypeId","eventData","userData","varargs","__emscripten_call_on_thread","getTargetThreadForEventCallback","getNodeNameForTarget","screen","nodeName","fullscreenEnabled","webkitFullscreenEnabled","stringToNewUTF8","jsString","cString","_emscripten_set_offscreencanvas_size_on_target_thread_js","targetCanvas","width","height","targetCanvasPtr","_emscripten_set_offscreencanvas_size_on_target_thread","maybeCStringToJsString","specialHTMLTargets","findEventTarget","querySelector","findCanvasEventTarget","_emscripten_set_canvas_element_size_calling_thread","canvas","canvasSharedPtr","offscreenCanvas","controlTransferredOffscreen","autoResizeViewport","GLctxObject","GLctx","prevViewport","getParameter","viewport","_emscripten_set_canvas_element_size_main_thread","_emscripten_set_canvas_element_size","_emscripten_set_current_thread_status","_emscripten_set_thread_name","threadId","name","__webgl_enable_ANGLE_instanced_arrays","ctx","ext","getExtension","divisor","first","primcount","__webgl_enable_OES_vertex_array_object","vao","__webgl_enable_WEBGL_draw_buffers","n","bufs","__webgl_enable_WEBGL_multi_draw","multiDrawWebgl","GL","counter","buffers","programs","framebuffers","renderbuffers","textures","uniforms","shaders","vaos","contexts","offscreenCanvases","timerQueriesEXT","programInfos","stringCache","unpackAlignment","recordError","errorCode","lastError","getNewId","table","getSource","shader","source","createContext","webGLContextAttributes","getContext","registerContext","handle","context","attributes","version","majorVersion","enableExtensionsByDefault","initExtensions","makeContextCurrent","contextHandle","currentContext","deleteContext","initExtensi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rmBlockNameLength","utable","numUniforms","getProgramParameter","getActiveUniform","loc","getUniformLoc
ation","__emscripten_webgl_power_preferences","_emscripten_webgl_do_create_context","powerPreference","con
textAttributes","stencil","antialias","premultipliedAlpha","preserveDrawingBuffer","failIfMajorPerformanceCaveat
","minorVersion","explicitSwapControl","proxyContextToMainThread","renderViaOffscreenBackBuffer","_emscri
pten_webgl_create_context","a0","a1","SYSCALLS","mappings","printChar","stream","curr","getStr","get64","low
","high","_fd_close","fd","_fd_seek","offset_low","offset_high","whence","newOffset","_fd_write","iov","iovcnt","
pnum","_pthread_cleanup_pop","execute","routine","_pthread_cleanup_push","threadParams","stackHigh","stackSi
ze","tis","detached","global_locale","_emscripten_get_global_libc","msg","start_routine","startRoutine","time","tra
nsferList","_pthread_create","attr","_emscripten_sync_run_in_main_thread_4","_memalign","__pthread_testcancel
_js","_emscripten_check_blocking_allowed","__emscripten_do_pthread_join","block","_emscripten_main_browser
_thread_id","threadStatus","threadExitCode","_pthread_join","_sysconf","calledRun","r","c","A","q","l","g","o","z"
,"m","this","run","doRun","implicit","returnCode","runCaller","ready","WasmBackendModule","UTF8Decoder","T
extDecoder","endPtr","decode","BackendWasm","KernelBackend","[object
Object]","super","tfjs","initWithThreadsCount","threadsCount","actualThreadsCount","getThreadsCount","DataStor
age","engine","dataIdNextNumber","move","numDataIds","kernelMs","refCount","memoryOffset","numBytes","by
tesPerElement","registerTensor","byteOffset","typedArrayFromBuffer","force","has","delete","dispose","unreliable
","write","getPathToWasmBinary","simdSupported","threadsSupported","wasmModuleFolder","wasmPath","wasm
FileMap","init","all","getAsync","factoryConfig","endsWith","blob","Blob","URL","createObjectURL","wasmPath
Prefix","customFetch","instantiateWasm","imports","arrayBuffer","createInstantiateWasmFunc","initialized","onAb
ort","initAborted","mainScriptUrlOrBlob","wasmFactoryThreadedSimd","toString","wasmFactory","wasmBinaryN
ames","setWasmPath","usePlatformFetch","deprecationWarn","setWasmPaths","prefixOrFileMap","missingPaths",
"join","setThreadsCount","numThreads","registerBackend"],"mappings":";;;;;;;;;;;;;;;;0rDAkBA,IAAYA,GASAC,G
CJZ,IAAIC,IDLJ,SAAYF,GACVA,yBACAA,qBACAA,mBACAA,uBACAA,6BALF,CAAYA,KAAAA,QASZ,S
AAYC,GACVA,uBACAA,mBACAA,qBACAA,qBACAA,6BACAA,yBACAA,iBAPF,CAAYA,KAAAA,QC6EL,
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* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/tf-backend-wasm.fesm.min.js.map
No license file was found, but licenses were detected in source scan.

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Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Square.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"FloorDiv.js","sourceRoot":"","sources":["../../src/kernels/FloorDiv.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,uBAAuB,EAAC,MAAM,gBAAgB,CAAC;AAEvD,OAAO,EAAC,QAAQ,EAAe,MAAM,EAAC,MAAM,uBAAuB,CAAC;AAEpE,MAAM,CAAC,MAAM,WAAW,GAAG,uBAAuB,CAAC,QAAQ,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing\n * permissions and\n * limitations under the License.\n * ==========\n*/\n\nimport {FloorDiv, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = false;\nexport const floorDivConfig: KernelConfig =\n createBinaryKernelConfig(FloorDiv, supportsFullBroadcast);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/FloorDiv.js.map
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out;\n}\n\nexport const anyConfig: KernelConfig = {\n kernelName: Any,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: any as {} as KernelFunc\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Any.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Neg.js","sourceRoot":"","sources":["../../src/kernels/Neg.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;GAeG;AACH,OAAO,EAAe,GAAG,EAAC,MAAM,uBAAuB,CAAC;AAExD,OAAO,EAAC,uBAAuB,EAAC,MAAM,gBAAgB,CAAC;AACvD,MAAM,CAAC,MAAM,SAAS,GAAG,uBAAuB,CAAC,GAAG,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ===\n */\nimport {KernelConfig, Neg} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const negConfig: KernelConfig = createUnaryKernelConfig(Neg);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Neg.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"unary_kernel.js","sourceRoot":"","sources":["../../src/kernels/unary_kernel.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAkD,IAAI,EAAC,MAAM,uBAAuB,CAAC;AAI5F,OAAO,EAAC,QAAQ,EAAC,MAAM,YAAY,CAAC;AACpC,MAAM,CAAC,MAAM,SAAS,GAAG,uBAAuB,CAAC,IAAI,CAAC,CAAC;AAEvD

'@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nimport {CppDType} from './types';\n\nexport function createUnaryKernelConfig(\n kernelName: string, outType?: DataType): KernelConfig {\n let wasmFunc: (xId: number, dtype: number, outId: number) => void;\n\n function setupFunc(backend: BackendWasm): void {\n   wasmFunc = backend.wasm.cwrap(kernelName, null /* void */, [\n   'number', // x_id\n   'number', // dtype\n   'number', // out_id\n   ]);\n }\n\n function kernelFunc(args: {backend: BackendWasm, inputs: UnaryInputs}):\n   TensorInfo {\n   const {backend, inputs: {x}} = args;\n   const xId = backend.dataIdMap.get(x.dataId).id;\n   const out = backend.makeOutput(x.shape, outType || x.dtype);\n   const outId = backend.dataIdMap.get(out.dataId).id;\n\n   // Short-circuit zero-sized tensors.\n   if (util.sizeFromShape(out.shape) === 0) {\n   return out;\n   }\n\n   wasmFunc(xId, CppDType[x.dtype], outId);\n   return out;\n }\n\n return {kernelName, backendName: 'wasm', setupFunc, kernelFunc};\n}\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/unary_kernel.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Prelu.js","sourceRoot":"","sources":["../../src/kernels/Prelu.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAA2B,KAAK,EAAc,MAAM,uBAAuB,CAAC;AAInF,OAAO,EAAC,IAAI,EAAC,MAAM,QAAQ,CAAC;AAE5B,IAAI,SAAS,kBAAkB,CAAC;AAEvE,SAAS,KAAK,GAAG,OAAO,CAAC,GAAG,CAAC,QAAQ,KAAK,YAAY,CAAC;AAEvD,SAAS,KAAK,CAAC,GAAG,IAAI,EAAE,GAAG,CAAC,GAAG,IAAI,CAAC,GAAG,CAAC,CAAC,CAAC

out_id\n]);\n}\n\nfunction prelu(args: {inputs: PreluInputs, backend: BackendWasm}) {\n const {inputs, backend} = args;\n const {x, alpha} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const weightsId = backend.dataIdMap.get(alpha.dataId).id;\n\n
let inputId = xId;\n const input = x;\n let castedInput = input;\n if (input.dtype !== 'float32') {\n castedInput = cast({backend, inputs: {x}, attrs: {dtype: 'float32'}});\n inputId = backend.dataIdMap.get(castedInput.dataId).id;\n }\n\n const out = backend.makeOutput(x.shape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmPrelu(inputId, weightsId, outId);\n\n if (input.dtype !== 'float32') {\n backend.disposeData(castedInput.dataId);\n }\n return out;\n}\n\nexport const preluConfig: KernelConfig = {\n kernelName: Prelu,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prelu as {} as KernelFunc\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Prelu.js.map
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* limitations under the License.
* ==*/

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* /tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Floor.cc
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* /tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/PadV2.h
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/BatchMatMul.h
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/tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Equal.cc
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/SquaredDifference.cc
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/_FusedMatMul_test.cc
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* /tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/DepthToSpace.cc
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/batch_mat_mul_impl.h
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Softmax.cc
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Prod.cc
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/TopK.cc
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Sqrt.cc

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* /tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/NotEqual.cc
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/NonMaxSuppressionV4.cc
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/Neg.cc
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/batch_mat_mul_impl.cc
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/kernels/PadV2_test.cc
No license file was found, but licenses were detected in source scan.

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backend.dataIdMap.get(t.dataId).id;\n const eId = backend.dataIdMap.get(e.dataId).id;\n const out = backend.makeOutput(t.shape, t.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const cRank = condition.shape.length;\n const tRank = t.shape.length;\n\n const offset = cRank === 0 || cRank > 1 || tRank === 1 ?\n   1 :\n   util.sizeFromShape(t.shape.slice(1));\n\n wasmSelect(conditionId, tId, eId, offset, outId);\n return out;\n}\n\nexport const selectConfig: KernelConfig = {\n kernelName: Select,\n backendName: 'wasm',\n kernelFunc: select as {} as KernelFunc,\n setupFunc: setup\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Select.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"ResizeBilinear.js","sourceRoot":"","sources":["../../src/kernels/ResizeBilinear.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAA2B,cAAc,EAAyD,IAAI,EAAE,MAAM,uBAAuB,CAAC;AAI5I,OAAO,EAAC,IAAI,EAAE,MAAM,QAAQ,CAAC;AAE5B,IAAI,kBAAgsE,CAAC;AAE3E,SAAS,KAAK,CAAC,OAAoB,EAAE,CAAS,EAAE,CAAS,EAAE,CAAS

halfPixelCenters: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm): void {\n wasmResizeBilinear = backend.wasm.cwrap(ResizeBilinear, null /*void*/, [\n 'number', // xId\n 'number', // batch\n 'number', // oldHeight\n 'number', // oldWidth\n 'number', // numChannels\n 'number', // newHeight\n 'number', // newWidth\n 'number', // alignCorners\n 'number', // halfPixelCenters\n 'number' // outId\n]);\n}\n\nfunction resizeBilinear(args: {\n backend: BackendWasm,\n inputs: ResizeBilinearInputs,\n attrs: ResizeBilinearAttrs\n}): TensorInfo {\n const {backend, inputs, attrs} = args;\n\n const {images} = inputs;\n const {alignCorners, halfPixelCenters, size} = attrs;\n const [newHeight, newWidth] = size;\n\n const [batch, oldHeight, oldWidth, numChannels] = images.shape;\n const outShape = [batch, newHeight, newWidth, numChannels];\n\n let xData = backend.dataIdMap.get(images.dataId);\n let castedData;\n if (xData.dtype !== 'float32') {\n castedData =\n cast({backend, inputs: {x: images}, attrs: {dtype: 'float32'}});\n xData = backend.dataIdMap.get(castedData.dataId);\n }\n const xId = xData.id;\n\n const out = backend.makeOutput(outShape, 'float32');\n if (util.sizeFromShape(images.shape) === 0) {\n return out;\n }\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmResizeBilinear(\n xId, batch, oldHeight, oldWidth, numChannels, newHeight, newWidth,\n alignCorners ? 1 : 0, halfPixelCenters ? 1 : 0, outId);\n\n if (castedData != null) {\n backend.disposeData(castedData.dataId);\n }\n\n return out;\n}\n\nexport const resizeBilinearConfig: KernelConfig = {\n kernelName: ResizeBilinear,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: resizeBilinear as {} as KernelFunc\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/ResizeBilinear.js.map
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No license file was found, but licenses were detected in source scan.

{"version":3,"file":"RealDiv.js","sourceRoot":"","sources":["../../src/kernels/RealDiv.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAe,OAAO,EAAC,MAAM,uBAAuB,CAAC;AAE5D,OAAO,EAAC,wBAAwB,EAAC,MAAM,iBAAiB,CAAC;AAEzD,MAAM,qBAAqB,GAAG,IAAI,CAAC;AACnC,MAAM,CAAC,MAAM,aAAa,GAAG,qBAAqB,CAAC,qBAAqB,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ===\n */\n\nimport {KernelConfig, RealDiv} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = true;\nexport const realDivConfig: KernelConfig = createBinaryKernelConfig(RealDiv, supportsFullBroadcast);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/RealDiv.js.map
No license file was found, but licenses were detected in source scan.

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=\n [batch, outHeight, outWidth,\n numChannels] as [number, number, number, number];\n const strides =\n new Uint8Array(new Int32Array(util.computeStrides(image.shape)).buffer);\n\n const out =
backend.makeOutput(outShape, image.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n
const imageData = backend.dataIdMap.get(image.dataId);\n const imageId = imageData.id;\n\n const
transformsData = backend.dataIdMap.get(transforms.dataId);\n const transformsId = transformsData.id;\n\n const
interpolationModeId = interpolation === 'nearest' ? 1 : 2;\n let fillModeId;\n switch (fillMode) {\n case
'constant':\n fillModeId = 1;\n break;\n case 'reflect':\n fillModeId = 2;\n break;\n case 'wrap':\n
fillModeId = 3;\n break;\n case 'nearest':\n fillModeId = 4;\n break;\n default:\n fillModeId = 1;\n
break;\n }\n\n wasmTransform(\n imageId, transformsId, (transforms.shape[0] > 1), batch, outHeight,\n
outWidth, numChannels, imageWidth, imageHeight, strides,\n image.shape.length - 1, interpolationModeId,
fillModeId, fillValue,\n outId);\n\n return out;\n}\n\nexport const transformConfig: KernelConfig = {\n
kernelName: Transform,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc:
transform as {} as KernelFunc\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Transform.js.map
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permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, Multiply} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\n\nconst supportsFullBroadcast = true;\nexport const multiplyConfig: KernelConfig =\n createBinaryKernelConfig(Multiply, supportsFullBroadcast);\n"]}

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WASM backend`);\n // permute required axis to inner most axis\n const permutation = backend_util.getAxesPermutation([axis], xRank);\n let permutedX = x;\n if (permutation !== null) {\n permutedX = transpose({inputs: {x}, attrs: {perm: permutation}, backend});\n }\n const permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];\n backend_util.assertAxesAreInnerMostDims('cumsum', [permutedAxis], xRank);\n\n const permutedOut = backend.makeOutput(permutedX.shape, permutedX.dtype);\n const finalDim = permutedX.shape[permutedAxis];\n const permutedXId = backend.dataIdMap.get(permutedX.dataId).id;\n const permutedOutId = backend.dataIdMap.get(permutedOut.dataId).id;\n wasmCumsum(permutedXId, exclusive ? 1 : 0, reverse ? 1 : 0, finalDim,\n permutedOutId, CppDType[x.dtype]);\n\n // transpose data back if permuted\n let out = permutedOut;\n if (permutation !== null) {\n   const undoPermutation = backend_util.getUndoAxesPermutation(permutation);\n   out = transpose(\n   {inputs: {x: permutedOut}, attrs: {perm: undoPermutation}, backend});\n backend.disposeData(permutedX.dataId);\n   backend.disposeData(permutedOut.dataId);\n }\n return out;\n}\n\nexport const cumsumConfig: KernelConfig = {\n kernelName: Cumsum,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: cumsum as {} as KernelFunc\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Cumsum.js.map
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 * ===\n
*/\nimport {Abs, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\n\nexport const absConfig: KernelConfig = createUnaryKernelConfig(Abs);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Abs.js.map
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blockShape.length; i < x.shape.length; ++i) {\n   completePaddings.push([0, 0]);\n }\n\n const paddedX = padV2Config.kernelFunc({\n
    inputs: {x},\n   backend,\n   attrs: {paddings: completePaddings, constantValue: 0}\n }) as TensorInfo;\n\n const reshapedPaddedShape =\n   backend_util.getReshaped(paddedX.shape, blockShape, prod, false);\n\n const permutedReshapedPaddedPermutation = backend_util.getPermuted(\n   reshapedPaddedShape.length, blockShape.length, false);\n\n const flattenShape =\n   backend_util.getReshapedPermuted(paddedX.shape, blockShape, prod, false);\n\n const reshapeInputs: ReshapeInputs = {x: paddedX};\n const reshapeAttrs: ReshapeAttrs = {shape: reshapedPaddedShape};\n const paddedXReshaped =\n   reshape({inputs: reshapeInputs, backend, attrs: reshapeAttrs});\n\n const transposeInputs: TransposeInputs = {x: paddedXReshaped};\n const transposeAttrs:\n   TransposeAttrs = {perm: permutedReshapedPaddedPermutation};\n const paddedXT =\n transpose({inputs: transposeInputs, backend, attrs: transposeAttrs});\n\n const resultReshapeInputs: ReshapeInputs = {x: paddedXT};\n
  const resultReshapeAttrs: ReshapeAttrs = {shape: flattenShape};\n const result = reshape(\n   {inputs: resultReshapeInputs, backend, attrs: resultReshapeAttrs});\n\n backend.disposeData(paddedX.dataId);\n backend.disposeData(paddedXReshaped.dataId);\n backend.disposeData(paddedXT.dataId);\n\n return result;\n}\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n kernelName: SpaceToBatchND,\n backendName: 'wasm',\n kernelFunc: spaceToBatchND as {} as KernelFunc\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/SpaceToBatchND.js.map
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* /tfjs-backend-wasm-zip/tfjs-backend-wasm/src/cc/sin_cos_workaround.cc
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 permissions and\n * limitations under the License.\n *
==\n
*/\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from './binary_kernel';\nconst supportsFullBroadcast = false;\nexport const maximumConfig: KernelConfig =\n createBinaryKernelConfig(Maximum, supportsFullBroadcast);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Maximum.js.map
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{"version":3,"file":"BatchMatMul.js","sourceRoot":"","sources":["../../src/kernels/BatchMatMul.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,OAAO,EAAE,OAAO,EAAC,MAAM,uBAAuB,CAAC;AAIvD,OAAO,EAAC,OAAO,EAAC,MAAM,WAAW,CAAC;AAElC,OAAO,EAAC,wBAAwB,EAAC,MAAM,iBAAiB,CAAC;AAEzD,MAAM,CAAC,MAAM,cAAc,GAAG,CAAC,OAAO,EAAE,OAAO,EAAE,EAAE;IACjD,MAAM,EAAC,CAAC,EAAE,CAAC,EAAC,GAAG,OAAO,CAAC;IACvB,MAAM,EAAC,CAAC,EAAE,CAAC,EAAC,GAAG,OAAO,CAAC;IAEvB,MAAM,qBAAqB,GAAG,KAAK,CAAC;IACpC,MAAM,aAAa,GAAG,wBAAwB,CAAC,OAAO,EAAE,qBAAqB,CAAC,CAAC;IAE/E,OAAO,aAAa,CAAC;AACvB,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n */\n\nimport {backend_util, KernelConfig, KernelFunc, TensorInfo, TypedArray} from '@tensorflow/tfjs-core';\n\nimport {CppDType} from './types';\n\nexport const batchMatMulConfig = (args: {\n backend: {\n   dataIdMap: {\n   get: (arg0: any) => {\n   (): any;\n   new (): any;\n   id: number;\n   };\n   };\n   wasm: {\n   _malloc: (arg0: number) => number;\n   _free: (arg0: number) => void;\n   _BatchMatMul: (\n   aId: number, aShapeBytes: number, aShapeLen: number, bId: number,\n   bShapeBytes: number, bShapeLen: number, transposeA: boolean,\n   transposeB: boolean, outputId: number) => void;\n   HEAPU8: {\n   set: (arg0: Uint8Array, arg1: number) => void;\n   };\n   HEAP32: {\n   set: (arg0: Int32Array, arg1: number) => void;\n   };\n   };\n   makeOutput: (arg0: number[], arg1: number) => TensorInfo;\n };\n inputs: {a: TensorInfo, b: TensorInfo};\n attrs: {adjoint_a: boolean, adjoint_b: boolean};\n}) => {\n const {backend, inputs, attrs} = args;\n const {a, b} = inputs;\n const {adjoint_a, adjoint_b} = attrs;\n\n const aId = backend.dataIdMap.get(a.dataId).id;\n const bId = backend.dataIdMap.get(b.dataId).id;\n\n const [batchDim, leftDim, rightDim, sharedDim] =\n   backend_util.getMatMulBroadcastDims(a, b, adjoint_a, adjoint_b);\n\n const out = backend.makeOutput([batchDim, leftDim, rightDim], a.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n\n const wasm = backend.wasm;\n\n const aShapeOffset = wasm._malloc(aShapeBytes.length);\n wasm.HEAPU8.set(aShapeBytes, aShapeOffset);\n const bShapeOffset = wasm._malloc(bShapeBytes.length);\n wasm.HEAPU8.set(bShapeBytes, bShapeOffset);\n\n wasm._BatchMatMul(\n   aId, aShapeOffset, a.shape.length, bId, bShapeOffset, b.shape.length,\n   adjoint_a, adjoint_b, outId);\n\n wasm._free(aShapeOffset);\n wasm._free(bShapeOffset);\n\n return out;\n};\n\nexport const batchMatMulKernelConfig: KernelConfig = {\n kernelName: 'BatchMatMul',\n backendName: 'wasm',\n setupFunc: (args: {\n   backend: {\n   dataIdMap: {\n   get: (arg0: any) => {\n   (): any;\n   new (): any;\n   id: number;\n   };\n   };\n   wasm: {\n   _malloc: (arg0: number) => number;\n   _free: (arg0: number) => void;\n   _BatchMatMul: (\n   aId: number, aShapeBytes: number, aShapeLen: number, bId: number,\n   bShapeBytes: number, bShapeLen: number, transposeA: boolean,\n   transposeB: boolean, outputId: number) => void;\n   HEAPU8: {\n   set: (arg0: Uint8Array, arg1: number) => void;\n   };\n   HEAP32: {\n   set: (arg0: Int32Array, arg1: number) => void;\n   };\n   };\n   makeOutput: (arg0: number[], arg1: number) => TensorInfo;\n   };\n   inputs: {a: TensorInfo, b: TensorInfo};\n   attrs: {adjoint_a: boolean, adjoint_b: boolean};\n }) => {\n   const {backend, inputs, attrs} = args;\n   const {a, b} = inputs;\n   const {adjoint_a, adjoint_b} = attrs;\n\n   const aId = backend.dataIdMap.get(a.dataId).id;\n   const bId = backend.dataIdMap.get(b.dataId).id;\n\n   const [batchDim, leftDim, rightDim, sharedDim] =\n   backend_util.getMatMulBroadcastDims(a, b, adjoint_a, adjoint_b);\n\n   const out = backend.makeOutput([batchDim, leftDim, rightDim], a.dtype);\n   const outId = backend.dataIdMap.get(out.dataId).id;\n\n   const aShapeBytes = new Uint8Array(new Int32Array(a.shape).buffer);\n   const bShapeBytes = new Uint8Array(new Int32Array(b.shape).buffer);\n\n   const wasm = backend.wasm;\n\n   const aShapeOffset = wasm._malloc(aShapeBytes.length);\n   wasm.HEAPU8.set(aShapeBytes, aShapeOffset);\n   const bShapeOffset = wasm._malloc(bShapeBytes.length);\n   wasm.HEAPU8.set(bShapeBytes, bShapeOffset);\n\n   wasm._BatchMatMul(\n   aId, aShapeOffset, a.shape.length, bId, bShapeOffset, b.shape.length,\n   adjoint_a, adjoint_b, outId);\n\n   wasm._free(aShapeOffset);\n   wasm._free(bShapeOffset);\n\n   return out;\n }\n};\n"]}

CAAC,CAAC;IAElE,IAAI,CAAC,MAAM,CACP,KAAK,IAAI,CAAC,IAAI,KAAK,IAAI,CAAC,IAAI,mBAAmB,EAC/C,GAAG,EAAE,CAAC,iEAAiE;QACnE,kEAAkE;QAClE,wBAAwB,UAAU,UAAU,UAAU,IAAI,CAAC,CAAC;IAEpE,MAAM,iBAAiB,GACnB,SAAS,GAAG,SAAS,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,KAAK,CAAC,KAAK,CAAC,CAAC,CAAC,EAAE,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,KAAK,CAAC,KAAK,CAAC,CAAC,CAAC,EAAE,CAAC,CAAC,CAAC,CAAC;IACxE,MAAM,QAAQ,GAAG,iBAAiB,CAAC,CAAC,MAAM,CAAC,CAAC,CAAC,EAAE,CAAC,CAAC,CAAC,CAAC;IAEtE,IAAI,CAAC,MAAM,CACP,WAAW,EAAE,WAAW,CAAC,CAAC,CAAC;IAEhC,MAAM,CACF,EAAE,CAAC,KAAK,CAAC,QAAQ,EAAE,CAAC,WAAW,CAAC,CAAC,CAAC,EAAE,CAAC,WAAW,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC,CAAC

'number' // out_id\n]);\n}\n\nfunction batchMatMul(args: {\n inputs: BatchMatMulInputs,\n backend: BackendWasm,\n
 attrs: BatchMatMulAttrs\n}) {\n const {inputs, backend, attrs} = args;\n const {a, b} = inputs;\n const {transposeA, transposeB} = attrs;\n\n if (a.dtype !== 'float32' || b.dtype !== 'float32') {\n   throw new Error(\n `BatchMatMul for non non-float32 tensors not yet supported.`);\n }\n\n const aRank = a.shape.length;\n const bRank = b.shape.length;\n\n const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];\n const innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];\n\n const outerShapeA = transposeA ? a.shape[aRank - 1] : a.shape[aRank - 2];\n const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank - 1];\n\n const outerDimsA = a.shape.slice(0, -2);\n const outerDimsB = b.shape.slice(0, -2);\n\n const batchDimA = util.sizeFromShape(outerDimsA);\n const batchDimB = util.sizeFromShape(outerDimsB);\n\n const batchDimsCompatible =\n   batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;\n\n util.assert(\n
      aRank >= 2 && bRank >= 2 && batchDimsCompatible,\n   () => `Error in matMul: the input batch dimensions must either be the ` +\n   `same or at least one input batch dimension must be 1. Got input ` +\n   `batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);\n\n const outShapeOuterDims =\n   batchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);\n const outShape = outShapeOuterDims.concat([outerShapeA, outerShapeB]);\n\n util.assert(\n   innerShapeA === innerShapeB,\n   () => `Error in matMul: inner shapes (${innerShapeA}) and (` +\n   `${innerShapeB}) of Tensors with shapes ${a.shape} and ` +\n   `${b.shape} and transposeA=${transposeA}` +\n   ` and transposeB=${transposeB} must match.`);\n\n const a3dShape = transposeA ? [batchDimA, innerShapeA, outerShapeA] :\n   [batchDimA, outerShapeA, innerShapeA];\n const b3dShape = transposeB ? [batchDimB, outerShapeB, innerShapeB] :\n
                [batchDimB, innerShapeB, outerShapeB];\n\n // The rest of the implementation is designed to operate on rank-3 tensors\n const a3d = reshape({inputs: {x: a}, backend, attrs: {shape: a3dShape}});\n const b3d = reshape({inputs: {x: b}, backend, attrs: {shape: b3dShape}});\n\n const a3dId = backend.dataIdMap.get(a3d.dataId).id;\n const b3dId = backend.dataIdMap.get(b3d.dataId).id;\n\n const leftDim = transposeA ? a3d.shape[2] : a3d.shape[1];\n const rightDim = transposeB ? b3d.shape[1] : b3d.shape[2];\n const batchDim = Math.max(batchDimA, batchDimB);\n\n const out = backend.makeOutput([batchDim, leftDim, rightDim], a3d.dtype);\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n const aShapeBytes = new Uint8Array(new Int32Array(a3d.shape).buffer);\n const bShapeBytes = new Uint8Array(new Int32Array(b3d.shape).buffer);\n\n wasmBatchMatMul(\n   a3dId, aShapeBytes, a3d.shape.length, b3dId, bShapeBytes,\n   b3d.shape.length, transposeA, transposeB,
 outId);\n\n backend.disposeData(a3d.dataId);\n backend.disposeData(b3d.dataId);\n\n out.shape = outShape;\n return out;\n}\n\nexport const batchMatMulConfig: KernelConfig = {\n kernelName: BatchMatMul,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: batchMatMul as {} as KernelFunc\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/BatchMatMul.js.map
No license file was found, but licenses were detected in source scan.

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implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n
 * ==\n
*/\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from './unary_kernel';\nexport const tanhConfig: KernelConfig = createUnaryKernelConfig(Tanh);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Tanh.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"All.js","sourceRoot":"","sources":["../../src/kernels/All.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,GAAG,EAAuB,YAAY,EAAwC,IAAI,EAAC,MAAM,uBAAuB,CAAC;AAIzH,OAAO,EAAC,uBAAuB,EAAC,MAAM,gBAAgB,CAAC;AAEvD,IAAI,OAAiE,CAAC;AAEtE,SAAS,KAAK,CAAC,OAAoB;IACjC,OAAO,GAAG,OAAO,CAAC,IAAI,CAAC,KAAK,CAAC,CAAC,GAAG,EAAE,CAAC,GAAG,EAAE,CAAC,GAAG,EAAE

args;\n const {axis, keepDims} = attrs;\n const {x} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n let inputId = xId;\n let input = x;\n\n const {transposed, axes, originalAxes, inputWasTransposed} =\n permuteAxesAndTranspose(x, axis, backend);\n\n if (inputWasTransposed) {\n   const transposedId =\n backend.dataIdMap.get(transposed.dataId).id;\n   input = transposed;\n   inputId = transposedId;\n }\n\n const\n inputRank = input.shape.length;\n backend_util.assertAxesAreInnerMostDims('all', axes, inputRank);\n const\n [outShape, reduceShape] =\n   backend_util.computeOutAndReduceShapes(input.shape, axes);\n const\n reduceSize\n   = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, x.dtype);\n if\n (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n wasmAll(inputId, reduceSize, outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape =\n backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n return\n out;\n}\n\nexport const allConfig: KernelConfig = {\n kernelName: All,\n backendName: 'wasm',\n setupFunc:\n setup,\n kernelFunc: all as {} as KernelFunc\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/All.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Sqrt.js","sourceRoot":"","sources":["../../src/kernels/Sqrt.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAe,IAAI,EAAC,MAAM,uBAAuB,CAAC;AAEzD,OAAO,EAAC,uBAAuB,EAAC,MAAM,gBAAgB,CAAC;AACvD,MAAM,CAAC,MAAM,UAAU,GAAG,uBAAuB,CAAC,IAAI,EAAE,IAAI,CAAC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n
 * ==\n
*/\n\nimport {KernelConfig, Sqrt} from '@tensorflow/tfjs-core';\n\nimport {createUnaryKernelConfig} from
'./unary_kernel';\nexport const sqrtConfig: KernelConfig = createUnaryKernelConfig(Sqrt);\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Sqrt.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"SplitV.js","sourceRoot":"","sources":["../../src/kernels/SplitV.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAAC,MAAM,gBAAgB,CAAC;AAC5C,OAAO,EAAC,uBAAuB,EAAC,MAAM,gBAAgB,CAAC;AACvD,MAAM,CAAC,MAAM,WAAW,GAAG,uBAAuB,CAAC,YAAY,EAAE,IAAI,CAAC,CAAC

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CpE,KAAK,CAAC,KAAK,CAAC,IAAI,CAAC,CAAC;QAClB,OAAO,MAAM,CAAC;IAChB,CAAC,CAAC,CA
AC;AACL,CAAC;AAED,MAAM,CAAC,MAAM,YAAY,GAAiB;IACxC,UAAU,EAAE,MAAM;IAClB,WAAW,
EAAE,MAM;IACnB,UAAU,EAAE,MA0B;CACvC,CAAC","sourcesContent":["/**\n
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==\n
*/\n\nimport {KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, util} from '@tensorflow/tfjs-
core';\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from
'../backend_wasm';\n\nimport {slice} from './Slice';\n\nexport function splitV(\n args: {inputs: SplitVInputs, attrs:
SplitVAttrs, backend: BackendWasm}) {\n const {inputs, attrs, backend} = args;\n const {x} = inputs;\n const
{numOrSizeSplits, axis} = attrs;\n\n const $axis = util.parseAxisParam(axis, x.shape)[0];\n\n const splitSizes =
backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n const begin = new Array(x.shape.length).fill(0);\n
const size = x.shape.slice();\n return splitSizes.map(s => {\n const xSliceSize = [...size];\n xSliceSize[$axis] =
s;\n const xSlice =\n slice({inputs: {x}, attrs: {begin, size: xSliceSize}, backend});\n begin[$axis] += s;\n
return xSlice;\n });\n}\n\nexport const
splitVConfig: KernelConfig = {\n kernelName: SplitV,\n backendName: 'wasm',\n kernelFunc: splitV as {} as
KernelFunc\n};\n"]}

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* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/SplitV.js.map
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 * ========================================================================
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*** */
/**
 * @deprecated Use `setWasmPaths` instead.
 * Sets the path to the `.wasm` file which will be fetched when the wasm
 * backend is initialized. See
 * https://github.com/tensorflow/tfjs/blob/master/tfjs-backend-wasm/README.md#using-bundlers
  * for more details.
 * @param path wasm file path or url
 * @param usePlatformFetch optional boolean to use platform fetch to download
 *   the wasm file, default to false.
 *
 * @doc {heading: 'Environment', namespace: 'wasm'}
 */

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/tf-backend-wasm.js
No license file was found, but licenses were detected in source scan.

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 governing permissions and\n * limitations under the License.\n *
==\n
*/\nimport {KernelConfig, NotEqual} from '@tensorflow/tfjs-core';\n\nimport {createBinaryKernelConfig} from
'./binary_kernel';\nconst supportsFullBroadcast = false;\nexport const notEqualConfig: KernelConfig =\n
createBinaryKernelConfig(NotEqual, supportsFullBroadcast, 'bool');\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/NotEqual.js.map

No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Prod.js","sourceRoot":"","sources":["../../src/kernels/Prod.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAA4B,IAAI,EAAqC,IAAI,EAAC,MAAM,uBAAuB,CAAC;AAI5H,OAAO,EAAC,uBAAuB,EAAC,MAAM,gBAAgB,CAAC;AAEvD,OAAO,EAAC,QAAQ,EAAC,MAAM,SAAS,CAAC;AAEjC,OAAO,EAAC,qBAAqB,EAAC,MAAM,cAAc,CAAC;AAE1C,OAAO,EAAC,MAAM,EAAC,MAAM,WAAW,CAAC;AAEjC

let reductionAxes = axes;\n if (inputWasTransposed) {\n   const transposedId = backend.dataIdMap.get(transposed.dataId).id;\n   if (transposedId !== xId) {\n   // transpose was not a no-op. We will need to dispose of this\n   // once we are done.\n   input = transposed;\n   inputId = transposedId;\n   reductionAxes = backend_util.getInnerMostAxes(\n   reductionAxes.length, input.shape.length);\n   }\n }\n\n backend_util.assertAxesAreInnerMostDims(\n   'prod', reductionAxes, input.shape.length);\n const [outShape, reduceShape] =\n   backend_util.computeOutAndReduceShapes(input.shape, reductionAxes);\n const reduceSize = util.sizeFromShape(reduceShape);\n\n const out = backend.makeOutput(outShape, input.dtype);\n if (util.sizeFromShape(input.shape) !== 0) {\n   const outId = backend.dataIdMap.get(out.dataId).id;\n   wasmProd(inputId, reduceSize, CppDType[out.dtype], outId);\n }\n\n if (inputWasTransposed) {\n   // dispose of the transposed tensor.\n   backend.disposeData(transposed.dataId);\n }\n\n if (keepDims) {\n   // reshape\n   const newShape = backend_util.expandShapeToKeepDim(out.shape, originalAxes);\n   out.shape = newShape;\n }\n\n return out;\n}\n\nexport const prodConfig: KernelConfig = {\n kernelName: Prod,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: prod as {} as KernelFunc\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Prod.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"Pack.js","sourceRoot":"","sources":["../../src/kernels/Pack.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAA2B,IAAI,EAAqC,IAAI,EAAC,MAAM,uBAAuB,CAAC;AAG9G,OAAO,EAAC,MAAM,EAAC,MAAM,UAAU,CAAC;AAChC,OAAO,EAAC,UAAU,EAAC,MAAM,cAAc,CAAC;AAExC,MAAM,UAAU,IAAI,CAAC,hB,IAAkE;IAEpE,MAAM,EAAC,MAAM,EAAC,MAAM,EAAE,OAAO,EAAE,EAAE,KAAK,EAAC,GAAG,IAAI,CAAC;IACtC,MAAM,EAAC,MAAM,EAAC,IAAI,EAAC,GAAG,KAAK,EAAC,CAAC;IAErB,MAAM,EAAC,MAAM,EAAC,IAAI,EAAC,GAAG,KAAK,EAAC,CAAC;IAEvC,MAAM,EAAC,MAAM,EAAC,MAAM,EAAE,EAAE,KAAK,EAAC,GAAG,IAAI,CAAC;IAEtC,MAAM,EAAC,MAAM,EAAC,IAAI,EAAC,GAAG,KAAK,EAAC,CAAC;IAE7B

core';\nimport {BackendWasm} from '../backend_wasm';\n\nimport {concat} from './Concat';\nimport {expandDims} from './ExpandDims';\n\nexport function pack(\n args: {inputs: PackInputs, backend: BackendWasm, attrs: PackAttrs}):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n const {axis} = attrs;\n\n if (inputs.length === 1) {\n return expandDims(\n {inputs: {input: inputs[0]}, backend, attrs: {dim: axis}});\n }\n\n const shape = inputs[0].shape;\n const dtype = inputs[0].dtype;\n\n inputs.forEach(t => {\n util.assertShapesMatch(\n shape, t.shape,\n 'All tensors passed to stack must have matching shapes');\n util.assert(\n dtype === t.dtype,\n () => 'All tensors passed to stack must have matching dtypes');\n });\n\n const intermediateTensorInfos: TensorInfo[] = [];\n const expandedTensors = inputs.map(t => {\n const expandedT =\n expandDims({inputs: {input: t}, backend, attrs: {dim: axis}});\n intermediateTensorInfos.push(expandedT);\n return expandedT;\n });\n\n const result = concat({inputs: expandedTensors, backend, attrs: {axis}});\n\n intermediateTensorInfos.forEach(t => backend.disposeData(t.dataId));\n\n return result;\n}\n\nexport const packConfig: KernelConfig = {\n kernelName: Pack,\n backendName: 'wasm',\n kernelFunc: pack as {} as KernelFunc\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/Pack.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"MaxPool.js","sourceRoot":"","sources":["../../src/kernels/MaxPool.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAA4B,OAAO,EAAyC,IAAI,EAAC,MAAM,uBAAuB,CAAC;AAInI,IAAI,WAAqE,CAAC;AAE1E,SAAS,KAAK,CAAC,OAAoB;IAAC,WAAW,GAAG,OAAO,CAAC,IAAI,CAAC,KAAK,CAAC,KAAK,CAAC,OAAO,EAAE,IAAI,CAAC,UAAU,EAAE,QAAQ;QAAC,QAAQ;QAAC,QAAQ;QAAC

OAA2B;CACxC,CAAC","sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, Tensor4D, util} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmMaxPool: (\n xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterHeight: number, filterWidth: number, padTop: number, padRight: number,\n padBottom: number, padLeft: number, dilationHeight: number,\n dilationWidth: number, strideHeight: number, strideWidth: number,\n inputChannels: number, outputChannels: number, outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmMaxPool = backend.wasm.cwrap(MaxPool, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number',\n // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n}\n\nfunction maxPool(\n args: {inputs: MaxPoolInputs, backend: BackendWasm, attrs: MaxPoolAttrs}) {\n const {inputs, attrs, backend} = args;\n\n const x = inputs.x as Tensor4D;\n const xId = backend.dataIdMap.get(x.dataId).id;\n\n // TF API supports int32 input. CPU and WebGL backend also support int32\n // input. WASM backend doesn't support it because it uses xnnpack which only\n // supports float32.\n //\n // Add the following assert only for the WASM backend instead of at core op\n // level.\n //\n // TODO: add support for int32 input.\n util.assert(\n x.dtype === 'float32',\n () =>\n `Error in MaxPool: only float32 input is supported. Got ${x.dtype}.`);\n\n const {filterSize, strides, pad, dimRoundingMode} = attrs;\n const convInfo = backend_util.computePool2DInfo(\n x.shape, filterSize, strides, 1 /* dilations */, pad, dimRoundingMode);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend does not support dataFormat:` +\n `${convInfo.dataFormat}'.\n Please use 'channelsLast'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n\n wasmMaxPool(\n xId, x.shape[0], x.shape[1], x.shape[2], filterHeight, filterWidth,\n padTop, padRight, padBottom, padLeft, dilationHeight, dilationWidth,\n strideHeight, strideWidth, inputChannels, outputChannels, outId);\n return out;\n}\n\nexport const maxPoolConfig: KernelConfig = {\n kernelName: MaxPool,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: maxPool as {} as KernelFunc\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/MaxPool.js.map
No license file was found, but licenses were detected in source scan.

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'./kernels/FusedBatchNorm';\nimport {fusedConv2DConfig} from './kernels/FusedConv2D';\nimport {fusedDepthwiseConv2DConfig} from './kernels/FusedDepthwiseConv2D';\nimport {gatherNdConfig} from './kernels/GatherNd';\nimport {gatherV2Config} from './kernels/GatherV2';\nimport {greaterConfig} from './kernels/Greater';\nimport {greaterEqualConfig} from './kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport {leakyReluConfig} from './kernels/LeakyRelu';\nimport {lessConfig} from './kernels/Less';\nimport {lessEqualConfig} from './kernels/LessEqual';\nimport {logConfig} from './kernels/Log';\nimport {logicalAndConfig} from './kernels/LogicalAnd';\nimport {maxConfig} from './kernels/Max';\nimport {maximumConfig} from './kernels/Maximum';\nimport {maxPoolConfig} from './kernels/MaxPool';\nimport {meanConfig} from './kernels/Mean';\nimport {minConfig} from './kernels/Min';\nimport {minimumConfig} from './kernels/Minimum';\nimport {mirrorPadConfig} from './kernels/MirrorPad';\nimport {multiplyConfig} from './kernels/Multiply';\nimport {negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from './kernels/NonMaxSuppressionV3';\nimport {nonMaxSuppressionV4Config} from './kernels/NonMaxSuppressionV4';\nimport {nonMaxSuppressionV5Config} from './kernels/NonMaxSuppressionV5';\nimport {notEqualConfig} from './kernels/NotEqual';\nimport {oneHotConfig} from './kernels/OneHot';\nimport {onesLikeConfig} from './kernels/OnesLike';\nimport {packConfig} from './kernels/Pack';\nimport {padV2Config} from './kernels/PadV2';\nimport {powConfig} from './kernels/Pow';\nimport {preluConfig} from './kernels/Prelu';\nimport {prodConfig} from './kernels/Prod';\nimport {rangeConfig} from './kernels/Range';\nimport {realDivConfig} from './kernels/RealDiv';\nimport {reluConfig} from './kernels/Relu';\nimport {relu6Config} from './kernels/Relu6';\nimport {reshapeConfig} from './kernels/Reshape';\nimport {resizeBilinearConfig} from './kernels/ResizeBilinear';\nimport {reverseConfig} from './kernels/Reverse';\nimport {rotateWithOffsetConfig} from './kernels/RotateWithOffset';\nimport {roundConfig} from './kernels/Round';\nimport {rsqrtConfig} from './kernels/Rsqrt';\nimport {scatterNdConfig} from './kernels/ScatterNd';\nimport {selectConfig} from './kernels/Select';\nimport {sigmoidConfig} from './kernels/Sigmoid';\nimport {sinConfig} from './kernels/Sin';\nimport {sliceConfig} from './kernels/Slice';\nimport {softmaxConfig} from './kernels/Softmax';\nimport {spaceToBatchNDConfig} from './kernels/SpaceToBatchND';\nimport {splitVConfig} from './kernels/SplitV';\nimport {sqrtConfig} from './kernels/Sqrt';\nimport {squareConfig} from './kernels/Square';\nimport {squaredDifferenceConfig} from './kernels/SquaredDifference';\nimport {stepConfig} from './kernels/Step';\nimport {stridedSliceConfig} from './kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig} from './kernels/Sum';\nimport {tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport {tileConfig} from './kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transformConfig} from './kernels/Transform';\nimport {transposeConfig} from './kernels/Transpose';\nimport {unpackConfig} from './kernels/Unpack';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst kernelConfigs: KernelConfig[] = [\n absConfig,\n addConfig,\n addNConfig,\n allConfig,\n anyConfig,\n argMaxConfig,\n avgPoolConfig,\n batchMatMulConfig,\n batchToSpaceNDConfig,\n castConfig,\n ceilConfig,\n clipByValueConfig,\n concatConfig,\n conv2DConfig,\n conv2DBackpropInputConfig,\n cosConfig,\n coshConfig,\n cropAndResizeConfig,\n cumsumConfig,\n depthToSpaceConfig,\n depthwiseConv2dNativeConfig,\n eluConfig,\n equalConfig,\n expConfig,\n expandDimsConfig,\n fillConfig,\n flipLeftRightConfig,\n floorConfig,\n floorDivConfig,\n fusedMatMulConfig,\n fusedBatchNormConfig,\n fusedConv2DConfig,\n fusedDepthwiseConv2DConfig,\n gatherNdConfig,\n gatherV2Config,\n greaterConfig,\n greaterEqualConfig,\n identityConfig,\n leakyReluConfig,\n lessConfig,\n lessEqualConfig,\n logConfig,\n logicalAndConfig,\n maxConfig,\n maximumConfig,\n maxPoolConfig,\n meanConfig,\n minConfig,\n minimumConfig,\n mirrorPadConfig,\n multiplyConfig,\n negConfig,\n nonMaxSuppressionV3Config,\n nonMaxSuppressionV4Config,\n nonMaxSuppressionV5Config,\n notEqualConfig,\n oneHotConfig,\n onesLikeConfig,\n packConfig,\n padV2Config,\n powConfig,\n preluConfig,\n prodConfig,\n rangeConfig,\n realDivConfig,\n reluConfig,\n relu6Config,\n reshapeConfig,\n resizeBilinearConfig,\n reverseConfig,\n rotateWithOffsetConfig,\n rsqrtConfig,\n roundConfig,\n

scatterNdConfig,\n selectConfig,\n sigmoidConfig,\n sinConfig,\n sliceConfig,\n softmaxConfig,\n spaceToBatchNDConfig,\n splitVConfig,\n sqrtConfig,\n squareConfig,\n squaredDifferenceConfig,\n stepConfig,\n stridedSliceConfig,\n subConfig,\n sumConfig,\n tanConfig,\n tanhConfig,\n tileConfig,\n topKConfig,\n transformConfig,\n transposeConfig,\n unpackConfig,\n zerosLikeConfig\n];\n\nfor (const kernelConfig of kernelConfigs) {\n registerKernel(kernelConfig);\n}\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/register_all_kernels.js.map
No license file was found, but licenses were detected in source scan.

{"version":3,"file":"DepthwiseConv2dNative.js","sourceRoot":"","sources":["../../src/kernels/DepthwiseConv2dNative.ts"],"names":[],"mappings":"AAAA;;;;;;;;;;;;;;;GAeG;AAEH,OAAO,EAAC,YAAY,EAAE,qBAAqB,EAA8F,MAAM,uBAAuB,CAAC;AAIvK,IAAI,mBAAmB,CAAC;AAE3B,SAAS,KAAK,CAAC,OAAoB;IACjC,mBAAmB;QACf,OAAO,CAAC,IAAI,CAAC,KAAK,CAAC,qBAAqB,EAAE,IAAI,CAAC,UAAU,EAAE;YACzD,QAAQ;YACR,QAAQ;YACR,QAAQ;YACR

the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs, DepthwiseConv2dNativeInputs, KernelConfig, KernelFunc, Tensor4D} from '@tensorflow/tfjs-core';\n\nimport {BackendWasm} from '../backend_wasm';\n\nlet wasmDepthwiseConv2d: (\n xId: number, batchSize: number, inputHeight: number, inputWidth: number,\n filterId: number, filterHeight: number, filterWidth: number, padTop: number,\n padRight: number, padBottom: number, padLeft: number, isSamePad: number,\n dilationHeight: number, dilationWidth: number, strideHeight: number,\n strideWidth: number, inputChannels: number, outputChannels:
number,\n outId: number) => void;\n\nfunction setup(backend: BackendWasm) {\n wasmDepthwiseConv2d =\n backend.wasm.cwrap(DepthwiseConv2dNative, null /* void */, [\n 'number', // xId\n 'number', // batchSize\n 'number', // inputHeight\n 'number', // inputWidth\n 'number', // filterId\n 'number', // filterHeight\n 'number', // filterWidth\n 'number', // padTop\n 'number', // padRight\n 'number', // padBottom\n 'number', // padLeft\n 'number', // isSamePad\n 'number', // dilationHeight\n 'number', // dilationWidth\n 'number', // strideHeight\n 'number', // strideWidth\n 'number', // inputChannels\n 'number', // outputChannels\n 'number', // outId\n]);\n}\n\nfunction depthwiseConv2d(args: {\n inputs: DepthwiseConv2dNativeInputs,\n backend: BackendWasm,\n attrs: DepthwiseConv2dNativeAttrs\n}) {\n const {inputs, attrs,
backend} = args;\n\n const {x, filter} = inputs;\n const xId = backend.dataIdMap.get(x.dataId).id;\n const filterId = backend.dataIdMap.get(filter.dataId).id;\n\n const {strides, dilations, pad, dimRoundingMode} = attrs;\n\n const $dilations = dilations == null ? [1, 1] : dilations;\n\n const convInfo = backend_util.computeConv2DInfo(\n (x as Tensor4D).shape, (filter as Tensor4D).shape, strides,\n ($dilations as number | [number, number]), pad, dimRoundingMode,\n true /* depthwise */);\n\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const padTop = convInfo.padInfo.top;\n const padRight = convInfo.padInfo.right;\n const padBottom = convInfo.padInfo.bottom;\n const padLeft = convInfo.padInfo.left;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const inputChannels = convInfo.inChannels;\n const outputChannels = convInfo.outChannels;\n const isSamePad = convInfo.padInfo.type === 'SAME' ? 1 : 0;\n\n if (convInfo.dataFormat !== 'channelsLast') {\n throw new Error(\n `wasm backend DepthwiseConv2dNative does not support dataFormat:'` +\n `${convInfo.dataFormat}'. Please use 'channelsLast'.`);\n }\n\n const out = backend.makeOutput(convInfo.outShape, 'float32');\n const outId = backend.dataIdMap.get(out.dataId).id;\n wasmDepthwiseConv2d(\n xId, x.shape[0], x.shape[1], x.shape[2], filterId, filterHeight,\n filterWidth, padTop, padRight, padBottom, padLeft, isSamePad,\n dilationHeight, dilationWidth, strideHeight, strideWidth, inputChannels,\n outputChannels, outId);\n return out;\n}\n\nexport const depthwiseConv2dNativeConfig: KernelConfig = {\n kernelName: DepthwiseConv2dNative,\n backendName: 'wasm',\n setupFunc: setup,\n kernelFunc: depthwiseConv2d as {} as KernelFunc\n};\n"]}

Found in path(s):
* /tfjs-backend-wasm-zip/tfjs-backend-wasm/dist/kernels/DepthwiseConv2dNative.js.map

1.363 @tensorflow/tfjs-backend-webgl 3.11.0

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1.364 @tensorflow/tfjs-backend-cpu 3.11.0

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{"version":3,"file":"body-pix.esm.js","sources":["../src/decode_part_map.ts","../src/base_model.ts","../src/mobilenet.ts","../src/keypoints.ts","../src/multi_person/util.ts","../src/multi_person/decode_multiple_masks_cpu.ts","../src/multi_person/decode_multiple_masks_webgl.ts","../src/multi_person/decode_instance_masks.ts","../src/multi_person/max_heap.ts","../src/multi_person/build_part_with_score_queue.ts","../src/multi_person/decode_pose.ts","../src/multi_person/decode_multiple_poses.ts","../src/resnet.ts","../src/saved_models.ts","../src/util.ts","../src/body_pix_model.ts","../src/blur.ts","../src/output_rendering_util.ts","../src/part_channels.ts","../src/version.ts"],"sourcesContent":["/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport * as tf from '@tensorflow/tfjs-core';\n\n/**\n * Takes the sigmoid of the part heatmap output and generates a 2d one-hot\n * tensor with ones where the part's score has the maximum value.\n *\n * @param partHeatmapScores\n */\nfunction toFlattenedOneHotPartMap(partHeatmapScores: tf.Tensor3D): tf.Tensor2D {\n const numParts = partHeatmapScores.shape[2];\n const partMapLocations = tf.argMax(partHeatmapScores, 2);\n\n const partMapFlattened = tf.reshape(partMapLocations, [-1]);\n\n return tf.oneHot(partMapFlattened, numParts) as tf.Tensor2D;\n}\n\nfunction clipByMask2d(image: tf.Tensor2D, mask: tf.Tensor2D): tf.Tensor2D {\n return tf.mul(image, mask);\n}\n\n/**\n * Takes the sigmoid of the segmentation output, and generates a segmentation\n * mask with a 1 or 0 at each pixel where there is a person or not a person. The\n * segmentation threshold determines the threshold of a score for a pixel for it\n * to be considered part of a person.\n *\n * @param segmentScores A 3d-tensor of the sigmoid of the segmentation output.\n * @param segmentationThreshold The minimum that segmentation values must have\n * to be considered part of the person. Affects the generation of the\n * segmentation mask and the clipping of the colored part image.\n *\n * @returns A segmentation mask with a 1 or 0 at each pixel where there is a\n * person or not a person.\n */\nexport function toMaskTensor(\n   segmentScores: tf.Tensor2D, threshold: number): tf.Tensor2D {\n return tf.tidy(\n   () =>\n   (tf.cast(tf.greater(\n   segmentScores, tf.scalar(threshold)), 'int32') as tf.Tensor2D));\n}\n\n/**\n * Takes the sigmoid of the person and part map output, and returns a 2d tensor\n * of an image with the corresponding value at each pixel corresponding to the\n * part with the highest value. These part ids are clipped by the segmentation\n * mask. Wherever the a pixel is clipped by the segmentation mask, its value\n * will set to -1, indicating that there is no part in that pixel.\n *\n * @param segmentScores A 3d-tensor of the sigmoid of the segmentation output.\n * @param partHeatmapScores A 3d-tensor of the sigmoid of the part heatmap\n * output. The third dimension corresponds to the part.\n *\n * @returns A 2d tensor of an image with the corresponding value at each pixel\n * corresponding to the part with the highest value. These part ids are clipped\n * by the segmentation mask. It will have values of -1 for pixels that are\n * outside of the body and do not have a corresponding part.\n */\nexport function decodePartSegmentation(\n   segmentationMask: tf.Tensor2D,\n   partHeatmapScores: tf.Tensor3D): tf.Tensor2D {\n const [partMapHeight, partMapWidth, numParts] = partHeatmapScores.shape;\n return tf.tidy(() => {\n   const flattenedMap = toFlattenedOneHotPartMap(partHeatmapScores);\n   const partNumbers = tf.expandDims(tf.range(0, numParts, 1, 'int32'), 1);\n\n   const partMapFlattened =\n   tf.cast(tf.matMul(flattenedMap, partNumbers as tf.Tensor2D), 'int32');\n\n   const partMap = tf.reshape(partMapFlattened, [partMapHeight, partMapWidth]);\n\n   const partMapShiftedUpForClipping = tf.add(partMap, tf.scalar(1, 'int32'));\n\n   return tf.sub(clipByMask2d(\n   partMapShiftedUpForClipping as tf.Tensor2D, segmentationMask)\n   , tf.scalar(1, 'int32'));\n });\n}\n\nexport function decodeOnlyPartSegmentation(partHeatmapScores: tf.Tensor3D):\n   tf.Tensor2D {\n const

[partMapHeight, partMapWidth, numParts] = partHeatmapScores.shape;\n
return tf.tidy(() => {\n const flattenedMap = toFlattenedOneHotPartMap(partHeatmapScores);\n const partNumbers = tf.expandDims(tf.range(0, numParts, 1, 'int32'), 1);\n\n const partMapFlattened =\n tf.cast(tf.matMul(flattenedMap, partNumbers as tf.Tensor2D), 'int32');\n\n return tf.reshape(partMapFlattened, [partMapHeight, partMapWidth]);\n });\n}\n","\n/**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n
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==========\n
*/\n\nimport * as tfconv from '@tensorflow/tfjs-converter';\nimport * as tf from '@tensorflow/tfjs-core';\nimport {BodyPixOutputStride} from './types';\n\n/**\n * BodyPix supports using various convolution neural network models\n * (e.g. ResNet and MobileNetV1) as its underlying base model.\n * The following BaseModel interface defines a unified interface for\n * creating such BodyPix base models. Currently both MobileNet (in\n * ./mobilenet.ts) and ResNet (in ./resnet.ts) implements the BaseModel\n * interface. New base models that conform to the BaseModel interface can be\n * added to BodyPix.\n */\nexport abstract class BaseModel {\n constructor(\n protected readonly model: tfconv.GraphModel,\n public readonly outputStride: BodyPixOutputStride) {\n const inputShape =\n this.model.inputs[0].shape as [number, number, number, number];\n tf.util.assert(\n (inputShape[1] === -1) && (inputShape[2] === -1),\n () => `Input shape [${inputShape[1]}, ${inputShape[2]}] ` +\n `must both be equal to or -1`);\n }\n\n abstract preprocessInput(input: tf.Tensor3D): tf.Tensor3D;\n\n /**\n * Predicts intermediate Tensor representations.\n *\n * @param input The input RGB image of the base model.\n * A Tensor of shape: [`inputResolution`, `inputResolution`, 3].\n *\n * @return A dictionary of base model's intermediate predictions.\n * The returned dictionary should contains the following elements:\n * - heatmapScores: A Tensor3D that represents the keypoint heatmap scores.\n * - offsets: A Tensor3D that represents the offsets.\n * - displacementFwd: A Tensor3D that represents the forward displacement.\n * - displacementBwd: A Tensor3D that represents the backward displacement.\n * - segmentation: A Tensor3D that represents the segmentation of all\n * people.\n * - longOffsets: A Tensor3D that represents the long offsets used for\n * instance grouping.\n * - partHeatmaps: A Tensor3D that represents the body part segmentation.\n */\n predict(input: tf.Tensor3D): {\n heatmapScores: tf.Tensor3D,\n offsets: tf.Tensor3D,\n displacementFwd: tf.Tensor3D,\n displacementBwd: tf.Tensor3D,\n segmentation: tf.Tensor3D,\n partHeatmaps: tf.Tensor3D,\n longOffsets: tf.Tensor3D,\n partOffsets: tf.Tensor3D\n } {\n return tf.tidy(() => {\n const asFloat = this.preprocessInput(tf.cast(input, 'float32'));\n const asBatch = tf.expandDims(asFloat, 0);\n const results = this.model.predict(asBatch) as tf.Tensor4D[];\n const results3d: tf.Tensor3D[] = results.map(y => tf.squeeze(y, [0]));\n const namedResults = this.nameOutputResults(results3d);\n\n return {\n heatmapScores: tf.sigmoid(namedResults.heatmap),\n offsets: namedResults.offsets,\n displacementFwd: namedResults.displacementFwd,\n displacementBwd: namedResults.displacementBwd,\n segmentation: namedResults.segmentation,\n partHeatmaps: namedResults.partHeatmaps,\n longOffsets: namedResults.longOffsets,\n partOffsets: namedResults.partOffsets\n };\n });\n }\n\n // Because MobileNet and ResNet predict() methods output a different order for\n // these values, we have a method that needs to be implemented to order them.\n abstract nameOutputResults(results: tf.Tensor3D[]): {\n heatmap: tf.Tensor3D,\n offsets: tf.Tensor3D,\n displacementFwd: tf.Tensor3D,\n displacementBwd: tf.Tensor3D,\n segmentation: tf.Tensor3D,\n partHeatmaps: tf.Tensor3D,\n longOffsets: tf.Tensor3D,\n partOffsets: tf.Tensor3D\n };\n\n /**\n * Releases the CPU and GPU memory allocated by the model.\n */\n dispose() {\n this.model.dispose();\n }\n}\n","/**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0

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*/\n\nimport * as tf from '@tensorflow/tfjs-core';\n\nimport {BaseModel} from './base_model';\n\nexport class MobileNet extends BaseModel {\n preprocessInput(input: tf.Tensor3D): tf.Tensor3D {\n   // Normalize the pixels [0, 255] to be between [-1, 1].\n   return tf.tidy(() => tf.sub(tf.div(input, 127.5), 1.0));\n }\n\n nameOutputResults(results: tf.Tensor3D[]) {\n   const [\n   offsets,\n   segmentation,\n   partHeatmaps,\n   longOffsets,\n   heatmap,\n   displacementFwd,\n   displacementBwd,\n partOffsets,\n] = results;\n   return {\n   offsets,\n   segmentation,\n   partHeatmaps,\n   longOffsets,\n heatmap,\n   displacementFwd,\n   displacementBwd,\n   partOffsets\n   };\n }\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
 */\n\nexport type Tuple<T> = [T, T];\nexport type StringTuple = Tuple<string>;\nexport type NumberTuple = Tuple<number>;\n\nexport const PART_NAMES = [\n 'nose', 'leftEye', 'rightEye', 'leftEar', 'rightEar', 'leftShoulder',\n 'rightShoulder', 'leftElbow', 'rightElbow', 'leftWrist', 'rightWrist',\n 'leftHip', 'rightHip', 'leftKnee', 'rightKnee', 'leftAnkle', 'rightAnkle'\n];\n\nexport const NUM_KEYPOINTS = PART_NAMES.length;\n\nexport interface NumberDict {\n [jointName: string]: number;\n}\n\nexport const PART_IDS =\n PART_NAMES.reduce((result: NumberDict, jointName, i): NumberDict => {\n   result[jointName] = i;\n   return result;\n }, {});\n\nconst CONNECTED_PART_NAMES: StringTuple[] = [\n ['leftHip', 'leftShoulder'], ['leftElbow', 'leftShoulder'],\n ['leftElbow', 'leftWrist'], ['leftHip', 'leftKnee'],\n ['leftKnee', 'leftAnkle'], ['rightHip', 'rightShoulder'],\n ['rightElbow', 'rightShoulder'], ['rightElbow',
 'rightWrist'],\n ['rightHip', 'rightKnee'], ['rightKnee', 'rightAnkle'],\n ['leftShoulder', 'rightShoulder'], ['leftHip', 'rightHip']\n];\n\n/*\n * Define the skeleton. This defines the parent->child relationships of our\n * tree. Arbitrarily this defines the nose as the root of the tree, however\n * since we will infer the displacement for both parent->child and\n * child->parent, we can define the tree root as any node.\n */\nexport const POSE_CHAIN: StringTuple[] = [\n ['nose', 'leftEye'], ['leftEye', 'leftEar'], ['nose', 'rightEye'],\n ['rightEye', 'rightEar'], ['nose', 'leftShoulder'],\n ['leftShoulder', 'leftElbow'], ['leftElbow', 'leftWrist'],\n ['leftShoulder', 'leftHip'], ['leftHip', 'leftKnee'],\n ['leftKnee', 'leftAnkle'], ['nose', 'rightShoulder'],\n ['rightShoulder', 'rightElbow'], ['rightElbow', 'rightWrist'],\n ['rightShoulder', 'rightHip'], ['rightHip', 'rightKnee'],\n ['rightKnee', 'rightAnkle']\n];\n\nexport const CONNECTED_PART_INDICES = CONNECTED_PART_NAMES.map(\n   ([jointNameA, jointNameB]) =>\n   ([PART_IDS[jointNameA], PART_IDS[jointNameB]]));\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {NUM_KEYPOINTS} from '../keypoints';\nimport {Padding, Part, TensorBuffer3D, Vector2D} from

'../types';\n\nexport function getScale(\n [height, width]: [number,
number],\n [inputResolutionY, inputResolutionX]: [number, number],\n padding: Padding): [number, number]
{\n const {top: padT, bottom: padB, left: padL, right: padR} = padding;\n const scaleY = inputResolutionY / (padT
+ padB + height);\n const scaleX = inputResolutionX / (padL + padR + width);\n return [scaleX,
scaleY];\n}\n\nexport function getOffsetPoint(\n y: number, x: number, keypoint: number, offsets:
TensorBuffer3D): Vector2D {\n return {\n y: offsets.get(y, x, keypoint),\n x: offsets.get(y, x, keypoint +
NUM_KEYPOINTS)\n };\n}\n\nexport function getImageCoords(\n part: Part, outputStride: number, offsets:
TensorBuffer3D): Vector2D {\n const {heatmapY, heatmapX, id: keypoint} = part;\n const {y, x} =
getOffsetPoint(heatmapY, heatmapX, keypoint, offsets);\n return {\n x: part.heatmapX * outputStride + x,\n y:
part.heatmapY * outputStride + y\n };\n}\n\nexport function fillArray<T>(element: T, size: number): T[] {\n const
result: T[] = new Array(size);\n\n
for (let i = 0; i < size; i++) {\n result[i] = element;\n }\n\n return result;\n}\n\nexport function clamp(a: number,
min: number, max: number): number {\n if (a < min) {\n return min;\n }\n if (a > max) {\n return max;\n }\n
return a;\n}\n\nexport function squaredDistance(\n y1: number, x1: number, y2: number, x2: number): number {\n
const dy = y2 - y1;\n const dx = x2 - x1;\n return dy * dy + dx * dx;\n}\n\nexport function addVectors(a:
Vector2D, b: Vector2D): Vector2D {\n return {x: a.x + b.x, y: a.y + b.y};\n}\n\nexport function clampVector(a:
Vector2D, min: number, max: number): Vector2D {\n return {y: clamp(a.y, min, max), x: clamp(a.x, min,
max)};\n}\n","/**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the
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distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either
express or implied.\n * See the License for the specific language governing permissions and\n * limitations under
the License.\n *
==\n
*/\n\nimport {NUM_KEYPOINTS} from '../keypoints';\nimport {Padding, Pose} from '../types';\n\nimport
{getScale} from './util';\n\ninterface Pair {\n x: number;\n y: number;\n}\n\nfunction computeDistance(embedding:
Pair[], pose: Pose, minPartScore = 0.3) {\n let distance = 0.0;\n let numKpt = 0;\n for (let p = 0; p <
embedding.length; p++) {\n if (pose.keypoints[p].score > minPartScore) {\n numKpt += 1;\n distance +=
(embedding[p].x - pose.keypoints[p].position.x) ** 2 +\n (embedding[p].y - pose.keypoints[p].position.y) **
2;\n }\n }\n
if (numKpt === 0) {\n distance = Infinity;\n } else {\n distance = distance / numKpt;\n }\n return
distance;\n}\n\nfunction convertToPositionInOuput(\n position: Pair, [padT, padL]: [number, number],\n
[scaleX, scaleY]: [number, number], stride: number): Pair {\n const y = Math.round(((padT + position.y + 1.0) *
scaleY - 1.0) / stride);\n const x = Math.round(((padL + position.x + 1.0) * scaleX - 1.0) / stride);\n return {x,
y};\n}\n\nfunction getEmbedding(\n location: Pair, keypointIndex: number,\n convertToPosition: (pair: Pair) =>
Pair, outputResolutionX: number,\n longOffsets: Float32Array, refineSteps: number,\n [height, width]: [number,
number]): Pair {\n const newLocation = convertToPosition(location);\n\n const nn = newLocation.y *
outputResolutionX + newLocation.x;\n let dy = longOffsets[NUM_KEYPOINTS * (2 * nn) + keypointIndex];\n let
dx = longOffsets[NUM_KEYPOINTS * (2 * nn + 1) + keypointIndex];\n let y = location.y + dy;\n let x =
location.x
+ dx;\n for (let t = 0; t < refineSteps; t++) {\n y = Math.min(y, height - 1);\n x = Math.min(x, width - 1);\n
const newPos = convertToPosition({x, y});\n const nn = newPos.y * outputResolutionX + newPos.x;\n dy =
longOffsets[NUM_KEYPOINTS * (2 * nn) + keypointIndex];\n dx = longOffsets[NUM_KEYPOINTS * (2 * nn
+ 1) + keypointIndex];\n y = y + dy;\n x = x + dx;\n }\n\n return {x, y};\n}\n\nfunction
matchEmbeddingToInstance(\n location: Pair, longOffsets: Float32Array, poses: Pose[],\n numKptForMatching:
number, [padT, padL]: [number, number],\n [scaleX, scaleY]: [number, number], outputResolutionX: number,\n
[height, width]: [number, number], stride: number,\n refineSteps: number): number {\n const embed: Pair[] = [];\n

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const convertToPosition = (pair: Pair) =>\n      convertToPositionInOuput(pair, [padT, padL], [scaleX, scaleY],
stride);\n\n  for (let keypointsIndex = 0; keypointsIndex < numKptForMatching;\n       keypointsIndex++) {\n
    const embedding = getEmbedding(\n         location, keypointsIndex, convertToPosition, outputResolutionX,\n
longOffsets, refineSteps, [height, width]);\n\n    embed.push(embedding);\n  }\n\n  let kMin = -1;\n  let kMinDist =
Infinity;\n  for (let k = 0; k < poses.length; k++) {\n    const dist = computeDistance(embed, poses[k]);\n    if (dist <
kMinDist) {\n      kMin = k;\n      kMinDist = dist;\n    }\n  }\n  return kMin;\n}\n\nfunction getOutputResolution(\n
 [inputResolutionY, inputResolutionX]: [number, number],\n    stride: number): [number, number] {\n  const
outputResolutionX = Math.round((inputResolutionX - 1.0) / stride + 1.0);\n  const outputResolutionY =
Math.round((inputResolutionY - 1.0) / stride + 1.0);\n  return [outputResolutionX, outputResolutionY];\n}\n\nexport
function decodeMultipleMasksCPU(\n    segmentation: Uint8Array, longOffsets: Float32Array,\n
posesAboveScore: Pose[], height: number, width: number, stride: number,\n    [inHeight, inWidth]: [number,
 number], padding: Padding,\n    refineSteps: number, numKptForMatching = 5): Uint8Array[] {\n  const dataArrays
=\n      posesAboveScore.map(x => new Uint8Array(height * width).fill(0));\n\n  const {top: padT, left: padL} =
padding;\n\n  const [scaleX, scaleY] =\n      getScale([height, width], [inHeight, inWidth], padding);\n  const
[outputResolutionX, ] =\n    getOutputResolution([inHeight, inWidth], stride);\n  for (let i = 0; i < height; i += 1) {\n
  for (let j = 0; j < width; j += 1) {\n      const n = i * width + j;\n      const prob = segmentation[n];\n      if (prob ===
1) {\n        const kMin = matchEmbeddingToInstance(\n            {x: j, y: i}, longOffsets, posesAboveScore,
numKptForMatching,\n            [padT, padL], [scaleX, scaleY], outputResolutionX, [height, width],\n            stride,
refineSteps);\n        if (kMin >= 0) {\n          dataArrays[kMin][n] = 1;\n        }\n      }\n    }\n  }\n\n  return
dataArrays;\n}\n\nexport function decodeMultiplePartMasksCPU(\n
    segmentation: Uint8Array, longOffsets: Float32Array,\n    partSegmentaion: Uint8Array, posesAboveScore:
Pose[], height: number,\n    width: number, stride: number, [inHeight, inWidth]: [number, number],\n    padding:
Padding, refineSteps: number,\n    numKptForMatching = 5): Int32Array[] {\n  const dataArrays =\n
posesAboveScore.map(x => new Int32Array(height * width).fill(-1));\n\n  const {top: padT, left: padL} =
padding;\n\n  const [scaleX, scaleY] =\n      getScale([height, width], [inHeight, inWidth], padding);\n  const
[outputResolutionX, ] =\n    getOutputResolution([inHeight, inWidth], stride);\n\n  for (let i = 0; i < height; i += 1)
{\n    for (let j = 0; j < width; j += 1) {\n      const n = i * width + j;\n      const prob = segmentation[n];\n      if (prob
=== 1) {\n        const kMin = matchEmbeddingToInstance(\n            {x: j, y: i}, longOffsets, posesAboveScore,
numKptForMatching,\n            [padT, padL], [scaleX, scaleY], outputResolutionX, [height,
 width],\n            stride, refineSteps);\n        if (kMin >= 0) {\n          dataArrays[kMin][n] = partSegmentaion[n];\n
  }\n      }\n    }\n  }\n\n  return dataArrays;\n}\n","/**\n * @license\n * Copyright 2019 Google Inc. All Rights
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governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport * as tf from '@tensorflow/tfjs-core';\nimport * as tf_webgl from '@tensorflow/tfjs-backend-
webgl';\n\nimport
 {NUM_KEYPOINTS} from '../keypoints';\nimport {Padding, Pose} from '../types';\nimport {getScale} from
'./util';\n\nexport function decodeMultipleMasksWebGl(\n    segmentation: tf.Tensor2D, longOffsets: tf.Tensor3D,\n
  posesAboveScore: Pose[], height: number, width: number, stride: number,\n    [inHeight, inWidth]: [number,
number], padding: Padding,\n    refineSteps: number, minKptScore: number,\n    maxNumPeople: number):
tf.TensorInfo {\n  // The height/width of the image/canvas itself.\n  const [origHeight, origWidth] =
segmentation.shape;\n  // The height/width of the output of the model.\n  const [outHeight, outWidth] =
longOffsets.shape.slice(0, 2);\n\n  const shapedLongOffsets: tf.Tensor4D =\n      tf.reshape(longOffsets, [outHeight,
outWidth, 2, NUM_KEYPOINTS]);\n\n  // Make pose tensor of shape [MAX_NUM_PEOPLE,
```

NUM_KEYPOINTS, 3] where\n // the last 3 coordinates correspond to the score, h and w coordinate of that\n // keypoint.\n const poseVals
 = new Float32Array(maxNumPeople * NUM_KEYPOINTS * 3).fill(0.0);\n for (let i = 0; i < posesAboveScore.length; i++) {\n const poseOffset = i * NUM_KEYPOINTS * 3;\n const pose = posesAboveScore[i];\n for (let kp = 0; kp < NUM_KEYPOINTS; kp++) {\n const keypoint = pose.keypoints[kp];\n const offset = poseOffset + kp * 3;\n poseVals[offset] = keypoint.score;\n poseVals[offset + 1] = keypoint.position.y;\n poseVals[offset + 2] = keypoint.position.x;\n }\n }\n\n const [scaleX, scaleY] =\n getScale([height, width], [inHeight, inWidth], padding);\n\n const posesTensor = tf.tensor(poseVals, [maxNumPeople, NUM_KEYPOINTS, 3]);\n\n const {top: padT, left: padL} = padding;\n\n const program: tf_webgl.GPGPUProgram = {\n variableNames: ['segmentation', 'longOffsets', 'poses'],\n outputShape: [origHeight, origWidth],\n userCode: `\n int convertToPositionInOutput(int pos, int pad, float scale, int stride) {\n return round(((float(pos +
 pad) + 1.0) * scale - 1.0) / float(stride));\n }\n\n float convertToPositionInOutputFloat(\n int pos, int pad, float scale, int stride) {\n return ((float(pos + pad) + 1.0) * scale - 1.0) / float(stride);\n }\n\n float dist(float x1, float y1, float x2, float y2) {\n return pow(x1 - x2, 2.0) + pow(y1 - y2, 2.0);\n }\n\n float sampleLongOffsets(float h, float w, int d, int k) {\n float fh = fract(h);\n float fw = fract(w);\n int clH = int(ceil(h));\n int clW = int(ceil(w));\n int flH = int(floor(h));\n int flW = int(floor(w));\n float o11 = getLongOffsets(flH, flW, d, k);\n float o12 = getLongOffsets(flH, clW, d, k);\n float o21 = getLongOffsets(clH, flW, d, k);\n float o22 = getLongOffsets(clH, clW, d, k);\n float o1 = mix(o11, o12, fw);\n float o2 = mix(o21, o22, fw);\n return mix(o1, o2, fh);\n }\n\n int findNearestPose(int h, int w) {\n float prob = getSegmentation(h, w);\n
  if (prob < 1.0) {\n return -1;\n }\n\n // Done(Tyler): convert from output space h/w to strided space.\n float stridedH = convertToPositionInOutputFloat(\n h, ${padT}, ${scaleY}, ${stride});\n float stridedW = convertToPositionInOutputFloat(\n w, ${padL}, ${scaleX}, ${stride});\n\n float minDist = 1000000.0;\n int iMin = -1;\n for (int i = 0; i < ${maxNumPeople}; i++) {\n float curDistSum = 0.0;\n int numKpt = 0;\n for (int k = 0; k < ${NUM_KEYPOINTS}; k++) {\n float dy = sampleLongOffsets(stridedH, stridedW, 0, k);\n float dx = sampleLongOffsets(stridedH, stridedW, 1, k);\n\n float y = float(h) + dy;\n float x = float(w) + dx;\n\n for (int s = 0; s < ${refineSteps}; s++) {\n int yRounded = round(min(y, float(${height - 1.0})));\n int xRounded = round(min(x, float(${width - 1.0})));\n\n float yStrided = convertToPositionInOutputFloat(\n yRounded, ${padT}, ${scaleY}, ${stride});\n float xStrided = convertToPositionInOutputFloat(\n xRounded, ${padL}, ${scaleX}, ${stride});\n\n float dy = sampleLongOffsets(yStrided, xStrided, 0, k);\n float dx = sampleLongOffsets(yStrided, xStrided, 1, k);\n\n y = y + dy;\n x = x + dx;\n }\n\n float poseScore = getPoses(i, k, 0);\n float poseY = getPoses(i, k, 1);\n float poseX = getPoses(i, k, 2);\n if (poseScore > ${minKptScore}) {\n numKpt = numKpt + 1;\n curDistSum = curDistSum + dist(x, y, poseX, poseY);\n }\n }\n if (numKpt > 0 && curDistSum / float(numKpt) < minDist) {\n minDist = curDistSum / float(numKpt);\n iMin = i;\n }\n }\n return iMin;\n }\n\n void main() {\n ivec2 coords = getOutputCoords();\n int nearestPose = findNearestPose(coords[0], coords[1]);\n
  setOutput(float(nearestPose));\n }\n `\n };\n const webglBackend = tf.backend() as tf_webgl.MathBackendWebGL;\n return webglBackend.compileAndRun(\n program, [segmentation, shapedLongOffsets, posesTensor]);\n}\n","/**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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==========\n*/\n\nimport * as tf from '@tensorflow/tfjs-core';\nimport {getBackend} from '@tensorflow/tfjs-core';\n\nimport {Padding, PartSegmentation, PersonSegmentation, Pose} from '../types';\n\nimport {decodeMultipleMasksCPU, decodeMultiplePartMasksCPU} from './decode_multiple_masks_cpu';\nimport {decodeMultipleMasksWebGl} from './decode_multiple_masks_webgl';\n\nexport function toPersonKSegmentation(\n    segmentation: tf.Tensor2D, k: number): tf.Tensor2D {\n  return tf.tidy(\n      () => (tf.cast(tf.equal(\n          segmentation, tf.scalar(k)), 'int32') as tf.Tensor2D));\n}\n\nexport function toPersonKPartSegmentation(\n    segmentation: tf.Tensor2D, bodyParts: tf.Tensor2D, k: number): tf.Tensor2D {\n  return tf.tidy(\n      () => tf.sub(tf.mul(tf.cast(tf.equal(\n          segmentation, tf.scalar(k)), 'int32'), tf.add(bodyParts, 1)), 1));\n}\n\nfunction isWebGlBackend() {\n  return getBackend() === 'webgl';\n}\n\nexport async function decodePersonInstanceMasks(\n    segmentation: tf.Tensor2D, longOffsets: tf.Tensor3D, poses: Pose[],\n    height: number, width: number, stride: number,\n    [inHeight, inWidth]: [number, number], padding: Padding, minPoseScore = 0.2,\n    refineSteps = 8, minKeypointScore = 0.3,\n    maxNumPeople = 10): Promise<PersonSegmentation[]> {\n  // Filter out poses with smaller score.\n  const posesAboveScore = poses.filter(pose => pose.score >= minPoseScore);\n\n  let personSegmentationsData: Uint8Array[];\n\n  if (isWebGlBackend()) {\n    const personSegmentations = tf.tidy(() => {\n      const masksTensorInfo = decodeMultipleMasksWebGl(\n          segmentation, longOffsets, posesAboveScore, height, width, stride,\n          [inHeight, inWidth], padding, refineSteps, minKeypointScore,\n          maxNumPeople);\n      const masksTensor = tf.engine().makeTensorFromDataId(\n          masksTensorInfo.dataId, masksTensorInfo.shape,\n          masksTensorInfo.dtype) as tf.Tensor2D;\n\n      return posesAboveScore.map(\n          (_, k) => toPersonKSegmentation(masksTensor, k));\n    });\n\n    personSegmentationsData =\n        (await Promise.all(personSegmentations.map(mask => mask.data())) as\n        Uint8Array[]);\n\n    personSegmentations.forEach(x => x.dispose());\n  } else {\n    const segmentationsData = await segmentation.data() as Uint8Array;\n    const longOffsetsData = await longOffsets.data() as Float32Array;\n\n    personSegmentationsData = decodeMultipleMasksCPU(\n        segmentationsData, longOffsetsData, posesAboveScore, height, width,\n        stride, [inHeight, inWidth], padding, refineSteps);\n  }\n\n  return personSegmentationsData.map(\n      (data, i) => ({data, pose: posesAboveScore[i], width, height}));\n}\n\nexport async function decodePersonInstancePartMasks(\n    segmentation: tf.Tensor2D, longOffsets: tf.Tensor3D,\n    partSegmentation: tf.Tensor2D, poses: Pose[], height: number, width: number,\n    stride: number, [inHeight, inWidth]: [number, number], padding: Padding,\n    minPoseScore = 0.2, refineSteps = 8, minKeypointScore = 0.3,\n    maxNumPeople = 10): Promise<PartSegmentation[]> {\n  const posesAboveScore = poses.filter(pose => pose.score >= minPoseScore);\n\n  let partSegmentationsByPersonData: Int32Array[];\n\n  if (isWebGlBackend()) {\n    const partSegmentations = tf.tidy(() => {\n      const masksTensorInfo = decodeMultipleMasksWebGl(\n          segmentation, longOffsets, posesAboveScore, height, width, stride,\n          [inHeight, inWidth], padding, refineSteps, minKeypointScore,\n          maxNumPeople);\n      const masksTensor = tf.engine().makeTensorFromDataId(\n          masksTensorInfo.dataId, masksTensorInfo.shape,\n          masksTensorInfo.dtype) as tf.Tensor2D;\n\n      return posesAboveScore.map(\n          (_, k) =>\n              toPersonKPartSegmentation(masksTensor, partSegmentation, k));\n    });\n\n    partSegmentationsByPersonData =\n        (await Promise.all(partSegmentations.map(x => x.data()))) as\n        Int32Array[];\n\n    partSegmentations.forEach(x => x.dispose());\n  } else {\n    const segmentationsData = await segmentation.data() as Uint8Array;\n    const longOffsetsData = await longOffsets.data() as Float32Array;\n    const partSegmentaionData = await partSegmentation.data() as Uint8Array;\n\n    partSegmentationsByPersonData = decodeMultiplePartMasksCPU(\n        segmentationsData, longOffsetsData, partSegmentaionData,\n        posesAboveScore, height, width, stride, [inHeight, inWidth], padding,\n        refineSteps);\n  }\n\n  return partSegmentationsByPersonData.map(\n      (data, k) => ({pose: posesAboveScore[k], data, height, width}));\n}\n","/**\n * @license\n * Copyright 2019 Google Inc. All Rights
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is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\n// algorithm based on Coursera Lecture from Algorithms, Part 1:\n// https://www.coursera.org/learn/algorithms-part1/lecture/ZjoSM/heapsort\n\nfunction half(k: number) {\n return Math.floor(k / 2);\n}\n\nexport class MaxHeap<T> {\n private priorityQueue: T[];\n private numberOfElements: number;\n private getElementValue: (element: T) => number;\n\n constructor(maxSize: number, getElementValue: (element: T) => number) {\n this.priorityQueue = new Array(maxSize);\n this.numberOfElements = -1;\n this.getElementValue = getElementValue;\n }\n\n public enqueue(x: T): void {\n this.priorityQueue[++this.numberOfElements] = x;\n this.swim(this.numberOfElements);\n }\n\n public dequeue(): T {\n const max = this.priorityQueue[0];\n this.exchange(0, this.numberOfElements--);\n this.sink(0);\n this.priorityQueue[this.numberOfElements + 1] = null;\n return max;\n }\n\n public empty(): boolean {\n return this.numberOfElements === -1;\n }\n\n public size(): number {\n return this.numberOfElements + 1;\n }\n\n public all(): T[] {\n return this.priorityQueue.slice(0, this.numberOfElements + 1);\n }\n\n public max(): T {\n return this.priorityQueue[0];\n }\n\n private swim(k: number): void {\n while (k > 0 && this.less(half(k), k)) {\n this.exchange(k, half(k));\n k = half(k);\n }\n }\n\n private sink(k: number): void {\n while (2 * k <= this.numberOfElements) {\n let j = 2 * k;\n if (j < this.numberOfElements && this.less(j, j + 1)) {\n j++;\n }\n if (!this.less(k, j)) {\n break;\n }\n this.exchange(k, j);\n k = j;\n }\n }\n\n private getValueAt(i: number): number {\n return this.getElementValue(this.priorityQueue[i]);\n }\n\n private less(i: number, j: number): boolean {\n return this.getValueAt(i) < this.getValueAt(j);\n }\n\n private exchange(i: number, j: number): void {\n const t = this.priorityQueue[i];\n this.priorityQueue[i] = this.priorityQueue[j];\n this.priorityQueue[j] = t;\n }\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under
the License.\n *
==========\n */\n\nimport {PartWithScore, TensorBuffer3D} from '../types';\n\nimport {MaxHeap} from './max_heap';\n\nfunction scoreIsMaximumInLocalWindow(\n keypointId: number, score: number, heatmapY: number, heatmapX: number,\n localMaximumRadius: number, scores: TensorBuffer3D): boolean {\n const [height, width] = scores.shape;\n\n let localMaximum = true;\n const yStart = Math.max(heatmapY - localMaximumRadius, 0);\n const yEnd = Math.min(heatmapY + localMaximumRadius + 1, height);\n for (let yCurrent = yStart; yCurrent < yEnd; ++yCurrent) {\n const xStart = Math.max(heatmapX - localMaximumRadius, 0);\n const xEnd = Math.min(heatmapX + localMaximumRadius + 1, width);\n for (let xCurrent = xStart; xCurrent < xEnd; ++xCurrent) {\n if (scores.get(yCurrent, xCurrent, keypointId) > score) {\n localMaximum = false;\n break;\n }\n }\n if (!localMaximum)
{\n break;\n }\n }\n\n return localMaximum;\n}\n\n/**\n * Builds a priority queue with part candidate positions for a specific image in\n * the batch. For this we find all local maxima in the score maps with score\n * values above a threshold. We create a single priority queue across all parts.\n */\nexport function

buildPartWithScoreQueue(\n scoreThreshold: number, localMaximumRadius: number,\n scores: TensorBuffer3D): MaxHeap<PartWithScore> {\n const [height, width, numKeypoints] = scores.shape;\n\n const queue = new MaxHeap<PartWithScore>(\n height * width * numKeypoints, ({score}) => score);\n\n for (let heatmapY = 0; heatmapY < height; ++heatmapY) {\n for (let heatmapX = 0; heatmapX < width; ++heatmapX) {\n for (let keypointId = 0; keypointId < numKeypoints; ++keypointId) {\n const score = scores.get(heatmapY, heatmapX, keypointId);\n\n // Only consider parts with score greater or equal to threshold as\n // root candidates.\n if (score < scoreThreshold) {\n continue;\n }\n\n // Only consider keypoints whose score is maximum in a local window.\n if (scoreIsMaximumInLocalWindow(\n keypointId, score, heatmapY, heatmapX, localMaximumRadius,\n scores)) {\n queue.enqueue({score, part: {heatmapY, heatmapX, id: keypointId}});\n }\n }\n }\n }\n\n return queue;\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {NumberTuple, PART_IDS, PART_NAMES, POSE_CHAIN} from '../keypoints';\nimport {Keypoint, PartWithScore, TensorBuffer3D, Vector2D} from '../types';\n\nimport {clamp, getOffsetPoint} from './util';\nimport {addVectors, getImageCoords} from './util';\n\nconst parentChildrenTuples: NumberTuple[] = POSE_CHAIN.map(\n ([parentJoinName, childJoinName]): NumberTuple =>\n ([PART_IDS[parentJoinName], PART_IDS[childJoinName]]));\n\nconst parentToChildEdges: number[] =\n parentChildrenTuples.map(([, childJointId]) => childJointId);\n\nconst childToParentEdges: number[] =\n parentChildrenTuples.map(([\n parentJointId,\n]) => parentJointId);\n\nfunction getDisplacement(\n edgeId: number, point: Vector2D, displacements: TensorBuffer3D): Vector2D {\n const numEdges =\n displacements.shape[2] / 2;\n return {\n y: displacements.get(point.y, point.x, edgeId),\n x: displacements.get(point.y, point.x, numEdges + edgeId)\n };\n}\n\nfunction getStridedIndexNearPoint(\n point: Vector2D, outputStride: number, height: number,\n width: number): Vector2D {\n return {\n y: clamp(Math.round(point.y / outputStride), 0, height - 1),\n x: clamp(Math.round(point.x / outputStride), 0, width - 1)\n };\n}\n\n/**\n * We get a new keypoint along the `edgeId` for the pose instance, assuming\n * that the position of the `idSource` part is already known. For this, we\n * follow the displacement vector from the source to target part (stored in\n * the `i`-t channel of the displacement tensor). The displaced keypoint\n * vector is refined using the offset vector by `offsetRefineStep` times.\n */\nfunction traverseToTargetKeypoint(\n edgeId: number, sourceKeypoint: Keypoint, targetKeypointId: number,\n scoresBuffer: TensorBuffer3D, offsets: TensorBuffer3D,\n outputStride: number,\n displacements: TensorBuffer3D, offsetRefineStep = 2): Keypoint {\n const [height, width] = scoresBuffer.shape;\n\n // Nearest neighbor interpolation for the source->target displacements.\n const sourceKeypointIndices = getStridedIndexNearPoint(\n sourceKeypoint.position, outputStride, height, width);\n\n const displacement =\n getDisplacement(edgeId, sourceKeypointIndices, displacements);\n\n const displacedPoint = addVectors(sourceKeypoint.position, displacement);\n let targetKeypoint = displacedPoint;\n for (let i = 0; i < offsetRefineStep; i++) {\n const targetKeypointIndices =\n getStridedIndexNearPoint(targetKeypoint, outputStride, height, width);\n\n const offsetPoint = getOffsetPoint(\n targetKeypointIndices.y, targetKeypointIndices.x, targetKeypointId,\n offsets);\n\n targetKeypoint = addVectors(\n {\n x: targetKeypointIndices.x * outputStride,\n y: targetKeypointIndices.y * outputStride\n },\n {x: offsetPoint.x, y: offsetPoint.y});\n }\n const targetKeyPointIndices =\n getStridedIndexNearPoint(targetKeypoint, outputStride, height, width);\n const score = scoresBuffer.get(\n targetKeyPointIndices.y, targetKeyPointIndices.x, targetKeypointId);\n\n return {position: targetKeypoint, part:

PART_NAMES[targetKeypointId], score};\n}\n\n/**\n * Follows the displacement fields to decode the full pose of the object\n * instance given the position of a part that acts as root.\n *\n * @return An array of decoded keypoints and their scores for a single pose\n */\nexport function decodePose(\n root: PartWithScore, scores: TensorBuffer3D, offsets: TensorBuffer3D,\n outputStride: number, displacementsFwd: TensorBuffer3D,\n displacementsBwd: TensorBuffer3D): Keypoint[] {\n const numParts = scores.shape[2];\n const numEdges = parentToChildEdges.length;\n\n const instanceKeypoints: Keypoint[] = new Array(numParts);\n // Start a new detection instance at the position of the root.\n const {part: rootPart, score: rootScore} = root;\n const rootPoint = getImageCoords(rootPart, outputStride, offsets);\n\n instanceKeypoints[rootPart.id] = {\n score: rootScore,\n part: PART_NAMES[rootPart.id],\n position: rootPoint\n };\n\n // Decode the part positions upwards in the tree, following the backward\n // displacements.\n for (let edge = numEdges - 1; edge >= 0; --edge) {\n const sourceKeypointId = parentToChildEdges[edge];\n const targetKeypointId = childToParentEdges[edge];\n if (instanceKeypoints[sourceKeypointId] &&\n !instanceKeypoints[targetKeypointId]) {\n instanceKeypoints[targetKeypointId] = traverseToTargetKeypoint(\n edge, instanceKeypoints[sourceKeypointId], targetKeypointId, scores,\n offsets, outputStride, displacementsBwd);\n }\n }\n\n // Decode the part positions downwards in the tree, following the forward\n // displacements.\n for (let edge = 0; edge < numEdges; ++edge) {\n const sourceKeypointId = childToParentEdges[edge];\n const targetKeypointId = parentToChildEdges[edge];\n if (instanceKeypoints[sourceKeypointId] &&\n !instanceKeypoints[targetKeypointId]) {\n instanceKeypoints[targetKeypointId] = traverseToTargetKeypoint(\n edge, instanceKeypoints[sourceKeypointId], targetKeypointId, scores,\n offsets, outputStride, displacementsFwd);\n }\n }\n\n return instanceKeypoints;\n}\n","/**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {Keypoint, Pose, TensorBuffer3D} from '../types';\n\nimport {buildPartWithScoreQueue} from './build_part_with_score_queue';\nimport {decodePose} from './decode_pose';\nimport {getImageCoords, squaredDistance} from './util';\n\nfunction withinNmsRadiusOfCorrespondingPoint(\n poses: Pose[], squaredNmsRadius: number, {x, y}: {x: number, y: number},\n keypointId: number): boolean {\n return poses.some(({keypoints}) => {\n const correspondingKeypoint = keypoints[keypointId].position;\n return squaredDistance(\n y, x, correspondingKeypoint.y, correspondingKeypoint.x) <=\n squaredNmsRadius;\n });\n}\n\n/* Score the newly proposed object instance without taking into account\n * the scores of the parts that overlap with any previously detected\n * instance.\n */\nfunction getInstanceScore(\n existingPoses: Pose[], squaredNmsRadius: number,\n instanceKeypoints: Keypoint[]): number {\n let notOverlappedKeypointScores = instanceKeypoints.reduce(\n (result, {position, score}, keypointId): number => {\n if (!withinNmsRadiusOfCorrespondingPoint(\n existingPoses, squaredNmsRadius, position, keypointId)) {\n result += score;\n }\n return result;\n }, 0.0);\n\n return notOverlappedKeypointScores /= instanceKeypoints.length;\n}\n\n// A point (y, x) is considered as root part candidate if its score is a\n// maximum in a window |y - y'| <= kLocalMaximumRadius, |x - x'| <=\n// kLocalMaximumRadius.\nconst kLocalMaximumRadius = 1;\n\n/**\n * Detects multiple poses and finds their parts from part scores and\n * displacement vectors. It returns up to `maxDetections` object instance\n * detections in decreasing root score order. It works as follows: We first\n * create a priority queue with local part score maxima above\n * `scoreThreshold`, considering all parts at the same time. Then we\n * iteratively pull the top element of the queue (in decreasing score order)\n * and treat it as a root candidate for a new

object instance. To avoid\n * duplicate detections, we reject the root candidate if it is within a disk\n * of `nmsRadius` pixels from the corresponding part of a previously detected\n * instance, which is a form of part-based non-maximum suppression (NMS). If\n * the root candidate passes the NMS check, we start a new object instance\n * detection, treating the corresponding part as root and finding the\n * positions of the remaining parts by following the displacement vectors\n * along the tree-structured part graph. We assign to the newly detected\n * instance a score equal to the sum of scores of its parts which have not\n * been claimed by a previous instance (i.e., those at least `nmsRadius`\n * pixels away from the corresponding part of all previously detected\n * instances), divided by the total number of parts `numParts`.\n *\n * @param heatmapScores 3-D tensor with shape `[height, width, numParts]`.\n * The value of heatmapScores[y, x, k]` is the score of placing the `k`-th\n * object part at position `(y, x)`.\n *\n * @param offsets 3-D tensor with shape `[height, width, numParts * 2]`.\n * The value of [offsets[y, x, k], offsets[y, x, k + numParts]]` is the\n * short range offset vector of the `k`-th object part at heatmap\n * position `(y, x)`.\n *\n * @param displacementsFwd 3-D tensor of shape\n * `[height, width, 2 * num_edges]`, where `num_edges = num_parts - 1` is the\n * number of edges (parent-child pairs) in the tree. It contains the forward\n * displacements between consecutive part from the root towards the leaves.\n *\n * @param displacementsBwd 3-D tensor of shape\n * `[height, width, 2 * num_edges]`, where `num_edges = num_parts - 1` is the\n * number of edges (parent-child pairs) in the tree. It contains the backward\n * displacements between consecutive part from the root towards the leaves.\n *\n * @param outputStride The output stride that was used when feed-forwarding\n * through the PoseNet model. Must be 32, 16, or 8.\n *\n * @param maxPoseDetections Maximum number of returned instance detections per\n * image.\n *\n * @param scoreThreshold Only return instance detections that have root part\n * score greater or equal to this value. Defaults to 0.5.\n *\n * @param nmsRadius Non-maximum suppression part distance. It needs to be\n * strictly positive. Two parts suppress each other if they are less than\n * `nmsRadius` pixels away. Defaults to 20.\n *\n * @return An array of poses and their scores, each containing keypoints and\n * the corresponding keypoint scores.\n */\nexport function decodeMultiplePoses(\n scoresBuffer: TensorBuffer3D, offsetsBuffer: TensorBuffer3D,\n displacementsFwdBuffer: TensorBuffer3D,\n displacementsBwdBuffer: TensorBuffer3D, outputStride: number,\n maxPoseDetections: number, scoreThreshold = 0.5, nmsRadius = 20): Pose[] {\n const poses: Pose[] = [];\n\n const queue = buildPartWithScoreQueue(\n scoreThreshold, kLocalMaximumRadius, scoresBuffer);\n\n const squaredNmsRadius = nmsRadius * nmsRadius;\n\n // Generate at most maxDetections object instances per image in\n // decreasing root part score order.\n while (poses.length < maxPoseDetections && !queue.empty()) {\n // The top element in the queue is the next root candidate.\n const root = queue.dequeue();\n\n // Part-based non-maximum suppression: We reject a root candidate if it\n // is within a disk of `nmsRadius` pixels from the corresponding part of\n // a previously detected instance.\n const rootImageCoords =\n getImageCoords(root.part, outputStride, offsetsBuffer);\n if (withinNmsRadiusOfCorrespondingPoint(\n poses, squaredNmsRadius, rootImageCoords, root.part.id)) {\n continue;\n }\n\n // Start a new detection instance at the position of the root.\n const keypoints = decodePose(\n root, scoresBuffer, offsetsBuffer, outputStride, displacementsFwdBuffer,\n displacementsBwdBuffer);\n\n const score = getInstanceScore(poses, squaredNmsRadius, keypoints);\n\n poses.push({keypoints, score});\n }\n\n return poses;\n}\n","/**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * https://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport * as tf from '@tensorflow/tfjs-core';\n\nimport {BaseModel} from './base_model';\n\nconst imageNetMean = [-123.15, -115.90, -103.06];\n\nexport class ResNet extends BaseModel {\n preprocessInput(input: tf.Tensor3D): tf.Tensor3D {\n return tf.add(input, imageNetMean);\n }\n\n nameOutputResults(results: tf.Tensor3D[]) {\n const [\n displacementBwd,\n displacementFwd,\n

heatmap,\n longOffsets,\n offsets,\n partHeatmaps,\n segmentation,\n partOffsets,\n] = results;\n return {\n offsets,\n segmentation,\n partHeatmaps,\n longOffsets,\n heatmap,\n displacementFwd,\n displacementBwd,\n partOffsets\n };\n }\n}\n","/**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * https://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nconst RESNET50_BASE_URL =\n 'https://storage.googleapis.com/tfjs-models/savedmodel/bodypix/resnet50/';\nconst MOBILENET_BASE_URL =\n 'https://storage.googleapis.com/tfjs-models/savedmodel/bodypix/mobilenet/';\n\n// The BodyPix 2.0 ResNet50 models use the latest TensorFlow.js 1.0 model\n// format.\nexport function resNet50SavedModel(stride: number, quantBytes: number): string {\n const graphJson = `model-stride${stride}.json`;\n // quantBytes=4 corresponding to the non-quantized full-precision SavedModel.\n if (quantBytes === 4) {\n return RESNET50_BASE_URL + `float/` + graphJson;\n } else {\n return RESNET50_BASE_URL + `quant${quantBytes}/` + graphJson;\n }\n}\n\n// The BodyPix 2.0 MobileNetV1 models use the latest TensorFlow.js 1.0 model\n// format.\nexport function mobileNetSavedModel(\n stride: number, multiplier: number, quantBytes: number): string {\n const toStr: {[key: number]: string} = {1.0: '100', 0.75: '075', 0.50: '050'};\n const graphJson = `model-stride${stride}.json`;\n // quantBytes=4 corresponding to the non-quantized full-precision SavedModel.\n if (quantBytes === 4) {\n return MOBILENET_BASE_URL + `float/${toStr[multiplier]}/` + graphJson;\n } else {\n return MOBILENET_BASE_URL + `quant${quantBytes}/${toStr[multiplier]}/` +\n graphJson;\n }\n}\n","/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ==========\n */\n\nimport * as tf from '@tensorflow/tfjs-core';\n\nimport {BodyPixInput, BodyPixOutputStride, Padding} from './types';\nimport {Pose, TensorBuffer3D} from './types';\nimport {BodyPixInternalResolution} from './types';\n\nfunction getSizeFromImageLikeElement(input: HTMLImageElement|\n HTMLCanvasElement|\n OffscreenCanvas): [number, number] {\n if ('offsetHeight' in input && input.offsetHeight !== 0\n && 'offsetWidth' in input && input.offsetWidth !== 0) {\n return [input.offsetHeight, input.offsetWidth];\n } else if (input.height != null && input.width != null) {\n return [input.height, input.width];\n } else {\n throw new Error(\n `HTMLImageElement must have height and width attributes set.`);\n }\n}\n\nfunction getSizeFromVideoElement(input: HTMLVideoElement): [number, number] {\n if (input.hasAttribute('height') && input.hasAttribute('width')) {\n // Prioritizes user specified height and width.\n // We can't test the .height and .width properties directly,\n // because they evaluate to 0 if unset.\n return [input.height, input.width];\n } else {\n return [input.videoHeight, input.videoWidth];\n }\n}\n\nexport function getInputSize(input: BodyPixInput): [number, number] {\n if ((typeof (HTMLCanvasElement) !== 'undefined' &&\n input instanceof HTMLCanvasElement) ||\n (typeof (OffscreenCanvas) !== 'undefined' &&\n input instanceof OffscreenCanvas) ||\n (typeof (HTMLImageElement) !== 'undefined' &&\n input instanceof HTMLImageElement)) {\n return getSizeFromImageLikeElement(input);\n } else if (typeof (ImageData) !== 'undefined' && input instanceof ImageData) {\n return [input.height,

input.width];\n } else if (\n   typeof (HTMLVideoElement) !== 'undefined' &&\n   input instanceof HTMLVideoElement) {\n   return getSizeFromVideoElement(input);\n } else if (input instanceof tf.Tensor) {\n return [input.shape[0], input.shape[1]];\n } else {\n   throw new Error(`error: Unknown input type: ${input}.`);\n }\n}\n\nfunction isValidInputResolution(\n   resolution: number, outputStride: number): boolean {\n return (resolution - 1) % outputStride === 0;\n}\n\nexport function toValidInputResolution(\n   inputResolution: number, outputStride: BodyPixOutputStride): number {\n if (isValidInputResolution(inputResolution, outputStride)) {\n   return inputResolution;\n }\n\n return Math.floor(inputResolution / outputStride) * outputStride + 1;\n}\n\nconst INTERNAL_RESOLUTION_STRING_OPTIONS = {\n low: 'low',\n medium: 'medium',\n high: 'high',\n full: 'full'\n};\n\nconst INTERNAL_RESOLUTION_PERCENTAGES = {\n [INTERNAL_RESOLUTION_STRING_OPTIONS.low]: 0.25,\n [INTERNAL_RESOLUTION_STRING_OPTIONS.medium]: 0.5,\n [INTERNAL_RESOLUTION_STRING_OPTIONS.high]: 0.75,\n [INTERNAL_RESOLUTION_STRING_OPTIONS.full]: 1.0\n};\n\nconst MIN_INTERNAL_RESOLUTION = 0.1;\nconst MAX_INTERNAL_RESOLUTION = 2.0;\n\nfunction toInternalResolutionPercentage(\n internalResolution: BodyPixInternalResolution): number {\n if (typeof internalResolution === 'string') {\n   const result = INTERNAL_RESOLUTION_PERCENTAGES[internalResolution];\n\n   tf.util.assert(\n   typeof result === 'number',\n   () => `string value of inputResolution must be one of ${\n            Object.values(INTERNAL_RESOLUTION_STRING_OPTIONS)\n                .join(',')}\n  but was ${internalResolution}.`);\n   return result;\n } else {\n   tf.util.assert(\n   typeof internalResolution === 'number' &&\n   internalResolution <= MAX_INTERNAL_RESOLUTION &&\n   internalResolution >= MIN_INTERNAL_RESOLUTION,\n   () =>\n   `inputResolution must be a string or number between ${\n                MIN_INTERNAL_RESOLUTION} and ${MAX_INTERNAL_RESOLUTION}, but ` +\n   `was ${internalResolution}`);\n\n   return internalResolution;\n }\n}\n\nexport function toInputResolutionHeightAndWidth(\n   internalResolution: BodyPixInternalResolution,\n   outputStride: BodyPixOutputStride,\n   [inputHeight, inputWidth]: [number, number]): [number, number] {\n const internalResolutionPercentage =\n   toInternalResolutionPercentage(internalResolution);\n\n return [\n toValidInputResolution(\n   inputHeight * internalResolutionPercentage, outputStride),\n toValidInputResolution(\n   inputWidth * internalResolutionPercentage,\n outputStride)\n];\n}\n\nexport function toInputTensor(input: BodyPixInput) {\n // TODO: tf.browser.fromPixels types to support OffscreenCanvas\n // @ts-ignore\n return input instanceof tf.Tensor ? input : tf.browser.fromPixels(input);\n}\n\nexport function resizeAndPadTo(\n   imageTensor: tf.Tensor3D, [targetH, targetW]: [number, number],\n   flipHorizontal = false): {\n resizedAndPadded: tf.Tensor3D,\n paddedBy: [[number, number], [number, number]]\n} {\n const [height, width] = imageTensor.shape;\n\n const targetAspect = targetW / targetH;\n const aspect = width / height;\n\n let resizeW: number;\n let resizeH: number;\n let padL: number;\n let padR: number;\n let padT: number;\n let padB: number;\n\n if (aspect > targetAspect) {\n   // resize to have the larger dimension match the shape.\n   resizeW = targetW;\n   resizeH = Math.ceil(resizeW / aspect);\n\n   const padHeight = targetH - resizeH;\n   padL = 0;\n   padR = 0;\n   padT = Math.floor(padHeight / 2);\n   padB = targetH - (resizeH + padT);\n } else {\n   resizeH = targetH;\n   resizeW = Math.ceil(targetH * aspect);\n\n   const padWidth = targetW - resizeW;\n   padL = Math.floor(padWidth / 2);\n   padR = targetW - (resizeW + padL);\n   padT = 0;\n   padB = 0;\n }\n\n const resizedAndPadded = tf.tidy(() => {\n   // resize to have largest dimension match image\n   let resized: tf.Tensor3D;\n   if (flipHorizontal) {\n   resized = tf.image.resizeBilinear(\n   tf.reverse(imageTensor, 1), [resizeH, resizeW]);\n   } else {\n   resized = tf.image.resizeBilinear(imageTensor, [resizeH, resizeW]);\n   }\n\n   const padded = tf.pad3d(resized, [[padT, padB], [padL, padR], [0, 0]]);\n\n   return padded;\n });\n\n return {resizedAndPadded, paddedBy: [[padT, padB], [padL, padR]]};\n}\n\nexport function scaleAndCropToInputTensorShape(\n   tensor: tf.Tensor3D,\n [inputTensorHeight, inputTensorWidth]: [number, number],\n   [resizedAndPaddedHeight, resizedAndPaddedWidth]: [number, number],\n   [[padT, padB], [padL, padR]]: [[number, number], [number, number]],\n   applySigmoidActivation = false): tf.Tensor3D {\n return tf.tidy(() => {\n   let inResizedAndPadded:

tf.Tensor3D = tf.image.resizeBilinear(tensor,\n [resizedAndPaddedHeight, resizedAndPaddedWidth], true);\n\n if (applySigmoidActivation) {\n inResizedAndPadded = tf.sigmoid(inResizedAndPadded);\n }\n\n return removePaddingAndResizeBack(\n inResizedAndPadded, [inputTensorHeight, inputTensorWidth],\n [[padT, padB], [padL, padR]]);\n });\n}\n\nexport function removePaddingAndResizeBack(\n resizedAndPadded: tf.Tensor3D,\n [originalHeight, originalWidth]: [number, number],\n [[padT, padB], [padL, padR]]: [[number, number], [number, number]]):\n tf.Tensor3D {\n return tf.tidy(() => {\n const batchedImage: tf.Tensor4D = tf.expandDims(resizedAndPadded);\n return tf.squeeze(tf.image\n .cropAndResize(\n batchedImage, [[\n padT / (originalHeight + padT + padB - 1.0),\n padL / (originalWidth + padL + padR - 1.0),\n (padT + originalHeight - 1.0) /\n (originalHeight + padT + padB - 1.0),\n (padL + originalWidth - 1.0) / (originalWidth + padL + padR - 1.0)\n]],\n [0], [originalHeight, originalWidth]), [0]);\n });\n}\n\nexport function resize2d(\n tensor: tf.Tensor2D, resolution: [number, number],\n nearestNeighbor?: boolean): tf.Tensor2D {\n return tf.tidy(() => {\n const batchedImage: tf.Tensor4D = tf.expandDims(tensor, 2);\n return tf.squeeze(\n tf.image.resizeBilinear(batchedImage, resolution, nearestNeighbor));\n });\n}\n\nexport function padAndResizeTo(\n input: BodyPixInput, [targetH, targetW]: [number, number]):\n {resized: tf.Tensor3D, padding: Padding} {\n const [height, width] = getInputSize(input);\n const targetAspect = targetW / targetH;\n const aspect = width / height;\n let [padT, padB, padL, padR] = [0, 0, 0, 0];\n if (aspect < targetAspect) {\n // pads the width\n padT = 0;\n padB = 0;\n padL = Math.round(0.5 * (targetAspect * height - width));\n padR = Math.round(0.5 * (targetAspect * height - width));\n } else {\n // pads the height\n padT = Math.round(0.5 * ((1.0 / targetAspect) * width - height));\n padB = Math.round(0.5 * ((1.0 / targetAspect) * width - height));\n padL = 0;\n padR = 0;\n }\n\n const resized: tf.Tensor3D = tf.tidy(() => {\n let imageTensor = toInputTensor(input);\n imageTensor = tf.pad3d(imageTensor, [[padT, padB], [padL, padR], [0, 0]]);\n\n return tf.image.resizeBilinear(imageTensor, [targetH, targetW]);\n });\n\n return {resized, padding: {top: padT, left: padL, right: padR, bottom: padB}};\n}\n\nexport async function toTensorBuffers3D(tensors: tf.Tensor3D[]):\n Promise<TensorBuffer3D[]> {\n return Promise.all(tensors.map(tensor => tensor.buffer()));\n}\n\nexport function scalePose(\n pose: Pose, scaleY: number, scaleX: number, offsetY = 0,\n offsetX = 0): Pose {\n return {\n score: pose.score,\n keypoints: pose.keypoints.map(({score, part, position}) => ({\n score,\n part,\n position: {\n x: position.x * scaleX + offsetX,\n y: position.y * scaleY + offsetY\n }\n }))\n };\n}\n\nexport function scalePoses(\n poses: Pose[], scaleY: number, scaleX: number, offsetY = 0, offsetX = 0) {\n if (scaleX === 1 && scaleY === 1 && offsetY === 0 && offsetX === 0) {\n return poses;\n }\n return poses.map(pose => scalePose(pose, scaleY, scaleX, offsetY, offsetX));\n}\n\nexport function flipPoseHorizontal(pose: Pose, imageWidth: number): Pose {\n return {\n score: pose.score,\n keypoints: pose.keypoints.map(\n ({score, part, position}) => ({\n score,\n part,\n position: {x: imageWidth - 1 - position.x, y: position.y}\n }))\n };\n}\n\nexport function flipPosesHorizontal(poses: Pose[], imageWidth: number) {\n if (imageWidth <= 0) {\n return poses;\n }\n return poses.map(pose => flipPoseHorizontal(pose, imageWidth));\n}\n\nexport function scaleAndFlipPoses(\n poses: Pose[], [height, width]: [number, number],\n [inputResolutionHeight, inputResolutionWidth]: [number, number],\n padding: Padding, flipHorizontal: boolean): Pose[] {\n const scaleY =\n (height + padding.top + padding.bottom) / (inputResolutionHeight);\n const scaleX =\n (width + padding.left + padding.right) / (inputResolutionWidth);\n\n const scaledPoses =\n scalePoses(poses, scaleY, scaleX, -padding.top, -padding.left);\n\n if (flipHorizontal) {\n return flipPosesHorizontal(scaledPoses, width);\n } else {\n return scaledPoses;\n }\n}\n","\n/**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the

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License for the specific language governing permissions and\n * limitations under the License.\n * ==========================================================================\n */\n\nimport * as tfconv from '@tensorflow/tfjs-converter';\nimport * as tf from '@tensorflow/tfjs-core';\n\nimport {BaseModel} from './base_model';\nimport {decodeOnlyPartSegmentation, decodePartSegmentation, toMaskTensor} from './decode_part_map';\nimport {MobileNet} from './mobilenet';\nimport {decodePersonInstanceMasks, decodePersonInstancePartMasks} from './multi_person/decode_instance_masks';\nimport {decodeMultiplePoses} from './multi_person/decode_multiple_poses';\nimport {ResNet} from './resnet';\nimport {mobileNetSavedModel, resNet50SavedModel} from './saved_models';\nimport {BodyPixArchitecture, BodyPixInput, BodyPixInternalResolution, BodyPixMultiplier, BodyPixOutputStride, BodyPixQuantBytes, Padding} from './types';\nimport {PartSegmentation, PersonSegmentation, SemanticPartSegmentation, SemanticPersonSegmentation} from './types';\nimport {getInputSize, padAndResizeTo, scaleAndCropToInputTensorShape, scaleAndFlipPoses, toInputResolutionHeightAndWidth, toTensorBuffers3D} from './util';\n\nconst APPLY_SIGMOID_ACTIVATION = true;\nconst FLIP_POSES_AFTER_SCALING = false;\n\n/**\n * BodyPix model loading is configurable using the following config dictionary.\n *\n * `architecture`: BodyPixArchitecture. It determines which BodyPix architecture\n * to load. The supported architectures are: MobileNetV1 and ResNet50.\n *\n * `outputStride`: Specifies the output stride of the BodyPix model.\n * The smaller the value, the larger the output resolution, and more accurate\n * the model at the cost of speed. Set this to a larger value to increase speed\n * at the cost of accuracy. Stride 32 is supported for ResNet and\n * stride 8,16,32 are supported for various MobileNetV1 models.\n *\n * `multiplier`: An optional number with values: 1.01, 1.0, 0.75, or\n * 0.50. The value is used only by MobileNet architecture. It is the float\n * multiplier for the depth (number of channels) for all convolution ops.\n * The larger the value, the larger the size of the layers, and more accurate\n * the model at the cost of speed. Set this to a smaller value to increase speed\n * at the cost of accuracy.\n *\n * `modelUrl`: An optional string that specifies custom url of the model. This\n * is useful for area/countries that don't have access to the model hosted on\n * GCP.\n *\n * `quantBytes`: An optional number with values: 1, 2, or 4.  This parameter\n * affects weight quantization in the models. The available options are\n * 1 byte, 2 bytes, and 4 bytes. The higher the value, the larger the model size\n * and thus the longer the loading time, the lower the value, the shorter the\n * loading time but lower the accuracy.\n */\nexport interface ModelConfig {\n  architecture: BodyPixArchitecture;\n  outputStride: BodyPixOutputStride;\n  multiplier?: BodyPixMultiplier;\n  modelUrl?: string;\n  quantBytes?: BodyPixQuantBytes;\n}\n\n// The default configuration for loading MobileNetV1 based BodyPix.\n//\n// (And for references, the default configuration for loading ResNet\n// based PoseNet is also included).\n//\n// ```\n// const RESNET_CONFIG = {\n//   architecture: 'ResNet50',\n//   outputStride: 32,\n//   quantBytes: 4,\n// } as ModelConfig;\n// ```\n\nconst MOBILENET_V1_CONFIG = {\n  architecture: 'MobileNetV1',\n  outputStride: 16,\n  quantBytes: 4,\n  multiplier: 0.75,\n} as ModelConfig;\n\nconst VALID_ARCHITECTURE: BodyPixArchitecture[] = ['MobileNetV1', 'ResNet50'];\nconst VALID_STRIDE: {[id: string]: BodyPixOutputStride[]} = {\n  'MobileNetV1': [8, 16, 32],\n  'ResNet50': [32, 16]\n};\nconst VALID_MULTIPLIER: {[id: string]: BodyPixMultiplier[]} = {\n  'MobileNetV1': [0.50, 0.75, 1.0],\n  'ResNet50': [1.0]\n};\nconst VALID_QUANT_BYTES: BodyPixQuantBytes[] = [1, 2, 4];\n\nfunction validateModelConfig(config: ModelConfig): ModelConfig {\n  config = config || MOBILENET_V1_CONFIG;\n\n  if (config.architecture == null) {\n    config.architecture = 'MobileNetV1';\n  }\n  if (VALID_ARCHITECTURE.indexOf(config.architecture) < 0) {\n    throw new Error(\n        `Invalid architecture ${config.architecture}. ` +\n        `Should be one of ${VALID_ARCHITECTURE}`);\n  }\n  if (config.outputStride == null) {\n    config.outputStride = 16;\n  }\n  if (VALID_STRIDE[config.architecture].indexOf(config.outputStride) < 0) {\n    throw new Error(\n        `Invalid outputStride ${config.outputStride}. ` +\n        `Should be one of ${VALID_STRIDE[config.architecture]} ` +\n        `for architecture ${config.architecture}.`);\n  }\n\n  if
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(config.multiplier == null) {\n config.multiplier = 1.0;\n }\n if (VALID_MULTIPLIER[config.architecture].indexOf(config.multiplier) < 0) {\n throw new Error(\n `Invalid multiplier ${config.multiplier}. ` +\n `Should be one of ${VALID_MULTIPLIER[config.architecture]} ` +\n `for architecture ${config.architecture}.`);\n }\n\n if (config.quantBytes == null) {\n config.quantBytes = 4;\n }\n if (VALID_QUANT_BYTES.indexOf(config.quantBytes) < 0) {\n throw new Error(\n `Invalid quantBytes ${config.quantBytes}. ` +\n `Should be one of ${VALID_QUANT_BYTES} ` +\n `for architecture ${config.architecture}.`);\n }\n\n return config;\n}\n\n/**\n * BodyPix inference is configurable using the following config dictionary.\n *\n * `flipHorizontal`: If the left-right keypoint of poses/part segmentation\n * should be flipped/mirrored horizontally. This should be set to true for\n * videos where the video is by default flipped horizontally (i.e. a webcam),\n * and you want the person & body part segmentation to be returned in the proper\n * orientation.\n *\n * `internalResolution`: Defaults to 'medium'. The internal resolution\n * percentage that the input is resized to before inference. The larger the\n * internalResolution the more accurate the model at the cost of slower\n * prediction times. Available values are 'low', 'medium', 'high', 'full', or a\n * percentage value between 0 and 1. The values 'low', 'medium', 'high', and\n * 'full' map to 0.25, 0.5, 0.75, and 1.0 correspondingly.\n *\n * `segmentationThreshold`: The minimum that segmentation values must\n * have to be considered part of the person. Affects the generation of the\n * segmentation mask. More specifically, it is the threshold
used to binarize\n * the intermediate person segmentation probability. The probability of each\n * pixel belongs to a person is in range [0, 1]. If the probability is greater\n * than the `segmentationThreshold`, it will be set to 1 otherwise 0.\n *\n */\nexport interface InferenceConfig {\n flipHorizontal?: boolean;\n internalResolution?: BodyPixInternalResolution;\n segmentationThreshold?: number;\n}\n\n/**\n * Person Inference Config\n *\n * `maxDetections`: Defaults to 10. Maximum number of person pose detections per\n * image.\n *\n * `scoreThreshold`: Defaults to 0.4. Only return person pose that have root\n * part score greater or equal to this value.\n *\n * `nmsRadius`: Defaults to 20. Non-maximum suppression part distance in pixels.\n * It needs to be strictly positive. Two pose keypoints suppress each other if\n * they are less than `nmsRadius` pixels away.\n */\nexport interface PersonInferenceConfig extends InferenceConfig {\n maxDetections?: number;\n scoreThreshold?:
number;\n nmsRadius?: number;\n}\n\n/**\n * Multiple Person Instance Inference Config\n *\n * `maxDetections`: Defaults to 10. Maximum number of returned instance\n * segmentation and pose detections per image.\n *\n * `scoreThreshold`: Defaults to 0.4. Only returns and uses person\n * poses for instance segmentation assignment when the pose has root part score\n * greater or equal to this value.\n *\n * `nmsRadius`: Defaults to 20. Non-maximum suppression part distance in pixels.\n * It needs to be strictly positive. Two parts suppress each other if they are\n * less than `nmsRadius` pixels away.\n *\n * `minKeypointScore`: Default to 0.3. Keypoints above the score are used\n * for matching and assigning segmentation mask to each person.\n *\n * `refineSteps`: Default to 10. The number of refinement steps used when\n * assigning the instance segmentation. It needs to be strictly positive. The\n * larger the higher the accuracy and slower the inference.\n *\n */\nexport interface MultiPersonInstanceInferenceConfig
extends InferenceConfig {\n maxDetections?: number;\n scoreThreshold?: number;\n nmsRadius?: number;\n minKeypointScore?: number;\n refineSteps?: number;\n}\n\nexport const PERSON_INFERENCE_CONFIG: PersonInferenceConfig = {\n flipHorizontal: false,\n internalResolution: 'medium',\n segmentationThreshold: 0.7,\n maxDetections: 10,\n scoreThreshold: 0.4,\n nmsRadius: 20,\n};\n\nexport const MULTI_PERSON_INSTANCE_INFERENCE_CONFIG:\n MultiPersonInstanceInferenceConfig = {\n flipHorizontal: false,\n internalResolution: 'medium',\n segmentationThreshold: 0.7,\n maxDetections: 10,\n scoreThreshold: 0.4,\n nmsRadius: 20,\n minKeypointScore: 0.3,\n refineSteps: 10\n};\n\nfunction validatePersonInferenceConfig(config: PersonInferenceConfig) {\n const {segmentationThreshold, maxDetections, scoreThreshold, nmsRadius} =\n config;\n\n if (segmentationThreshold < 0.0 || segmentationThreshold > 1.0) {\n

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  throw new Error(\n      `segmentationThreshold ${segmentationThreshold}. ` +\n      `Should be in range [0.0, 1.0]`);\n  }\n\n  if (maxDetections <= 0) {\n    throw new Error(\n        `Invalid maxDetections ${maxDetections}. ` +\n        `Should be > 0`);\n  }\n\n  if (scoreThreshold < 0.0 || scoreThreshold > 1.0) {\n    throw new Error(\n `Invalid scoreThreshold ${scoreThreshold}. ` +\n      `Should be in range [0.0, 1.0]`);\n  }\n\n  if (nmsRadius <= 0) {\n    throw new Error(`Invalid nmsRadius ${nmsRadius}.`);\n  }\n}\n\nfunction validateMultiPersonInstanceInferenceConfig(\n    config: MultiPersonInstanceInferenceConfig) {\n  const {\n segmentationThreshold,\n    maxDetections,\n    scoreThreshold,\n    nmsRadius,\n    minKeypointScore,\n refineSteps\n  } = config;\n\n  if (segmentationThreshold < 0.0 || segmentationThreshold > 1.0) {\n    throw new Error(\n      `segmentationThreshold ${segmentationThreshold}. ` +\n      `Should be in range [0.0, 1.0]`);\n  }\n\n  if (maxDetections <= 0) {\n    throw new Error(\n        `Invalid maxDetections ${maxDetections}. ` +\n `Should be > 0`);\n  }\n\n  if (scoreThreshold < 0.0 || scoreThreshold > 1.0) {\n    throw new Error(\n        `Invalid scoreThreshold ${scoreThreshold}. ` +\n      `Should be in range [0.0, 1.0]`);\n  }\n\n  if (nmsRadius <= 0) {\n    throw new Error(`Invalid nmsRadius ${nmsRadius}.`);\n  }\n\n  if (minKeypointScore < 0 || minKeypointScore > 1) {\n    throw new Error(\n        `Invalid minKeypointScore ${minKeypointScore}.` +\n        `Should be in range [0.0, 1.0]`);\n  }\n\n  if (refineSteps <= 0 || refineSteps > 20) {\n    throw new Error(\n        `Invalid refineSteps ${refineSteps}.` +\n        `Should be in range [1, 20]`);\n  }\n}\n\nexport class BodyPix {\n  baseModel: BaseModel;\n\n  constructor(net: BaseModel) {\n    this.baseModel = net;\n  }\n\n  private predictForPersonSegmentation(input: tf.Tensor3D): {\n    segmentLogits: tf.Tensor3D,\n    heatmapScores: tf.Tensor3D,\n    offsets: tf.Tensor3D,\n    displacementFwd: tf.Tensor3D,\n    displacementBwd: tf.Tensor3D,\n  } {\n    const {\n      segmentation,\n      heatmapScores,\n      offsets,\n      displacementFwd,\n      displacementBwd,\n    } = this.baseModel.predict(input);\n    return {\n      segmentLogits: segmentation,\n      heatmapScores,\n      offsets,\n      displacementFwd,\n      displacementBwd,\n    };\n  }\n\n  private predictForPersonSegmentationAndPart(input: tf.Tensor3D): {\n    segmentLogits: tf.Tensor3D,\n    partHeatmapLogits: tf.Tensor3D,\n    heatmapScores: tf.Tensor3D,\n    offsets: tf.Tensor3D,\n    displacementFwd: tf.Tensor3D,\n    displacementBwd: tf.Tensor3D,\n  } {\n    const {\n      segmentation,\n      partHeatmaps,\n      heatmapScores,\n      offsets,\n      displacementFwd,\n      displacementBwd\n    } = this.baseModel.predict(input);\n    return {\n      segmentLogits: segmentation,\n      partHeatmapLogits: partHeatmaps,\n      heatmapScores,\n      offsets,\n      displacementFwd,\n      displacementBwd,\n    };\n  }\n\n  private predictForMultiPersonInstanceSegmentationAndPart(input: tf.Tensor3D):\n      {\n        segmentLogits: tf.Tensor3D,\n        longOffsets: tf.Tensor3D,\n        heatmapScores: tf.Tensor3D,\n        offsets: tf.Tensor3D,\n        displacementFwd: tf.Tensor3D,\n        displacementBwd: tf.Tensor3D,\n        partHeatmaps: tf.Tensor3D\n      } {\n    const {\n      segmentation,\n      longOffsets,\n      heatmapScores,\n      offsets,\n      displacementFwd,\n      displacementBwd,\n      partHeatmaps,\n    } = this.baseModel.predict(input);\n    return {\n      segmentLogits: segmentation,\n      longOffsets,\n      heatmapScores,\n      offsets,\n      displacementFwd,\n      displacementBwd,\n      partHeatmaps\n    };\n  }\n\n  /**\n   * Given an image with people, returns a dictionary of all intermediate\n   * tensors including: 1) a binary array with 1 for the pixels that are part of\n   * the person, and 0 otherwise, 2) heatmapScores, 3) offsets, and 4) paddings.\n   *\n   * @param input ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)\n   * The input image to feed through the network.\n   *\n   * @param internalResolution Defaults to 'medium'. The internal resolution\n   * that the input is resized to before inference. The larger the\n   * internalResolution the more accurate the model at the cost of slower\n   * prediction times. Available values are 'low', 'medium', 'high', 'full', or\n   * a percentage value between 0 and 1. The values 'low', 'medium', 'high', and\n   * 'full' map to 0.25, 0.5, 0.75, and 1.0 correspondingly.\n   *\n   * @param segmentationThreshold The minimum that segmentation values must have\n   * to be considered part of the person. Affects the generation of the\n   * segmentation mask.\n   *\n   * @return A dictionary containing `segmentation`, `heatmapScores`, `offsets`,\n   * and `padding`:\n   * - `segmentation`: A 2d Tensor with 1 for the pixels that are part of the\n   * person, and 0 otherwise. The width and height correspond to the same\n   * dimensions of the input image.\n   * - `heatmapScores`: A 3d Tensor of the keypoint heatmaps used by\n   * pose estimation decoding.\n   * - `offsets`: A 3d Tensor of the keypoint offsets used by pose\n   * estimation decoding.\n
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* - `displacementFwd`: A 3d Tensor of the keypoint forward displacement used\n   * by pose estimation decoding.\n   * - `displacementBwd`: A 3d Tensor of the keypoint backward displacement used\n   * by pose estimation decoding.\n   * - `padding`: The padding (unit pixels) being applied to the input image\n   * before it is fed into the model.\n   */\n  segmentPersonActivation(\n      input: BodyPixInput, internalResolution:
BodyPixInternalResolution,\n      segmentationThreshold = 0.5): {\n    segmentation: tf.Tensor2D,\n
heatmapScores: tf.Tensor3D,\n    offsets: tf.Tensor3D,\n    displacementFwd: tf.Tensor3D,\n    displacementBwd:
tf.Tensor3D,\n
    padding: Padding,\n    internalResolutionHeightAndWidth: [number, number]\n  } {\n    const [height, width] =
getInputSize(input);\n    const internalResolutionHeightAndWidth = toInputResolutionHeightAndWidth(\n
internalResolution, this.baseModel.outputStride, [height, width]);\n    const {resized, padding} =\n
padAndResizeTo(input, internalResolutionHeightAndWidth);\n\n    const {\n      segmentation,\n
heatmapScores,\n      offsets,\n      displacementFwd,\n      displacementBwd\n    } = tf.tidy(() => {\n      const {\n
segmentLogits,\n      heatmapScores,\n      offsets,\n      displacementFwd,\n      displacementBwd\n    } =
this.predictForPersonSegmentation(resized);\n\n      const [resizedHeight, resizedWidth] = resized.shape;\n\n
const scaledSegmentScores = scaleAndCropToInputTensorShape(\n          segmentLogits, [height, width],
[resizedHeight, resizedWidth],\n          [[padding.top, padding.bottom], [padding.left, padding.right]],\n
          APPLY_SIGMOID_ACTIVATION);\n\n      return {\n        segmentation: toMaskTensor(\n
tf.squeeze(scaledSegmentScores), segmentationThreshold),\n        heatmapScores,\n        offsets,\n
displacementFwd,\n        displacementBwd,\n      };\n    });\n    resized.dispose();\n    return {\n      segmentation,\n
heatmapScores,\n      offsets,\n      displacementFwd,\n      displacementBwd,\n      padding,\n
internalResolutionHeightAndWidth\n    };\n  }\n\n  /**\n   * Given an image with many people, returns a
PersonSegmentation dictionary\n   * that contains the segmentation mask for all people and a single pose.\n   *\n   *
Note: The segmentation mask returned by this method covers all people but\n   * the pose works well for one
person. If you want to estimate instance-level\n   * multiple person segmentation & pose for each person, use\n   *
`segmentMultiPerson` instead.\n   *\n   * @param input
ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)\n
  * The input image to feed through the network.\n   *\n   * @param config PersonInferenceConfig object that
contains\n   * parameters for the BodyPix inference using person decoding.\n   *\n   * @return A
SemanticPersonSegmentation dictionary that contains height,\n   * width, the flattened binary segmentation mask
and the poses for all people.\n   * The width and height correspond to the same dimensions of the input image.\n   * -
`height`: The height of the segmentation data in pixel unit.\n   * - `width`: The width of the segmentation data in
pixel unit.\n   * - `data`: The flattened Uint8Array of segmentation data. 1 means the pixel\n   * belongs to a person
and 0 means the pixel doesn't belong to a person. The\n   * size of the array is equal to `height` x `width` in row-
major order.\n   * - `allPoses`: The 2d poses of all people.\n   */\n  async segmentPerson(\n      input:
BodyPixInput,\n      config: PersonInferenceConfig = PERSON_INFERENCE_CONFIG):\n
 Promise<SemanticPersonSegmentation> {\n    config = {...PERSON_INFERENCE_CONFIG, ...config};\n\n
validatePersonInferenceConfig(config);\n\n    const {\n      segmentation,\n      heatmapScores,\n      offsets,\n
displacementFwd,\n      displacementBwd,\n      padding,\n      internalResolutionHeightAndWidth\n    } =\n
this.segmentPersonActivation(\n          input, config.internalResolution, config.segmentationThreshold);\n\n
const [height, width] = segmentation.shape;\n\n    const result = await segmentation.data() as Uint8Array;\n
segmentation.dispose();\n\n    const tensorBuffers = await toTensorBuffers3D(\n        [heatmapScores, offsets,
displacementFwd, displacementBwd]);\n    const [scoresBuf, offsetsBuf, displacementsFwdBuf,
displacementsBwdBuf] =\n        tensorBuffers;\n\n    let poses = decodeMultiplePoses(\n        scoresBuf, offsetsBuf,
displacementsFwdBuf, displacementsBwdBuf,\n        this.baseModel.outputStride, config.maxDetections,\n
config.scoreThreshold,
 config.nmsRadius);\n\n    poses = scaleAndFlipPoses(\n        poses, [height, width],
internalResolutionHeightAndWidth, padding,\n        FLIP_POSES_AFTER_SCALING);\n\n
heatmapScores.dispose();\n    offsets.dispose();\n    displacementFwd.dispose();\n    displacementBwd.dispose();\n\n
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return {height, width, data: result, allPoses: poses};\n  }\n\n  /**\n   * Given an image with multiple people, returns an *array* of\n   * PersonSegmentation object. Each element in the array corresponding to one\n   * of the people in the input image. In other words, it predicts\n   * instance-level multiple person segmentation & pose for each person.\n   *\n   * The model does standard ImageNet pre-processing before inferring through\n   * the model. The image pixels should have values [0-255].\n   *\n   * @param input\n   * ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement) The input\n   * image to feed through the network.\n   *\n   * @param config MultiPersonInferenceConfig
 object that contains\n   * parameters for the BodyPix inference using multi-person decoding.\n   *\n   * @return An array of PersonSegmentation object, each containing a width,\n   * height, a binary array (1 for the pixels that are part of the\n   * person, and 0 otherwise) and 2D pose. The array size corresponds to the\n   * number of pixels in the image. The width and height correspond to the\n   * dimensions of the image the binary array is shaped to, which are the same\n   * dimensions of the input image.\n   */\n  async segmentMultiPerson(\n      input: BodyPixInput,\n  config: MultiPersonInstanceInferenceConfig =\n          MULTI_PERSON_INSTANCE_INFERENCE_CONFIG):\n      Promise<PersonSegmentation[]> {\n    config = {...MULTI_PERSON_INSTANCE_INFERENCE_CONFIG, ...config};\n    validateMultiPersonInstanceInferenceConfig(config);\n    const [height, width] = getInputSize(input);\n    const internalResolutionHeightAndWidth = toInputResolutionHeightAndWidth(\n  config.internalResolution, this.baseModel.outputStride,\n        [height, width]);\n\n    const {resized, padding} =\n      padAndResizeTo(input, internalResolutionHeightAndWidth);\n    const {\n      segmentation,\n      longOffsets,\n  heatmapScoresRaw,\n      offsetsRaw,\n      displacementFwdRaw,\n      displacementBwdRaw,\n    } = tf.tidy(() => {\n      const {\n        segmentLogits,\n        longOffsets,\n        heatmapScores,\n        offsets,\n  displacementFwd,\n        displacementBwd,\n      } =
this.predictForMultiPersonInstanceSegmentationAndPart(resized);\n      const scaledSegmentScores =
scaleAndCropToInputTensorShape(\n          segmentLogits, [height, width], internalResolutionHeightAndWidth,\n
    [[padding.top, padding.bottom], [padding.left, padding.right]],\n          APPLY_SIGMOID_ACTIVATION);\n
const longOffsetsResized = false;\n      let scaledLongOffsets;\n      if (longOffsetsResized) {\n
scaledLongOffsets = scaleAndCropToInputTensorShape(\n
          longOffsets, [height, width], internalResolutionHeightAndWidth,\n          [[padding.top, padding.bottom],
[padding.left, padding.right]],\n          APPLY_SIGMOID_ACTIVATION);\n      } else {\n        scaledLongOffsets
= longOffsets;\n      }\n\n      const segmentation = toMaskTensor(\n          tf.squeeze(scaledSegmentScores),
config.segmentationThreshold);\n\n      return {\n        segmentation,\n        longOffsets: scaledLongOffsets,\n
heatmapScoresRaw: heatmapScores,\n        offsetsRaw: offsets,\n        displacementFwdRaw: displacementFwd,\n
  displacementBwdRaw: displacementBwd,\n      };\n    });\n\n    const tensorBuffers = await toTensorBuffers3D(\n
    [heatmapScoresRaw, offsetsRaw, displacementFwdRaw, displacementBwdRaw]);\n    const [scoresBuf,
offsetsBuf, displacementsFwdBuf, displacementsBwdBuf] =\n        tensorBuffers;\n\n    let poses =
decodeMultiplePoses(\n        scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf,\n
      this.baseModel.outputStride, config.maxDetections,\n        config.scoreThreshold, config.nmsRadius);\n\n
poses = scaleAndFlipPoses(\n        poses, [height, width], internalResolutionHeightAndWidth, padding,\n
FLIP_POSES_AFTER_SCALING);\n\n    const instanceMasks = await decodePersonInstanceMasks(\n
segmentation, longOffsets, poses, height, width,\n        this.baseModel.outputStride,
internalResolutionHeightAndWidth, padding,\n        config.scoreThreshold, config.refineSteps,
config.minKeypointScore,\n        config.maxDetections);\n\n    resized.dispose();\n    segmentation.dispose();\n
longOffsets.dispose();\n    heatmapScoresRaw.dispose();\n    offsetsRaw.dispose();\n
displacementFwdRaw.dispose();\n    displacementBwdRaw.dispose();\n\n    return instanceMasks;\n  }\n\n  /**\n   *
Given an image with many people, returns a dictionary containing: height,\n   * width, a tensor with a part id from 0-
24 for the pixels that are\n   * part of a
 corresponding body part, and -1 otherwise. This does standard\n   * ImageNet pre-processing before inferring
through the model.  The image\n   * should pixels should have values [0-255].\n   *\n   * @param input
ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)\n   * The input image to feed
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through the network.\n   *\n   * @param internalResolution Defaults to 'medium'. The internal resolution\n   * percentage that the input is resized to before inference. The larger the\n   * internalResolution the more accurate the model at the cost of slower\n   * prediction times. Available values are 'low', 'medium', 'high', 'full', or\n   * a percentage value between 0 and 1. The values 'low', 'medium', 'high', and\n   * 'full' map to 0.25, 0.5, 0.75, and 1.0 correspondingly.\n   *\n   * @param segmentationThreshold The minimum that segmentation values must have\n   * to be considered part of the person.  Affects the clipping of the colored\n   * part image.\n   *\n   * @return  A dictionary
 containing `partSegmentation`, `heatmapScores`,\n   * `offsets`, and `padding`:\n   * - `partSegmentation`: A 2d Tensor with a part id from 0-24 for\n   * the pixels that are part of a corresponding body part, and -1 otherwise.\n   * - `heatmapScores`: A 3d Tensor of the keypoint heatmaps used by\n   * single-person pose estimation decoding.\n   * - `offsets`: A 3d Tensor of the keypoint offsets used by single-person pose\n   * estimation decoding.\n   * - `displacementFwd`: A 3d Tensor of the keypoint forward displacement\n   * used by pose estimation decoding.\n   * - `displacementBwd`: A 3d Tensor of the keypoint backward displacement used\n   * by pose estimation decoding.\n   * - `padding`: The padding (unit pixels) being applied to the input image\n   * before it is fed into the model.\n   */\n segmentPersonPartsActivation(\n     input: BodyPixInput, internalResolution: BodyPixInternalResolution,\n segmentationThreshold = 0.5): {\n   partSegmentation: tf.Tensor2D,\n
   heatmapScores: tf.Tensor3D,\n   offsets: tf.Tensor3D,\n   displacementFwd: tf.Tensor3D,\n   displacementBwd: tf.Tensor3D,\n   padding: Padding,\n   internalResolutionHeightAndWidth: [number, number]\n  } {\n   const [height, width] = getInputSize(input);\n   const internalResolutionHeightAndWidth = toInputResolutionHeightAndWidth(\n       internalResolution, this.baseModel.outputStride, [height, width]);\n   const {\n     resized,\n     padding,\n   } = padAndResizeTo(input, internalResolutionHeightAndWidth);\n\n   const {\n     partSegmentation,\n     heatmapScores,\n     offsets,\n     displacementFwd,\n     displacementBwd\n   } = tf.tidy(() => {\n     const {\n       segmentLogits,\n       partHeatmapLogits,\n       heatmapScores,\n       offsets,\n
     displacementFwd,\n       displacementBwd\n     } = this.predictForPersonSegmentationAndPart(resized);\n\n     const [resizedHeight, resizedWidth] = resized.shape;\n\n     const scaledSegmentScores
 = scaleAndCropToInputTensorShape(\n         segmentLogits, [height, width], [resizedHeight, resizedWidth],\n [[padding.top, padding.bottom], [padding.left, padding.right]],\n         APPLY_SIGMOID_ACTIVATION);\n\n     const scaledPartHeatmapScore = scaleAndCropToInputTensorShape(\n         partHeatmapLogits, [height, width], [resizedHeight, resizedWidth],\n         [[padding.top, padding.bottom], [padding.left, padding.right]],\n APPLY_SIGMOID_ACTIVATION);\n     const segmentation =\n toMaskTensor(tf.squeeze(scaledSegmentScores), segmentationThreshold);\n     return {\n       partSegmentation:\n       decodePartSegmentation(segmentation, scaledPartHeatmapScore),\n       heatmapScores,\n       offsets,\n displacementFwd,\n       displacementBwd,\n     };\n   });\n   resized.dispose();\n   return {\n partSegmentation,\n     heatmapScores,\n     offsets,\n     displacementFwd,\n     displacementBwd,\n padding,\n     internalResolutionHeightAndWidth\n
   };\n }\n\n  /**\n   * Given an image with many people, returns a PartSegmentation dictionary that\n   * contains the body part segmentation mask for all people and a single pose.\n   *\n   * Note: The body part segmentation mask returned by this method covers all\n   * people but the pose works well when there is one person. If you want to\n   * estimate instance-level multiple person body part segmentation & pose for\n   * each person, use `segmentMultiPersonParts` instead.\n   *\n   * @param input ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement)\n   * The input image to feed through the network.\n   *\n   * @param config PersonInferenceConfig object that contains\n   * parameters for the BodyPix inference using single person decoding.\n   *\n   * @return A SemanticPartSegmentation dictionary that contains height, width,\n   * the flattened binary segmentation mask and the pose for the person. The\n   * width and height correspond to
 the same dimensions of the input image.\n   * - `height`: The height of the person part segmentation data in pixel unit.\n   * - `width`: The width of the person part segmentation data in pixel unit.\n   * - `data`: The flattened Int32Array of person part segmentation data with a\n   * part id from 0-24 for the pixels that are part of a
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corresponding body\n   * part, and -1 otherwise. The size of the array is equal to `height` x\n   * `width` in row-major order.\n   * - `allPoses`: The 2d poses of all people.\n   */\n  async segmentPersonParts(\n      input: BodyPixInput,\n      config: PersonInferenceConfig = PERSON_INFERENCE_CONFIG):\n Promise<SemanticPartSegmentation> {\n    config = {...PERSON_INFERENCE_CONFIG, ...config};\n\n validatePersonInferenceConfig(config);\n    const {\n      partSegmentation,\n      heatmapScores,\n      offsets,\n displacementFwd,\n      displacementBwd,\n      padding,\n      internalResolutionHeightAndWidth\n    } =\n this.segmentPersonPartsActivation(\n        input, config.internalResolution, config.segmentationThreshold);\n\n    const [height, width] = partSegmentation.shape;\n    const data = await partSegmentation.data() as Int32Array;\n partSegmentation.dispose();\n\n    const tensorBuffers = await toTensorBuffers3D(\n        [heatmapScores, offsets, displacementFwd, displacementBwd]);\n    const [scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf] =\n        tensorBuffers;\n\n    let poses = decodeMultiplePoses(\n        scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf,\n        this.baseModel.outputStride, config.maxDetections,\n config.scoreThreshold, config.nmsRadius);\n\n    poses = scaleAndFlipPoses(\n        poses, [height, width], internalResolutionHeightAndWidth, padding,\n        FLIP_POSES_AFTER_SCALING);\n\n heatmapScores.dispose();\n    offsets.dispose();\n    displacementFwd.dispose();\n    displacementBwd.dispose();\n\n    return {height, width, data,
 allPoses: poses};\n  }\n\n  /**\n   * Given an image with multiple people, returns an *array* of PartSegmentation\n * object. Each element in the array corresponding to one\n   * of the people in the input image. In other words, it predicts\n   * instance-level multiple person body part segmentation & pose for each\n   * person.\n   *\n   * This does standard ImageNet pre-processing before inferring through\n   * the model. The image pixels should have values [0-255].\n   *\n   * @param input\n   * ImageData|HTMLImageElement|HTMLCanvasElement|HTMLVideoElement) The input\n   * image to feed through the network.\n   *\n   * @param config MultiPersonInferenceConfig object that contains\n   * parameters for the BodyPix inference using multi-person decoding.\n   *\n   * @return An array of PartSegmentation object, each containing a width,\n   * height, a flattened array (with part id from 0-24 for the pixels that are\n   * part of a corresponding body part, and -1 otherwise) and 2D pose.
    The width\n   * and height correspond to the dimensions of the image. Each flattened part\n   * segmentation array size is equal to `height` x `width`.\n   */\n  async segmentMultiPersonParts(\n      input: BodyPixInput,\n      config: MultiPersonInstanceInferenceConfig =\n          MULTI_PERSON_INSTANCE_INFERENCE_CONFIG):
 Promise<PartSegmentation[]> {\n    config = {...MULTI_PERSON_INSTANCE_INFERENCE_CONFIG, ...config};\n\n    validateMultiPersonInstanceInferenceConfig(config);\n    const [height, width] = getInputSize(input);\n    const internalResolutionHeightAndWidth = toInputResolutionHeightAndWidth(\n config.internalResolution, this.baseModel.outputStride,\n        [height, width]);\n    const {resized, padding} =\n padAndResizeTo(input, internalResolutionHeightAndWidth);\n    const {\n      segmentation,\n      longOffsets,\n heatmapScoresRaw,\n      offsetsRaw,\n      displacementFwdRaw,\n      displacementBwdRaw,\n partSegmentation,\n    } = tf.tidy(()
 => {\n      const {\n        segmentLogits,\n        longOffsets,\n        heatmapScores,\n        offsets,\n displacementFwd,\n        displacementBwd,\n        partHeatmaps\n      } =
this.predictForMultiPersonInstanceSegmentationAndPart(resized);\n\n      // decoding with scaling.\n      const scaledSegmentScores = scaleAndCropToInputTensorShape(\n          segmentLogits, [height, width], internalResolutionHeightAndWidth,\n          [[padding.top, padding.bottom], [padding.left, padding.right]],\n APPLY_SIGMOID_ACTIVATION);\n\n      // decoding with scaling.\n      const scaledPartSegmentationScores = scaleAndCropToInputTensorShape(\n          partHeatmaps, [height, width], internalResolutionHeightAndWidth,\n
    [[padding.top, padding.bottom], [padding.left, padding.right]],\n          APPLY_SIGMOID_ACTIVATION);\n\n
 const scaledLongOffsets = longOffsets;\n      const segmentation = toMaskTensor(\n tf.squeeze(scaledSegmentScores), config.segmentationThreshold);\n
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    const partSegmentation =\n        decodeOnlyPartSegmentation(scaledPartSegmentationScores);\n    return {\n      segmentation,\n      longOffsets: scaledLongOffsets,\n      heatmapScoresRaw: heatmapScores,\n      offsetsRaw: offsets,\n      displacementFwdRaw: displacementFwd,\n      displacementBwdRaw: displacementBwd,\n      partSegmentation\n    };\n  });\n\n  const tensorBuffers = await toTensorBuffers3D(\n    [heatmapScoresRaw, offsetsRaw, displacementFwdRaw, displacementBwdRaw]);\n  const [scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf] =\n      tensorBuffers;\n\n  let poses = decodeMultiplePoses(\n      scoresBuf, offsetsBuf, displacementsFwdBuf, displacementsBwdBuf,\n      this.baseModel.outputStride, config.maxDetections,\n      config.scoreThreshold, config.nmsRadius);\n\n  poses = scaleAndFlipPoses(\n      poses, [height, width], internalResolutionHeightAndWidth, padding,\n      FLIP_POSES_AFTER_SCALING);\n\n\n  const instanceMasks = await decodePersonInstancePartMasks(\n      segmentation, longOffsets, partSegmentation, poses, height, width,\n      this.baseModel.outputStride, internalResolutionHeightAndWidth,\n      padding,\n      config.scoreThreshold, config.refineSteps, config.minKeypointScore,\n      config.maxDetections);\n\n  resized.dispose();\n  segmentation.dispose();\n  longOffsets.dispose();\n  heatmapScoresRaw.dispose();\n  offsetsRaw.dispose();\n  displacementFwdRaw.dispose();\n  displacementBwdRaw.dispose();\n  partSegmentation.dispose();\n\n  return instanceMasks;\n }\n\n public dispose() {\n  this.baseModel.dispose();\n }\n}\n\n/**\n * Loads the MobileNet BodyPix model.\n */\nasync function loadMobileNet(config: ModelConfig): Promise<BodyPix> {\n const outputStride = config.outputStride;\n const quantBytes = config.quantBytes;\n const multiplier = config.multiplier;\n if (tf == null) {\n  throw new Error(\n      `Cannot find TensorFlow.js. If you are using a <script> tag, please ` +\n      `also include @tensorflow/tfjs on the page before using this\n      model.`);\n }\n\n const url = mobileNetSavedModel(outputStride, multiplier, quantBytes);\n const graphModel = await tfconv.loadGraphModel(config.modelUrl || url);\n const mobilenet = new MobileNet(graphModel, outputStride);\n return new BodyPix(mobilenet);\n}\n\n/**\n * Loads the ResNet BodyPix model.\n */\nasync function loadResNet(config: ModelConfig): Promise<BodyPix> {\n const outputStride = config.outputStride;\n const quantBytes = config.quantBytes;\n if (tf == null) {\n  throw new Error(\n      `Cannot find TensorFlow.js. If you are using a <script> tag, please ` +\n      `also include @tensorflow/tfjs on the page before using this\n      model.`);\n }\n\n const url = resNet50SavedModel(outputStride, quantBytes);\n const graphModel = await tfconv.loadGraphModel(config.modelUrl || url);\n const resnet = new ResNet(graphModel, outputStride);\n return new BodyPix(resnet);\n}\n\n/**\n * Loads the BodyPix model instance from a checkpoint, with the ResNet\n * or MobileNet architecture. The model to be loaded is configurable using the\n * config dictionary ModelConfig. Please find more details in the\n * documentation of the ModelConfig.\n *\n * @param config ModelConfig dictionary that contains parameters for\n * the BodyPix loading process. Please find more details of each parameters\n * in the documentation of the ModelConfig interface. The predefined\n * `MOBILENET_V1_CONFIG` and `RESNET_CONFIG` can also be used as references\n * for defining your customized config.\n */\nexport async function load(config: ModelConfig = MOBILENET_V1_CONFIG):\n    Promise<BodyPix> {\n  config = validateModelConfig(config);\n  if (config.architecture === 'ResNet50') {\n  return loadResNet(config);\n  } else if (config.architecture === 'MobileNetV1') {\n    return loadMobileNet(config);\n  } else {\n    return null;\n  }\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ========================================================================\n */\n\n// method copied from bGlur in https://codepen.io/zhaojun/pen/zZmRQe\nexport function cpuBlur(\n canvas: HTMLCanvasElement|OffscreenCanvas,\n  image:
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HTMLImageElement|HTMLVideoElement|HTMLCanvasElement|OffscreenCanvas,\n blur: number) {\n const ctx = canvas.getContext('2d');\n\n let sum = 0;\n const delta = 5;\n const alphaLeft = 1 / (2 * Math.PI * delta * delta);\n const step = blur < 3 ? 1 : 2;\n for (let y = -blur; y <= blur; y += step) {\n   for (let x = -blur; x <= blur; x += step) {\n   const weight =\n alphaLeft * Math.exp(-(x * x + y * y) / (2 * delta * delta));\n   sum += weight;\n   }\n }\n for (let y = -blur; y <= blur; y += step) {\n   for (let x = -blur; x <= blur; x += step) {\n   ctx.globalAlpha = alphaLeft *\n Math.exp(-(x * x + y * y) / (2 * delta * delta)) / sum * blur;\n   ctx.drawImage(image, x, y);\n   }\n }\n ctx.globalAlpha = 1;\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
  law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
  ==\n
  */\n\nimport {cpuBlur} from './blur';\nimport {Color, PartSegmentation, PersonSegmentation} from './types';\nimport {SemanticPartSegmentation, SemanticPersonSegmentation} from './types';\nimport {getInputSize} from './util';\n\nexport type Canvas = HTMLCanvasElement | OffscreenCanvas;\n\nconst offScreenCanvases: {[name: string]: Canvas} = {};\n\ntype ImageType = HTMLImageElement|HTMLVideoElement|Canvas;\ntype HasDimensions = {\n width: number,\n height: number\n};\n\nfunction isSafari() {\n return (/^((?!chrome|android).)*safari/i.test(navigator.userAgent));\n}\n\nfunction assertSameDimensions(\n   {width: widthA,
  height: heightA}: HasDimensions,\n   {width: widthB, height: heightB}: HasDimensions, nameA: string,\n nameB: string) {\n if (widthA !== widthB || heightA !== heightB) {\n   throw new Error(`error: dimensions must match. ${nameA} has dimensions ${\n        widthA}x${heightA}, ${nameB} has dimensions ${widthB}x${heightB}`);\n }\n}\n\nfunction flipCanvasHorizontal(canvas: Canvas) {\n const ctx = canvas.getContext('2d');\n ctx.scale(-1, 1);\n ctx.translate(-canvas.width, 0);\n}\n\nfunction drawWithCompositing(\n   ctx: CanvasRenderingContext2D|OffscreenCanvasRenderingContext2D,\n   image: Canvas|ImageType,\n   compositeOperation: string) {\n ctx.globalCompositeOperation = compositeOperation;\n ctx.drawImage(image, 0, 0);\n}\n\nfunction createOffScreenCanvas(): Canvas {\n if (typeof document !== 'undefined') {\n   return document.createElement('canvas');\n } else if (typeof OffscreenCanvas !== 'undefined') {\n   return new OffscreenCanvas(0, 0);\n } else {\n   throw
  new Error('Cannot create a canvas in this context');\n }\n}\n\nfunction ensureOffscreenCanvasCreated(id: string): Canvas {\n if (!offScreenCanvases[id]) {\n   offScreenCanvases[id] = createOffScreenCanvas();\n }\n return offScreenCanvases[id];\n}\n\nfunction drawAndBlurImageOnCanvas(\n   image: ImageType, blurAmount: number, canvas: Canvas) {\n const {height, width} = image;\n const ctx = canvas.getContext('2d');\n canvas.width = width;\n canvas.height = height;\n ctx.clearRect(0, 0, width, height);\n ctx.save();\n if (isSafari()) {\n   cpuBlur(canvas, image, blurAmount);\n } else {\n   // tslint:disable:no-any\n   (ctx as any).filter = `blur(${blurAmount}px)`;\n   ctx.drawImage(image, 0, 0, width, height);\n }\n ctx.restore();\n}\n\nfunction drawAndBlurImageOnOffScreenCanvas(\n   image: ImageType, blurAmount: number,\n   offscreenCanvasName: string): Canvas {\n const canvas = ensureOffscreenCanvasCreated(offscreenCanvasName);\n if (blurAmount === 0) {\n   renderImageToCanvas(image,
  canvas);\n } else {\n   drawAndBlurImageOnCanvas(image, blurAmount, canvas);\n }\n return canvas;\n}\n\nfunction renderImageToCanvas(image: ImageType, canvas: Canvas) {\n const {width, height} = image;\n canvas.width = width;\n canvas.height = height;\n const ctx = canvas.getContext('2d');\n\n ctx.drawImage(image, 0, 0, width, height);\n}\n\n/**\n * Draw an image on a canvas\n */\nfunction renderImageDataToCanvas(image: ImageData, canvas: Canvas) {\n canvas.width = image.width;\n canvas.height = image.height;\n const ctx = canvas.getContext('2d');\n\n ctx.putImageData(image, 0, 0);\n}\n\nfunction

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renderImageDataToOffScreenCanvas(\n    image: ImageData, canvasName: string): Canvas {\n  const canvas =
ensureOffscreenCanvasCreated(canvasName);\n  renderImageDataToCanvas(image, canvas);\n\n  return
canvas;\n}\n\n/**\n * Given the output from estimating multi-person segmentation, generates an\n * image with
foreground and background color at each pixel determined
 by the\n * corresponding binary segmentation value at the pixel from the output.  In\n * other words, pixels where
there is a person will be colored with foreground\n * color and where there is not a person will be colored with
background color.\n *\n * @param personOrPartSegmentation The output from\n * `segmentPerson`,
`segmentMultiPerson`,\n * `segmentPersonParts` or `segmentMultiPersonParts`. They can\n * be
SemanticPersonSegmentation object, an array of PersonSegmentation object,\n * SemanticPartSegmentation object,
or an array of PartSegmentation object.\n *\n * @param foreground Default to {r:0, g:0, b:0, a: 0}. The foreground
color\n * (r,g,b,a) for visualizing pixels that belong to people.\n *\n * @param background Default to {r:0, g:0, b:0,
a: 255}. The background color\n * (r,g,b,a) for visualizing pixels that don't belong to people.\n *\n * @param
drawContour Default to false. Whether to draw the contour around each\n * person's segmentation mask or body
part mask.\n
 *\n * @param foregroundIds Default to [1]. The integer values that represent\n * foreground. For person
segmentation, 1 is the foreground. For body part\n * segmentation, it can be a subset of all body parts ids.\n *\n *
@returns An ImageData with the same width and height of\n * all the PersonSegmentation in
multiPersonSegmentation, with opacity and\n * transparency at each pixel determined by the corresponding binary\n
* segmentation value at the pixel from the output.\n */\nexport function toMask(\n    personOrPartSegmentation:
SemanticPersonSegmentation|\n    SemanticPartSegmentation|PersonSegmentation[]|PartSegmentation[],\n
foreground: Color = {\n      r: 0,\n      g: 0,\n      b: 0,\n      a: 0\n    },\n    background: Color = {\n      r: 0,\n      g: 0,\n
    b: 0,\n      a: 255\n    },\n    drawContour = false, foregroundIds: number[] = [1]): ImageData {\n  if
(Array.isArray(personOrPartSegmentation) &&\n      personOrPartSegmentation.length === 0) {\n    return null;\n
  }\n\n  let multiPersonOrPartSegmentation:\n      Array<SemanticPersonSegmentation|SemanticPartSegmentation|\n
        PersonSegmentation|PartSegmentation>;\n\n  if (!Array.isArray(personOrPartSegmentation)) {\n
multiPersonOrPartSegmentation = [personOrPartSegmentation];\n  } else {\n    multiPersonOrPartSegmentation =
personOrPartSegmentation;\n  }\n\n  const {width, height} = multiPersonOrPartSegmentation[0];\n  const bytes =
new Uint8ClampedArray(width * height * 4);\n\n  function drawStroke(\n      bytes: Uint8ClampedArray, row:
number, column: number, width: number,\n      radius: number, color: Color = {r: 0, g: 255, b: 255, a: 255}) {\n
for (let i = -radius; i <= radius; i++) {\n      for (let j = -radius; j <= radius; j++) {\n        if (i !== 0 && j !== 0) {\n
    const n = (row + i) * width + (column + j);\n          bytes[4 * n + 0] = color.r;\n          bytes[4 * n + 1] = color.g;\n
      bytes[4 * n + 2] = color.b;\n          bytes[4 * n + 3] = color.a;\n
        }\n      }\n    }\n  }\n\n  function isSegmentationBoundary(\n      segmentationData: Uint8Array|Int32Array,\n
row: number,\n      column: number,\n      width: number,\n      foregroundIds: number[] = [1],\n      radius = 1,\n
): boolean {\n    let numberBackgroundPixels = 0;\n    for (let i = -radius; i <= radius; i++) {\n      for (let j = -radius;
j <= radius; j++) {\n        if (i !== 0 && j !== 0) {\n          const n = (row + i) * width + (column + j);\n          if
(!foregroundIds.some(id => id === segmentationData[n])) {\n            numberBackgroundPixels += 1;\n          }\n
}\n      }\n    }\n    return numberBackgroundPixels > 0;\n  }\n\n  for (let i = 0; i < height; i += 1) {\n    for (let j = 0; j
< width; j += 1) {\n      const n = i * width + j;\n      bytes[4 * n + 0] = background.r;\n      bytes[4 * n + 1] =
background.g;\n      bytes[4 * n + 2] = background.b;\n      bytes[4 * n + 3] = background.a;\n      for (let k = 0; k <
multiPersonOrPartSegmentation.length;
 k++) {\n        if (foregroundIds.some(\n                id => id === multiPersonOrPartSegmentation[k].data[n])) {\n
 bytes[4 * n] = foreground.r;\n          bytes[4 * n + 1] = foreground.g;\n          bytes[4 * n + 2] = foreground.b;\n
bytes[4 * n + 3] = foreground.a;\n          const isBoundary = isSegmentationBoundary(\n
multiPersonOrPartSegmentation[k].data, i, j, width,\n              foregroundIds);\n          if (drawContour && i - 1 >= 0
&& i + 1 < height && j - 1 >= 0 &&\n              j + 1 < width && isBoundary) {\n            drawStroke(bytes, i, j,
width, 1);\n          }\n        }\n      }\n    }\n  }\n\n  return new ImageData(bytes, width, height);\n}\n\nconst
RAINBOW_PART_COLORS: Array<[number, number, number]> = [\n  [110, 64, 170], [143, 61, 178], [178, 60,
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178], [210, 62, 167],\n [238, 67, 149], [255, 78, 125], [255, 94, 99], [255, 115, 75],\n [255, 140, 56], [239, 167, 47], [217, 194, 49], [194, 219, 64],\n
 [175, 240, 91], [135, 245, 87], [96, 247, 96], [64, 243, 115],\n [40, 234, 141], [28, 219, 169], [26, 199, 194], [33, 176, 213],\n [47, 150, 224], [65, 125, 224], [84, 101, 214], [99, 81, 195]\n];\n\n/**\n * Given the output from person body part segmentation (or multi-person\n * instance body part segmentation) and an array of colors indexed by part id,\n * generates an image with the corresponding color for each part at each pixel,\n * and white pixels where there is no part.\n *\n * @param partSegmentation The output from segmentPersonParts\n * or segmentMultiPersonParts. The former is a SemanticPartSegmentation\n * object and later is an array of PartSegmentation object.\n *\n * @param partColors A multi-dimensional array of rgb colors indexed by\n * part id. Must have 24 colors, one for every part.\n *\n * @returns An ImageData with the same width and height of all the element in\n * multiPersonPartSegmentation, with the corresponding color for each part at\n * each pixel, and
 black pixels where there is no part.\n */\nexport function toColoredPartMask(\n partSegmentation: SemanticPartSegmentation|PartSegmentation[],\n partColors: Array<[number, number, number]> =\n RAINBOW_PART_COLORS): ImageData {\n if (Array.isArray(partSegmentation) && partSegmentation.length === 0) {\n return null;\n }\n\n let multiPersonPartSegmentation;\n if (!Array.isArray(partSegmentation)) {\n multiPersonPartSegmentation = [partSegmentation];\n } else {\n multiPersonPartSegmentation = partSegmentation;\n }\n const {width, height} = multiPersonPartSegmentation[0];\n const bytes = new Uint8ClampedArray(width * height * 4);\n\n for (let i = 0; i < height * width; ++i) {\n // invert mask. Invert the segmentation mask.\n const j = i * 4;\n bytes[j + 0] = 255;\n bytes[j + 1] = 255;\n bytes[j + 2] = 255;\n bytes[j + 3] = 255;\n for (let k = 0; k < multiPersonPartSegmentation.length; k++) {\n const partId = multiPersonPartSegmentation[k].data[i];\n
  if (partId !== -1) {\n const color = partColors[partId];\n if (!color) {\n throw new Error(`No color could be found for part id ${partId}`);\n }\n bytes[j + 0] = color[0];\n bytes[j + 1] = color[1];\n bytes[j + 2] = color[2];\n bytes[j + 3] = 255;\n }\n }\n }\n return new ImageData(bytes, width, height);\n}\n\nconst CANVAS_NAMES = {\n blurred: 'blurred',\n blurredMask: 'blurred-mask',\n mask: 'mask',\n lowresPartMask: 'lowres-part-mask',\n};\n\n/**\n * Given an image and a maskImage of type ImageData, draws the image with the\n * mask on top of it onto a canvas.\n *\n * @param canvas The canvas to be drawn onto.\n *\n * @param image The original image to apply the mask to.\n *\n * @param maskImage An ImageData containing the mask. Ideally this should be\n * generated by toMask or toColoredPartMask.\n *\n * @param maskOpacity The opacity of the mask when drawing it on top of the\n * image. Defaults
 to 0.7. Should be a float between 0 and 1.\n *\n * @param maskBlurAmount How many pixels to blur the mask by. Defaults to 0.\n * Should be an integer between 0 and 20.\n *\n * @param flipHorizontal If the result should be flipped horizontally. Defaults\n * to false.\n */\nexport function drawMask(\n canvas: Canvas, image: ImageType, maskImage: ImageData|null,\n maskOpacity = 0.7, maskBlurAmount = 0, flipHorizontal = false) {\n const [height, width] = getInputSize(image);\n canvas.width = width;\n canvas.height = height;\n\n const ctx = canvas.getContext('2d');\n ctx.save();\n if (flipHorizontal) {\n flipCanvasHorizontal(canvas);\n }\n\n ctx.drawImage(image, 0, 0);\n\n ctx.globalAlpha = maskOpacity;\n if (maskImage) {\n assertSameDimensions({width, height}, maskImage, 'image', 'mask');\n\n const mask = renderImageDataToOffScreenCanvas(maskImage, CANVAS_NAMES.mask);\n\n const blurredMask = drawAndBlurImageOnOffScreenCanvas(\n mask, maskBlurAmount,
 CANVAS_NAMES.blurredMask);\n ctx.drawImage(blurredMask, 0, 0, width, height);\n }\n ctx.restore();\n}\n\n/**\n * Given an image and a maskImage of type ImageData, draws the image with the\n * pixelated mask on top of it onto a canvas.\n *\n * @param canvas The canvas to be drawn onto.\n *\n * @param image The original image to apply the mask to.\n *\n * @param maskImage An ImageData containing the mask. Ideally this should be\n * generated by toColoredPartMask.\n *\n * @param maskOpacity The opacity of the mask when drawing it on top of the\n * image. Defaults to 0.7. Should be a float between 0 and 1.\n *\n * @param maskBlurAmount How many pixels to blur the mask by. Defaults to 0.\n * Should be an integer between 0 and 20.\n *\n * @param flipHorizontal If the result should be flipped horizontally. Defaults\n * to false.\n *\n * @param

pixelCellWidth The width of each pixel cell. Default to 10 px.\n */\nexport function drawPixelatedMask(\n canvas: Canvas, image: ImageType,
maskImage: ImageData,\n maskOpacity = 0.7, maskBlurAmount = 0, flipHorizontal = false,\n pixelCellWidth = 10.0) {\n const [height, width] = getInputSize(image);\n assertSameDimensions({width, height}, maskImage, 'image', 'mask');\n\n const mask = renderImageDataToOffScreenCanvas(maskImage, CANVAS_NAMES.mask);\n const blurredMask = drawAndBlurImageOnOffScreenCanvas(\n mask, maskBlurAmount, CANVAS_NAMES.blurredMask);\n\n canvas.width = blurredMask.width;\n canvas.height = blurredMask.height;\n\n const ctx = canvas.getContext('2d');\n ctx.save();\n if (flipHorizontal) {\n flipCanvasHorizontal(canvas);\n }\n\n const offscreenCanvas =\n ensureOffscreenCanvasCreated(CANVAS_NAMES.lowresPartMask);\n const offscreenCanvasCtx = offscreenCanvas.getContext('2d');\n offscreenCanvas.width = blurredMask.width * (1.0 / pixelCellWidth);\n offscreenCanvas.height = blurredMask.height * (1.0 / pixelCellWidth);\n offscreenCanvasCtx.drawImage(\n blurredMask, 0, 0, blurredMask.width,
blurredMask.height, 0, 0,\n offscreenCanvas.width, offscreenCanvas.height);\n ctx.imageSmoothingEnabled = false;\n ctx.drawImage(\n offscreenCanvas, 0, 0, offscreenCanvas.width, offscreenCanvas.height, 0,\n 0, canvas.width, canvas.height);\n\n // Draws vertical grid lines that are `pixelCellWidth` apart from each other.\n for (let i = 0; i < offscreenCanvas.width; i++) {\n ctx.beginPath();\n ctx.strokeStyle = '#ffffff';\n ctx.moveTo(pixelCellWidth * i, 0);\n ctx.lineTo(pixelCellWidth * i, canvas.height);\n ctx.stroke();\n }\n\n // Draws horizontal grid lines that are `pixelCellWidth` apart from each\n // other.\n for (let i = 0; i < offscreenCanvas.height; i++) {\n ctx.beginPath();\n ctx.strokeStyle = '#ffffff';\n ctx.moveTo(0, pixelCellWidth * i);\n ctx.lineTo(canvas.width, pixelCellWidth * i);\n ctx.stroke();\n }\n\n ctx.globalAlpha = 1.0 - maskOpacity;\n ctx.drawImage(image, 0, 0, blurredMask.width, blurredMask.height);\n ctx.restore();\n}\n\nfunction createPersonMask(\n multiPersonSegmentation: PersonSegmentation[]|SemanticPersonSegmentation,\n edgeBlurAmount: number): Canvas {\n const backgroundMaskImage = toMask(\n multiPersonSegmentation, {r: 0, g: 0, b: 0, a: 255},\n {r: 0, g: 0, b: 0, a: 0});\n\n const backgroundMask =\n renderImageDataToOffScreenCanvas(backgroundMaskImage, CANVAS_NAMES.mask);\n if (edgeBlurAmount === 0) {\n return backgroundMask;\n } else {\n return drawAndBlurImageOnOffScreenCanvas(\n backgroundMask, edgeBlurAmount, CANVAS_NAMES.blurredMask);\n }\n}\n\n/**\n * Given a personSegmentation and an image, draws the image with its background\n * blurred onto the canvas.\n *\n * @param canvas The canvas to draw the background-blurred image onto.\n *\n * @param image The image to blur the background of and draw.\n *\n * @param personSegmentation A SemanticPersonSegmentation or an array of\n * PersonSegmentation object.\n *\n * @param backgroundBlurAmount
How many pixels in the background blend into each\n * other. Defaults to 3. Should be an integer between 1 and 20.\n *\n * @param edgeBlurAmount How many pixels to blur on the edge between the person\n * and the background by. Defaults to 3. Should be an integer between 0 and 20.\n *\n * @param flipHorizontal If the output should be flipped horizontally. Defaults\n * to false.\n */\nexport function drawBokehEffect(\n canvas: Canvas, image: ImageType,\n multiPersonSegmentation: SemanticPersonSegmentation|PersonSegmentation[],\n backgroundBlurAmount = 3, edgeBlurAmount = 3, flipHorizontal = false) {\n const blurredImage = drawAndBlurImageOnOffScreenCanvas(\n image, backgroundBlurAmount, CANVAS_NAMES.blurred);\n canvas.width = blurredImage.width;\n canvas.height = blurredImage.height;\n\n const ctx = canvas.getContext('2d');\n\n if (Array.isArray(multiPersonSegmentation) &&\n multiPersonSegmentation.length === 0) {\n ctx.drawImage(blurredImage,
0, 0);\n return;\n }\n\n const personMask = createPersonMask(multiPersonSegmentation, edgeBlurAmount);\n\n ctx.save();\n if (flipHorizontal) {\n flipCanvasHorizontal(canvas);\n }\n // draw the original image on the final canvas\n const [height, width] = getInputSize(image);\n ctx.drawImage(image, 0, 0, width, height);\n\n // \"destination-in\" - \"The existing canvas content is kept where both the\n // new shape and existing canvas content overlap. Everything else is made\n // transparent.\"\n // crop what's not the person using the mask from the original

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image\n  drawWithCompositing(ctx, personMask, 'destination-in');\n  // \"destination-over\" - \"The existing canvas content is kept where both the\n  // new shape and existing canvas content overlap. Everything else is made\n  // transparent.\"\n  // draw the blurred background on top of the original image where it doesn't\n  // overlap.\n drawWithCompositing(ctx, blurredImage, 'destination-over');\n  ctx.restore();\n}\n\nfunction
 createBodyPartMask(\n    multiPersonPartSegmentation: SemanticPartSegmentation|PartSegmentation[],\n bodyPartIdsToMask: number[], edgeBlurAmount: number): Canvas {\n  const backgroundMaskImage = toMask(\n
  multiPersonPartSegmentation, {r: 0, g: 0, b: 0, a: 0},\n      {r: 0, g: 0, b: 0, a: 255}, true, bodyPartIdsToMask);\n\n const backgroundMask =\n      renderImageDataToOffScreenCanvas(backgroundMaskImage,
CANVAS_NAMES.mask);\n  if (edgeBlurAmount === 0) {\n    return backgroundMask;\n  } else {\n    return drawAndBlurImageOnOffScreenCanvas(\n        backgroundMask, edgeBlurAmount,
CANVAS_NAMES.blurredMask);\n  }\n}\n\n/**\n * Given a personSegmentation and an image, draws the image with its background\n * blurred onto the canvas.\n *\n * @param canvas The canvas to draw the background-blurred image onto.\n *\n * @param image The image to blur the background of and draw.\n *\n * @param partSegmentation A SemanticPartSegmentation or an array of\n * PartSegmentation
 object.\n *\n * @param bodyPartIdsToBlur Default to [0, 1] (left-face and right-face). An\n * array of body part ids to blur. Each must be one of the 24 body part ids.\n *\n * @param backgroundBlurAmount How many pixels in the background blend into each\n * other.  Defaults to 3. Should be an integer between 1 and 20.\n *\n * @param edgeBlurAmount How many pixels to blur on the edge between the person\n * and the background by.  Defaults to 3. Should be an integer between 0 and 20.\n *\n * @param flipHorizontal If the output should be flipped horizontally.  Defaults\n * to false.\n */\nexport function blurBodyPart(\n    canvas: Canvas, image: ImageType,\n partSegmentation: SemanticPartSegmentation|PartSegmentation[],\n    bodyPartIdsToBlur = [0, 1], backgroundBlurAmount = 3, edgeBlurAmount = 3,\n    flipHorizontal = false) {\n  const blurredImage = drawAndBlurImageOnOffScreenCanvas(\n      image, backgroundBlurAmount, CANVAS_NAMES.blurred);\n canvas.width = blurredImage.width;\n
  canvas.height = blurredImage.height;\n\n  const ctx = canvas.getContext('2d');\n\n  if (Array.isArray(partSegmentation) && partSegmentation.length === 0) {\n    ctx.drawImage(blurredImage, 0, 0);\n return;\n  }\n  const bodyPartMask =\n      createBodyPartMask(partSegmentation, bodyPartIdsToBlur, edgeBlurAmount);\n\n  ctx.save();\n  if (flipHorizontal) {\n    flipCanvasHorizontal(canvas);\n  }\n  // draw the original image on the final canvas\n  const [height, width] = getInputSize(image);\n  ctx.drawImage(image, 0, 0, width, height);\n\n  // \"destination-in\" - \"The existing canvas content is kept where both the\n  // new shape and existing canvas content overlap. Everything else is made\n  // transparent.\"\n  // crop what's not the person using the mask from the original image\n  drawWithCompositing(ctx, bodyPartMask, 'destination-in');\n  // \"destination-over\" - \"The existing canvas content is kept where both the\n  // new shape and existing canvas content overlap. Everything else is made\n  // transparent.\"\n  // draw the blurred background on top of the original image where it doesn't\n  // overlap.\n  drawWithCompositing(ctx, blurredImage, 'destination-over');\n  ctx.restore();\n}\n","/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ========================================================================\n */\n\nexport const PART_CHANNELS: string[] = [\n
  'left_face',\n  'right_face',\n  'left_upper_arm_front',\n  'left_upper_arm_back',\n  'right_upper_arm_front',\n 'right_upper_arm_back',\n  'left_lower_arm_front',\n  'left_lower_arm_back',\n  'right_lower_arm_front',\n 'right_lower_arm_back',\n  'left_hand',\n  'right_hand',\n  'torso_front',\n  'torso_back',\n  'left_upper_leg_front',\n 'left_upper_leg_back',\n  'right_upper_leg_front',\n  'right_upper_leg_back',\n  'left_lower_leg_front',\n 'left_lower_leg_back',\n  'right_lower_leg_front',\n  'right_lower_leg_back',\n  'left_feet',\n  'right_feet'\n];\n","/**
```

@license See the LICENSE file. */\n\n// This code is auto-generated, do not modify this file!\nconst version = '2.2.0';\nexport {version};\n"],"names":["toFlattenedOneHotPartMap","partHeatmapScores","numParts","shape","partMapLocations","tf.argMax","partMapFlattened","tf.reshape","tf.oneHot","clipByMask2d","image","mask","tf.mul","toMaskTensor","segmentScores","threshold","tf.tidy","tf.cast","tf.greater","tf.scalar","decodePartSegmentation","segmentationMask","_a","partMapHeight","partMapWidth","flattenedMap","partNumbers","tf.expandDims","tf.range","tf.matMul","partMap","partMapShiftedUpForClipping","tf.add","tf.sub","decodeOnlyPartSegmentation","model","outputStride","this","inputShape","inputs","tf.util","assert","BaseModel","input","asFloat","_this","preprocessInput","asBatch","results3d","predict","map","y","tf.squeeze","namedResults","nameOutputResults","heatmapScores","tf.sigmoid","heatmap","offsets","displacementFwd","displacementBwd","segmentation","partHeatmaps","longOffsets","partOffsets","dispose","__extends","MobileNet","tf.div","results","PART_NAMES","NUM_KEYPOINTS","length","PART_IDS","reduce","result","jointName","i","CONNECTED_PART_NAMES","POSE_CHAIN","CONNECTED_PART_INDICES","jointNameA","jointNameB","getScale","_b","padding","height","width","inputResolutionY","inputResolutionX","padT","padB","getOffsetPoint","x","keypoint","get","getImageCoords","part","heatmapX","heatmapY","clamp","a","min","max","squaredDistance","y1","x1","y2","x2","dy","dx","addVectors","b","computeDistance","embedding","pose","minPartScore","distance","numKpt","p","keypoints","score","Math","position","Infinity","convertToPositionInOuput","stride","padL","scaleX","scaleY","round","getEmbedding","location","keypointIndex","convertToPosition","outputResolutionX","refineSteps","newLocation","nn","t","newPos","nn_1","matchEmbeddingToInstance","poses","numKptForMatching","_c","embed","pair","keypointsIndex","push","kMin","kMinDist","k","dist","getOutputResolution","decodeMultipleMasksCPU","posesAboveScore","inHeight","inWidth","dataArrays","Uint8Array","fill","j","n","decodeMultiplePartMasksCPU","partSegmentaion","Int32Array","decodeMultipleMasksWebGl","minKptScore","maxNumPeople","origHeight","origWidth","slice","outHeight","outWidth","shapedLongOffsets","poseVals","Float32Array","poseOffset","kp","offset","_d","posesTensor","tf.tensor","program","variableNames","outputShape","userCode","tf.backend","compileAndRun","toPersonKSegmentation","tf.equal","toPersonKPartSegmentation","bodyParts","isWebGlBackend","getBackend","decodePersonInstanceMasks","minPoseScore","minKeypointScore","filter","personSegmentations","masksTensorInfo","masksTensor","tf.engine","makeTensorFromDataId","dataId","dtype","_","Promise","all","data","personSegmentationsData","forEach","segmentationsData","longOffsetsData","decodePersonInstancePartMasks","partSegmentation","partSegmentations","partSegmentationsByPersonData","partSegmentaionData","half","floor","maxSize","getElementValue","priorityQueue","Array","numberOfElements","MaxHeap","swim","exchange","sink","less","getValueAt","scoreIsMaximumInLocalWindow","keypointId","localMaximumRadius","scores","localMaximum","yStart","yEnd","yCurrent","xStart","xEnd","xCurrent","buildPartWithScoreQueue","scoreThreshold","numKeypoints","queue","enqueue","id","parentChildrenTuples","parentJoinName","childJoinName","parentToChildEdges","childToParentEdges","getDisplacement","edgeId","point","displacements","numEdges","getStridedIndexNearPoint","traverseToTargetKeypoint","sourceKeypoint","targetKeypointId","scoresBuffer","offsetRefineStep","displacement","targetKeypoint","targetKeypointIndices","offsetPoint","targetKeyPointIndices","decodePose","root","displacementsFwd","displacementsBwd","instanceKeypoints","rootPart","rootScore","rootPoint","edge","sourceKeypointId","withinNmsRadiusOfCorrespondingPoint","squaredNmsRadius","some","correspondingKeypoint","getInstanceScore","existingPoses","kLocalMaximumRadius","decodeMultiplePoses","offsetsBuffer","displacementsFwdBuffer","displacementsBwdBuffer","maxPoseDetections","nmsRadius","empty","dequeue","imageNetMean","ResNet","RESNET50_BASE_URL","MOBILENET_BASE_URL","resNet50SavedModel","quantBytes","graphJson","mobileNetSavedModel","multiplier","toStr","1","0.75","0.5","getSizeFromImageLikeElement","offsetHeight","offsetWidth","Error","getSizeFromVideoElement","hasAttribute","videoHeight","videoWidth","getInputSize","HTMLCanvasElement","OffscreenCanvas","HTMLImageElement","ImageData","HTMLVideoElement","tf.Tensor","isValidInputResolution","resolution","toValidInputResolution","inputResolution","INTERNAL_RESOLUTION_STRING_OPTIONS","low","medium","high","full","INTERNAL_RESOLUTION_PERCENTAGES","MIN_INTERNAL_RESOLUTION","MAX_INTERNAL_RESOLUTION","toInternalResolutionPercentage","internalResolution","Object","values","join","toInputResolutionHeightAndWidth","inputHeight","inputWidth","internalResolutionPercentage","toInputTensor","tf.browser","fromPixels","resizeAndPadTo"

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TensorStorage, Backend, BackendTimer {\n refCount(dataId: DataId): number {\n   return notYetImplemented('refCount');\n }\n incRef(dataId: DataId): void {\n   return notYetImplemented('incRef');\n }\n timerAvailable(): boolean {\n   return true;\n }\n time(f: () => void): Promise<BackendTimingInfo> {\n   return notYetImplemented('time');\n }\n read(dataId: object): Promise<BackendValues> {\n   return notYetImplemented('read');\n }\n readSync(dataId: object): BackendValues {\n   return notYetImplemented('readSync');\n }\n numDataIds(): number {\n   return notYetImplemented('numDataIds');\n }\n disposeData(dataId: object, force?: boolean): boolean {\n   return notYetImplemented('disposeData');\n }\n write(values: BackendValues, shape: number[], dtype: DataType): DataId {\n   return notYetImplemented('write');\n }\n move(\n   dataId: DataId, values: BackendValues, shape: number[], dtype: DataType,\n   refCount: number): void {\n   return notYetImplemented('move');\n }\n memory(): {unreliable: boolean; reasons?: string[]} {\n   return notYetImplemented('memory');\n }\n /** Returns the highest precision for floats in bits (e.g. 16 or 32) */\n floatPrecision(): 16|32 {\n   return notYetImplemented('floatPrecision');\n }\n /** Returns the smallest representable number. */\n epsilon(): number {\n   return this.floatPrecision() === 32 ? EPSILON_FLOAT32 : EPSILON_FLOAT16;\n }\n dispose(): void {\n   return notYetImplemented('dispose');\n }\n}\n\nfunction notYetImplemented(kernelName: string): never {\n throw new Error(\n   `'${kernelName}' not yet implemented or not found in the registry. ` +\n   `This kernel may not be supported by the tfjs backend you have chosen`);\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ===\n */\n\nimport {DataType, DataTypeMap, FlatVector, NumericDataType, RecursiveArray, TensorLike, TypedArray} from\n './types';\n\n/**\n * Shuffles the array in-place using Fisher-Yates algorithm.\n *\n * ```js\n * const a = [1, 2, 3, 4, 5];\n * tf.util.shuffle(a);\n * console.log(a);\n * ```\n *\n * @param array The array to shuffle in-place.\n *\n * @doc {heading: 'Util', namespace: 'util'}\n */\n// tslint:disable-next-line:no-any\nexport function shuffle(array: any[]|Uint32Array|Int32Array|\n   Float32Array): void {\n let counter = array.length;\n let temp = 0;\n let index = 0;\n // While there are elements in the array\n while (counter > 0) {\n   // Pick a random index\n   index = (Math.random() * counter) | 0;\n   // Decrease counter by 1\n   counter--;\n   // And swap the last element with it\n   temp = array[counter];\n   array[counter] = array[index];\n   array[index] = temp;\n }\n}\n\n/**\n * Shuffles two arrays in-place the same way using Fisher-Yates algorithm.\n *\n * ```js\n * const a = [1,2,3,4,5];\n * const b = [11,22,33,44,55];\n * tf.util.shuffleCombo(a,\n b);\n * console.log(a, b);\n * ```\n *\n * @param array The first array to shuffle in-place.\n * @param array2 The second array to shuffle in-place with the same permutation\n *   as the first array.\n *\n * @doc {heading: 'Util', namespace: 'util'}\n */\n// tslint:disable-next-line:no-any\nexport function shuffleCombo(array: any[]|Uint32Array|Int32Array|Float32Array,\n// tslint:disable-next-line:no-any\n   array2: any[]|Uint32Array|Int32Array|Float32Array): void {\n\n if (array.length !== array2.length) {\n   throw Error(\n`Array sizes must match to be shuffled together ` +\n   `First array length was ${array.length}` +\n   `Second array length was ${array2.length}`);\n }\n let counter = array.length;\n let temp, temp2;\n let index = 0;\n // While there are elements in the array\n while (counter > 0) {\n   // Pick a random index\n   index = (Math.random() * counter) | 0;\n   // Decrease counter by 1\n   counter--;\n   // And swap the\n last element of each array with it\n   temp = array[counter];\n   temp2 = array2[counter];\n   array[counter] = array[index];\n   array2[counter] = array2[index];\n   array[index] = temp;\n   array2[index] = temp2;\n }\n}\n\n/** Clamps a value to a specified range. */\nexport function clamp(min: number, x: number, max: number): number {\n return Math.max(min, Math.min(x, max));\n}\n\nexport function nearestLargerEven(val: number):

number {\n return val % 2 === 0 ? val : val + 1;\n}\n\nexport function sum(arr: number[]): number {\n let sum = 0;\n for (let i = 0; i < arr.length; i++) {\n   sum += arr[i];\n }\n return sum;\n}\n\n/**\n * Returns a sample from a uniform [a, b) distribution.\n *\n * @param a The minimum support (inclusive).\n * @param b The maximum support (exclusive).\n * @return A pseudorandom number on the half-open interval [a,b).\n */\nexport function randUniform(a: number, b: number) {\n const r = Math.random();\n return (b * r) + (1 - r) * a;\n}\n\n/**\n Returns the squared Euclidean distance between two vectors. */\nexport function distSquared(a: FlatVector, b: FlatVector): number {\n let result = 0;\n for (let i = 0; i < a.length; i++) {\n   const diff = Number(a[i]) - Number(b[i]);\n   result += diff * diff;\n }\n return result;\n}\n\n/**\n * Asserts that the expression is true. Otherwise throws an error with the\n * provided message.\n *\n * ```js\n * const x = 2;\n * tf.util.assert(x === 2, 'x is not 2');\n * ```\n *\n * @param expr The expression to assert (as a boolean).\n * @param msg A function that returns the message to report when throwing an\n *   error. We use a function for performance reasons.\n *\n * @doc {heading: 'Util', namespace: 'util'}\n */\nexport function assert(expr: boolean, msg: () => string) {\n if (!expr) {\n   throw new Error(typeof msg === 'string' ? msg : msg());\n }\n}\n\nexport function assertShapesMatch(\n   shapeA: number[], shapeB: number[], errorMessagePrefix = ''): void {\n assert(\n   arraysEqual(shapeA, shapeB),\n   () => errorMessagePrefix + ` Shapes ${shapeA} and ${shapeB} must match`);\n}\n\nexport function assertNonNull(a: TensorLike): void {\n assert(\n   a != null,\n   () => `The input to the tensor constructor must be a non-null value.`);\n}\n\n// NOTE: We explicitly type out what T extends instead of any so that\n// util.flatten on a nested array of number doesn't try to infer T as a\n// number[][], causing us to explicitly type util.flatten<number>().\n/**\n * Flattens an arbitrarily nested array.\n *\n * ```js\n * const a = [[1, 2], [3, 4], [5, [6, [7]]]];\n * const flat = tf.util.flatten(a);\n * console.log(flat);\n * ```\n *\n * @param arr The nested array to flatten.\n * @param result The destination array which holds the elements.\n * @param skipTypedArray If true, avoids flattening the typed arrays. Defaults\n *   to false.\n *\n * @doc {heading: 'Util', namespace: 'util'}\n */\nexport function\nflatten<T extends number|boolean|string|Promise<number>|TypedArray>(\n   arr: T|RecursiveArray<T>, result: T[] = [], skipTypedArray = false): T[] {\n if (result == null) {\n   result = [];\n }\n if (Array.isArray(arr) || isTypedArray(arr) && !skipTypedArray) {\n   for (let i = 0; i < arr.length; ++i) {\n   flatten(arr[i], result, skipTypedArray);\n   }\n } else {\n   result.push(arr as T);\n }\n return result;\n}\n\n/**\n * Returns the size (number of elements) of the tensor given its shape.\n *\n * ```js\n * const shape = [3, 4, 2];\n * const size = tf.util.sizeFromShape(shape);\n * console.log(size);\n * ```\n *\n * @doc {heading: 'Util', namespace: 'util'}\n */\nexport function sizeFromShape(shape: number[]): number {\n if (shape.length === 0) {\n   // Scalar.\n   return 1;\n }\n let size = shape[0];\n for (let i = 1; i < shape.length; i++) {\n   size *= shape[i];\n }\n return size;\n}\n\nexport function isScalarShape(shape: number[]): boolean {\n return shape.length === 0;\n}\n\nexport function\n arraysEqual(n1: FlatVector, n2: FlatVector) {\n if (n1 === n2) {\n   return true;\n }\n if (n1 == null || n2 == null) {\n   return false;\n }\n\n if (n1.length !== n2.length) {\n   return false;\n }\n for (let i = 0; i < n1.length; i++) {\n if (n1[i] !== n2[i]) {\n   return false;\n   }\n }\n return true;\n}\n\nexport function isInt(a: number): boolean {\n return a % 1 === 0;\n}\n\nexport function tanh(x: number): number {\n // tslint:disable-next-line:no-any\n if ((Math as any).tanh != null) {\n   // tslint:disable-next-line:no-any\n   return (Math as any).tanh(x);\n }\n if (x === Infinity) {\n   return 1;\n } else if (x === -Infinity) {\n   return -1;\n } else {\n   const e2x = Math.exp(2 * x);\n   return (e2x - 1) / (e2x + 1);\n }\n}\n\nexport function sizeToSquarishShape(size: number): [number, number] {\n const width = Math.ceil(Math.sqrt(size));\n return [width, Math.ceil(size / width)];\n}\n\n/**\n * Creates a new array with randomized\n indicies to a given quantity.\n *\n * ```js\n * const randomTen = tf.util.createShuffledIndices(10);\n * console.log(randomTen);\n * ```\n *\n * @param number Quantity of how many shuffled indicies to create.\n *\n * @doc {heading: 'Util', namespace: 'util'}\n */\nexport function createShuffledIndices(n: number): Uint32Array {\n const shuffledIndices = new Uint32Array(n);\n for (let i = 0; i < n; ++i) {\n   shuffledIndices[i] = i;\n }\n shuffle(shuffledIndices);\n return shuffledIndices;\n}\n\nexport function rightPad(a: string, size: number): string {\n if (size <= a.length) {\n   return a;\n }\n return a + ' '.repeat(size - a.length);\n}\n\nexport function repeatedTry(\n   checkFn: () => boolean, delayFn = (counter: number) => 0,\n   maxCounter?: number): Promise<void> {\n return

```
new Promise<void>((resolve, reject) => {\n    let tryCount = 0;\n\n    const tryFn = () => {\n      if (checkFn()) {\n        resolve();\n        return;\n      }\n\n      tryCount++;\n\n      const nextBackoff = delayFn(tryCount);\n\n      if (maxCounter != null && tryCount >= maxCounter) {\n        reject();\n        return;\n      }\n      setTimeout(tryFn, nextBackoff);\n    };\n\n    tryFn();\n  });\n}\n\n/**\n * Given the full size of the array and a shape that may contain -1 as the\n * implicit dimension, returns the inferred shape where -1 is replaced.\n * E.g. For shape=[2, -1, 3] and size=24, it will return [2, 4, 3].\n *\n * @param shape The shape, which may contain -1 in some dimension.\n * @param size The full size (number of elements) of the array.\n * @return The inferred shape where -1 is replaced with the inferred size.\n */\nexport function inferFromImplicitShape(\n    shape: number[], size: number): number[] {\n  let shapeProd = 1;\n  let implicitIdx = -1;\n\n  for (let i = 0; i < shape.length; ++i) {\n    if (shape[i] >= 0) {\n      shapeProd *= shape[i];\n    } else if (shape[i] === -1) {\n      if (implicitIdx !== -1) {\n        throw Error(\n            `Shapes can only have 1 implicit size. ` +\n            `Found -1 at dim ${implicitIdx} and dim ${i}`);\n      }\n      implicitIdx = i;\n    } else if (shape[i] < 0) {\n      throw Error(`Shapes can not be < 0. Found ${shape[i]} at dim ${i}`);\n    }\n  }\n\n  if (implicitIdx === -1) {\n    if (size > 0 && size !== shapeProd) {\n      throw Error(`Size(${size}) must match the product of shape ${shape}`);\n    }\n    return shape;\n  }\n\n  if (shapeProd === 0) {\n    throw Error(\n        `Cannot infer the missing size in [${shape}] when ` +\n        `there are 0 elements`);\n  }\n  if (size % shapeProd !== 0) {\n    throw Error(\n        `The implicit shape can't be a fractional number. ` +\n        `Got ${size} / ${shapeProd}`);\n  }\n\n  const newShape = shape.slice();\n  newShape[implicitIdx] = size / shapeProd;\n  return newShape;\n}\n\nexport function parseAxisParam(\n    axis: number|number[], shape: number[]): number[] {\n  const rank = shape.length;\n\n  // Normalize input\n  axis = axis == null ? shape.map((s, i) => i) : [].concat(axis);\n\n  // Check for valid range\n  assert(\n      axis.every(ax => ax >= -rank && ax < rank),\n      () =>\n          `All values in axis param must be in range [-${rank}, ${rank}) but ` +\n          `got axis ${axis}`);\n\n  // Check for only integers\n  assert(\n      axis.every(ax => isInt(ax)),\n      () => `All values in axis param must be integers but ` +\n          `got axis ${axis}`);\n\n  // Handle negative axis.\n  return axis.map(a => a < 0 ? rank + a : a);\n}\n\n/** Reduces the shape by removing all dimensions of shape 1. */\nexport function squeezeShape(shape: number[], axis?: number[]):\n    {newShape: number[], keptDims: number[]} {\n  const newShape: number[] = [];\n  const keptDims: number[] = [];\n  const isEmptyArray = axis != null && Array.isArray(axis) && axis.length === 0;\n  const axes = (axis == null || isEmptyArray) ?\n      null :\n      parseAxisParam(axis, shape).sort();\n  let j = 0;\n  for (let i = 0; i < shape.length; ++i) {\n    if (axes != null) {\n      if (axes[j] === i && shape[i] !== 1) {\n        throw new Error(\n            `Can't squeeze axis ${i} since its dim '${shape[i]}' is not 1`);\n      }\n      if ((axes[j] == null || axes[j] > i) && shape[i] === 1) {\n        newShape.push(shape[i]);\n        keptDims.push(i);\n      }\n      if (axes[j] <= i) {\n        j++;\n      }\n    }\n    if (shape[i] !== 1) {\n      newShape.push(shape[i]);\n      keptDims.push(i);\n    }\n  }\n  return {newShape, keptDims};\n}\n\nexport function getTypedArrayFromDType<D extends NumericDataType>(\n    dtype: D, size: number): DataTypeMap[D] {\n  let values = null;\n  if (dtype == null || dtype === 'float32') {\n    values = new Float32Array(size);\n  } else if (dtype === 'int32') {\n    values = new Int32Array(size);\n  } else if (dtype === 'bool') {\n    values = new Uint8Array(size);\n  } else {\n    throw new Error(`Unknown data type ${dtype}`);\n  }\n  return values as DataTypeMap[D];\n}\n\nexport function getArrayFromDType<D extends DataType>(\n    dtype: D, size: number): DataTypeMap[D] {\n  let values = null;\n  if (dtype == null || dtype === 'float32') {\n    values = new Float32Array(size);\n  } else if (dtype === 'int32') {\n    values = new Int32Array(size);\n  } else if (dtype === 'bool') {\n    values = new Uint8Array(size);\n  } else if (dtype === 'string') {\n    values = new Array<'string'>(size);\n  } else {\n    throw new Error(`Unknown data type ${dtype}`);\n  }\n  return values as DataTypeMap[D];\n}\n\nexport function checkConversionForErrors<D extends DataType>(\n    vals: DataTypeMap[D]|number[], dtype: D): void {\n  for (let i = 0; i < vals.length; i++) {\n    const num = vals[i] as number;\n    if (isNaN(num) || !isFinite(num)) {\n      throw Error(`A tensor of type ${dtype} being uploaded contains ${num}.`);\n    }\n  }\n}\n\n/** Returns true if the dtype is valid. */\nexport function isValidDtype(dtype: DataType): boolean {\n  return
```

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 dtype === 'bool' || dtype === 'complex64' || dtype === 'float32' ||\n      dtype === 'int32' || dtype ===
'string';\n}\n\n/**\n * Returns true if the new type can't encode the old type without loss of\n * precision.\n
*/\nexport function hasEncodingLoss(oldType: DataType, newType: DataType): boolean {\n  if (newType ===
'complex64') {\n    return false;\n  }\n  if (newType === 'float32' && oldType !== 'complex64') {\n    return false;\n
}\n  if (newType === 'int32' && oldType !== 'float32' && oldType !== 'complex64') {\n    return false;\n  }\n  if
(newType === 'bool' && oldType === 'bool') {\n    return false;\n  }\n  return true;\n}\n\nexport function
isTypedArray(a: {}): a is Float32Array|Int32Array|Uint8Array {\n  return a instanceof Float32Array || a instanceof
Int32Array ||\n      a instanceof Uint8Array;\n}\n\nexport function bytesPerElement(dtype: DataType): number {\n
if (dtype === 'float32' || dtype === 'int32') {\n    return 4;\n  } else if (dtype === 'complex64') {\n
 return 8;\n  } else if (dtype === 'bool') {\n    return 1;\n  } else {\n    throw new Error(`Unknown dtype
${dtype}`);\n  }\n}\n\n/**\n * Returns the approximate number of bytes allocated in the string array - 2\n * bytes per
character. Computing the exact bytes for a native string in JS is\n * not possible since it depends on the encoding of
the html page that serves\n * the website.\n */\nexport function bytesFromStringArray(arr: Uint8Array[]): number
{\n  if (arr == null) {\n    return 0;\n  }\n  let bytes = 0;\n  arr.forEach(x => bytes += x.length);\n  return
bytes;\n}\n\n/** Returns true if the value is a string. */\nexport function isString(value: {}): value is string {\n
return typeof value === 'string' || value instanceof String;\n}\n\nexport function isBoolean(value: {}): boolean {\n
return typeof value === 'boolean';\n}\n\nexport function isNumber(value: {}): boolean {\n  return typeof value ===
'number';\n}\n\nexport function inferDtype(values: TensorLike): DataType {\n  if
 (Array.isArray(values)) {\n    return inferDtype(values[0]);\n  }\n  if (values instanceof Float32Array) {\n    return
'float32';\n  } else if (values instanceof Int32Array || values instanceof Uint8Array) {\n    return 'int32';\n  } else if
(isNumber(values)) {\n    return 'float32';\n  } else if (isString(values)) {\n    return 'string';\n  } else if
(isBoolean(values)) {\n    return 'bool';\n  }\n  return 'float32';\n}\n\nexport function isFunction(f: Function) {\n
return !!(f && f.constructor && f.call && f.apply);\n}\n\nexport function nearestDivisor(size: number, start:
number): number {\n  for (let i = start; i < size; ++i) {\n    if (size % i === 0) {\n      return i;\n    }\n  }\n  return
size;\n}\n\nexport function computeStrides(shape: number[]): number[] {\n  const rank = shape.length;\n  if (rank <
2) {\n    return [];\n  }\n\n  // Last dimension has implicit stride of 1, thus having D-1 (instead of D)\n  // strides.\n
const strides = new Array(rank - 1);\n  strides[rank
 - 2] = shape[rank - 1];\n  for (let i = rank - 3; i >= 0; --i) {\n    strides[i] = strides[i + 1] * shape[i + 1];\n  }\n  return
strides;\n}\n\nfunction createNestedArray(offset: number, shape: number[], a: TypedArray) {\n  const ret = new
Array();\n  if (shape.length === 1) {\n    const d = shape[0];\n    for (let i = 0; i < d; i++) {\n      ret[i] = a[offset +
i];\n    }\n  } else {\n    const d = shape[0];\n    const rest = shape.slice(1);\n    const len = rest.reduce((acc, c) => acc
* c);\n    for (let i = 0; i < d; i++) {\n      ret[i] = createNestedArray(offset + i * len, rest, a);\n    }\n  }\n  return
ret;\n}\n\n// Provide a nested array of TypedArray in given shape.\nexport function toNestedArray(shape: number[],
a: TypedArray) {\n  if (shape.length === 0) {\n    // Scalar type should return a single number.\n    return a[0];\n  }\n
const size = shape.reduce((acc, c) => acc * c);\n  if (size === 0) {\n    // A tensor with shape zero should be turned
into empty list.\n    return
 [];\n  }\n  if (size !== a.length) {\n    throw new Error(`[${shape}] does not match the input size ${a.length}.`);\n
}\n\n  return createNestedArray(0, shape, a);\n}\n\nexport function makeOnesTypedArray<D extends DataType>(\n
  size: number, dtype: D): DataTypeMap[D] {\n  const array = makeZerosTypedArray(size, dtype);\n  for (let i = 0; i
< array.length; i++) {\n    array[i] = 1;\n  }\n  return array;\n}\n\nexport function makeZerosTypedArray<D extends
DataType>(\n    size: number, dtype: D): DataTypeMap[D] {\n  if (dtype == null || dtype === 'float32' || dtype ===
'complex64') {\n    return new Float32Array(size) as DataTypeMap[D];\n  } else if (dtype === 'int32') {\n    return
new Int32Array(size) as DataTypeMap[D];\n  } else if (dtype === 'bool') {\n    return new Uint8Array(size) as
DataTypeMap[D];\n  } else {\n    throw new Error(`Unknown data type ${dtype}`);\n  }\n}\n\n/**\n * Make nested
`TypedArray` filled with zeros.\n * @param shape The shape information for the nested
 array.\n * @param dtype dtype of the array element.\n */\nexport function makeZerosNestedTypedArray<D
extends DataType>(\n    shape: number[], dtype: D) {\n  const size = shape.reduce((prev, curr) => prev * curr, 1);\n
if (dtype == null || dtype === 'float32') {\n    return toNestedArray(shape, new Float32Array(size));\n  } else if
```

(dtype === 'int32') {\n return toNestedArray(shape, new Int32Array(size));\n } else if (dtype === 'bool') {\n return toNestedArray(shape, new Uint8Array(size));\n } else {\n throw new Error(`Unknown data type ${dtype}`);\n }\n}\n\nexport function assertNonNegativeIntegerDimensions(shape: number[]) {\n shape.forEach(dimSize => {\n assert(\n   Number.isInteger(dimSize) && dimSize >= 0,\n   () =>\n `Tensor must have a shape comprised of positive integers but got ` +\n   `shape [${shape}].`);\n });\n}\n\n/**\n * Computes flat index for a given location (multidimentionsal index) in a\n * Tensor/multidimensional
 array.\n *\n * @param locs Location in the tensor.\n * @param rank Rank of the tensor.\n * @param strides Tensor strides.\n */\nexport function locToIndex(\n locs: number[], rank: number, strides: number[]): number {\n if (rank === 0) {\n return 0;\n } else if (rank === 1) {\n return locs[0];\n }\n let index = locs[locs.length - 1];\n for (let i = 0; i < locs.length - 1; ++i) {\n index += strides[i] * locs[i];\n }\n return index;\n}\n\n/**\n * Computes the location (multidimensional index) in a tensor/multidimentional\n * array for a given flat index.\n *\n * @param index Index in flat array.\n * @param rank Rank of tensor.\n * @param strides Strides of tensor.\n */\nexport function indexToLoc(\n index: number, rank: number, strides: number[]): number[] {\n if (rank === 0) {\n return [];\n } else if (rank === 1) {\n return [index];\n }\n const locs: number[] = new Array(rank);\n for (let i = 0; i < locs.length - 1; ++i) {\n locs[i] = Math.floor(index
 / strides[i]);\n index -= locs[i] * strides[i];\n }\n locs[locs.length - 1] = index;\n return locs;\n}\n\n/**\n * This method asserts whether an object is a Promise instance.\n * @param object\n */\n// tslint:disable-next-line: no-any\nexport function isPromise(object: any) {\n // We chose to not use 'obj instanceOf Promise' for two reasons:\n // 1. It only reliably works for es6 Promise, not other Promise\n // implementations.\n // 2. It doesn't work with framework that uses zone.js. zone.js monkey patch\n // the async calls, so it is possible the obj (patched) is comparing to a\n // pre-patched Promise.\n return object && object.then && typeof object.then === 'function';\n}\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {Platform} from './platforms/platform';\nimport {isPromise} from './util_base';\n\n// Expects flags from URL in the format ?tfjsflags=FLAG1:1,FLAG2:true.\nconst TENSORFLOWJS_FLAGS_PREFIX = 'tfjsflags';\n\ntype FlagValue = number|boolean;\ntype FlagEvaluationFn = (() => FlagValue)|(() => Promise<FlagValue>);\nexport type Flags = {\n [featureName: string]: FlagValue\n};\nexport type FlagRegistryEntry = {\n evaluationFn: FlagEvaluationFn;\n setHook?: (value: FlagValue) => void;\n};\n\n/**\n * The environment contains evaluated flags as well as the registered
 platform.\n * This is always used as a global singleton and can be retrieved with\n * `tf.env()`.\n *\n * @doc {heading: 'Environment'}\n */\nexport class Environment {\n private flags: Flags = {};\n private flagRegistry: {[flagName: string]: FlagRegistryEntry} = {};\n\n private urlFlags: Flags = {};\n\n platformName: string;\n platform: Platform;\n\n // tslint:disable-next-line: no-any\n constructor(public global: any) {\n this.populateURLFlags();\n }\n\n setPlatform(platformName: string, platform: Platform) {\n if (this.platform != null) {\n console.warn(\n   `Platform ${this.platformName} has already been set. ` +\n   `Overwriting the platform with ${platform}.`);\n }\n this.platformName = platformName;\n this.platform = platform;\n }\n\n registerFlag(\n flagName: string, evaluationFn: FlagEvaluationFn,\n setHook?: (value: FlagValue) => void) {\n this.flagRegistry[flagName] = {evaluationFn, setHook};\n\n // Override
 the flag value from the URL. This has to happen here because the\n // environment is initialized before flags get registered.\n if (this.urlFlags[flagName] != null) {\n const flagValue = this.urlFlags[flagName];\n console.warn(\n   `Setting feature override from URL ${flagName}: ${flagValue}.`);\n this.set(flagName,

flagValue);\n }\n }\n\n async getAsync(flagName: string): Promise<FlagValue> {\n if (flagName in this.flags) {\n return this.flags[flagName];\n }\n\n this.flags[flagName] = await this.evaluateFlag(flagName);\n return this.flags[flagName];\n }\n\n get(flagName: string): FlagValue {\n if (flagName in this.flags) {\n return this.flags[flagName];\n }\n\n const flagValue = this.evaluateFlag(flagName);\n if (isPromise(flagValue)) {\n throw new Error(\n `Flag ${flagName} cannot be synchronously evaluated. ` +\n `Please use getAsync() instead.`);\n }\n\n this.flags[flagName] = flagValue
 as number | boolean;\n\n return this.flags[flagName];\n }\n\n getNumber(flagName: string): number {\n return this.get(flagName) as number;\n }\n\n getBool(flagName: string): boolean {\n return this.get(flagName) as boolean;\n }\n\n getFlags(): Flags {\n return this.flags;\n }\n // For backwards compatibility.\n get features(): Flags {\n return this.flags;\n }\n\n set(flagName: string, value: FlagValue): void {\n if (this.flagRegistry[flagName] == null) {\n throw new Error(\n `Cannot set flag ${flagName} as it has not been registered.`);\n }\n this.flags[flagName] = value;\n if (this.flagRegistry[flagName].setHook != null) {\n this.flagRegistry[flagName].setHook(value);\n }\n }\n\n private evaluateFlag(flagName: string): FlagValue|Promise<FlagValue> {\n if (this.flagRegistry[flagName] == null) {\n throw new Error(\n `Cannot evaluate flag '${flagName}': no evaluation function found.`);\n }\n return this.flagRegistry[flagName].evaluationFn();\n
 }\n\n setFlags(flags: Flags) {\n this.flags = Object.assign({}, flags);\n }\n\n reset() {\n this.flags = {};\n this.urlFlags = {};\n this.populateURLFlags();\n }\n\n private populateURLFlags(): void {\n if (typeof this.global === 'undefined' ||\n typeof this.global.location === 'undefined' ||\n typeof this.global.location.search === 'undefined') {\n return;\n }\n\n const urlParams = getQueryParams(this.global.location.search);\n if (TENSORFLOWJS_FLAGS_PREFIX in urlParams) {\n const keyValues = urlParams[TENSORFLOWJS_FLAGS_PREFIX].split(',');\n keyValues.forEach(keyValue => {\n const [key, value] = keyValue.split(':') as [string, string];\n this.urlFlags[key] = parseValue(key, value);\n });\n }\n }\n}\n\nexport function getQueryParams(queryString: string): {[key: string]: string} {\n const params = {};\n queryString.replace(/[?&]([^=?&]+)(?:=([^&]*))?/g, (s, ...t)
 => {\n decodeParam(params, t[0], t[1]);\n return t.join('=');\n });\n return params;\n}\n\nfunction decodeParam(\n params: {[key: string]: string}, name: string, value?: string) {\n params[decodeURIComponent(name)] = decodeURIComponent(value || '');\n}\n\nfunction parseValue(flagName: string, value: string): FlagValue {\n value = value.toLowerCase();\n if (value === 'true' || value === 'false') {\n return value === 'true';\n } else if (`${+ value}` === value) {\n return +value;\n }\n throw new Error(\n `Could not parse value flag value ${value} for flag ${flagName}.`);\n}\n\n/**\n * Returns the current environment (a global singleton).\n *\n * The environment object contains the evaluated feature values as well as the\n * active platform.\n *\n * @doc {heading: 'Environment'}\n */\nexport function env() {\n return ENV;\n}\n\nexport let ENV: Environment = null;\nexport function setEnvironmentGlobal(environment: Environment) {\n ENV = environment;\n}\n","//
 shim for using process in browser\nvar process = module.exports = {};\n\n// cached from whatever global is present so that test runners that stub it\n// don't break things. But we need to wrap it in a try catch in case it is\n// wrapped in strict mode code which doesn't define any globals. It's inside a\n// function because try/catches deoptimize in certain engines.\n\nvar cachedSetTimeout;\nvar cachedClearTimeout;\n\nfunction defaultSetTimout() {\n throw new Error('setTimeout has not been defined');\n}\nfunction defaultClearTimeout () {\n throw new Error('clearTimeout has not been defined');\n}\n(function () {\n try {\n if (typeof setTimeout === 'function') {\n cachedSetTimeout = setTimeout;\n } else {\n cachedSetTimeout = defaultSetTimout;\n }\n } catch (e) {\n cachedSetTimeout = defaultSetTimout;\n }\n try {\n if (typeof clearTimeout === 'function') {\n cachedClearTimeout = clearTimeout;\n
  } else {\n cachedClearTimeout = defaultClearTimeout;\n }\n } catch (e) {\n cachedClearTimeout = defaultClearTimeout;\n }\n} ())\nfunction runTimeout(fun) {\n if (cachedSetTimeout === setTimeout) {\n //normal enviroments in sane situations\n return setTimeout(fun, 0);\n }\n // if setTimeout wasn't available but was latter defined\n if ((cachedSetTimeout === defaultSetTimout ||

!cachedSetTimeout) && setTimeout) {\n cachedSetTimeout = setTimeout;\n return setTimeout(fun, 0);\n }\n try {\n // when when somebody has screwed with setTimeout but no I.E. maddness\n return cachedSetTimeout(fun, 0);\n } catch(e){\n try {\n // When we are in I.E. but the script has been evaled so I.E. doesn't trust the global object when called normally\n return cachedSetTimeout.call(null, fun, 0);\n } catch(e){\n // same as above but when it's a version of I.E. that must have the global object for 'this', hopfully our context correct otherwise it will throw a global error\n return cachedSetTimeout.call(this, fun, 0);\n }\n }\n\n\n}\nfunction runClearTimeout(marker) {\n if (cachedClearTimeout === clearTimeout) {\n //normal enviroments in sane situations\n return clearTimeout(marker);\n }\n // if clearTimeout wasn't available but was latter defined\n if ((cachedClearTimeout === defaultClearTimeout || !cachedClearTimeout) && clearTimeout) {\n cachedClearTimeout = clearTimeout;\n return clearTimeout(marker);\n }\n try {\n // when when somebody has screwed with setTimeout but no I.E. maddness\n return cachedClearTimeout(marker);\n } catch (e){\n try {\n // When we are in I.E. but the script has been evaled so I.E. doesn't trust the global object when called normally\n return cachedClearTimeout.call(null, marker);\n } catch (e){\n // same as above but when it's a version of I.E. that must have the global object for 'this', hopfully our context correct otherwise it will throw a global error.\n // Some versions of I.E. have different rules for clearTimeout vs setTimeout\n return cachedClearTimeout.call(this, marker);\n }\n }\n\n\n\n}\nvar queue = [];\nvar draining = false;\nvar currentQueue;\nvar queueIndex = -1;\n\nfunction cleanUpNextTick() {\n if (!draining || !currentQueue) {\n return;\n }\n draining = false;\n if (currentQueue.length) {\n queue = currentQueue.concat(queue);\n } else {\n queueIndex = -1;\n }\n if (queue.length) {\n drainQueue();\n }\n}\n\nfunction drainQueue() {\n if (draining) {\n return;\n }\n var timeout = runTimeout(cleanUpNextTick);\n draining = true;\n\n var len = queue.length;\n while(len) {\n currentQueue = queue;\n queue = [];\n while (++queueIndex < len) {\n if (currentQueue) {\n currentQueue[queueIndex].run();\n }\n }\n queueIndex = -1;\n len = queue.length;\n }\n currentQueue = null;\n draining = false;\n runClearTimeout(timeout);\n}\n\nprocess.nextTick = function (fun) {\n var args = new Array(arguments.length - 1);\n if (arguments.length > 1) {\n for (var i = 1; i < arguments.length; i++) {\n args[i - 1] = arguments[i];\n }\n }\n queue.push(new Item(fun, args));\n if (queue.length === 1 && !draining) {\n runTimeout(drainQueue);\n }\n};\n\n// v8 likes predictible objects\nfunction Item(fun, array) {\n this.fun = fun;\n this.array = array;\n}\nItem.prototype.run = function () {\n this.fun.apply(null, this.array);\n};\nprocess.title = 'browser';\nprocess.browser = true;\nprocess.env = {};\nprocess.argv = [];\nprocess.version = ''; // empty string to avoid regexp issues\nprocess.versions = {};\n\nfunction noop() {}\n\nprocess.on = noop;\nprocess.addListener = noop;\nprocess.once = noop;\nprocess.off = noop;\nprocess.removeListener = noop;\nprocess.removeAllListeners = noop;\nprocess.emit = noop;\nprocess.prependListener = noop;\nprocess.prependOnceListener = noop;\n\nprocess.listeners = function (name) { return [] }\n\nprocess.binding = function (name) {\n throw new Error('process.binding is not supported');\n};\n\nprocess.cwd = function () { return '/' };\nprocess.chdir = function (dir) {\n throw new Error('process.chdir is not supported');\n};\nprocess.umask = function() { return 0; };\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\n// Note that the identifier globalNameSpace is scoped to this module, but will\n// always resolve to the same global object regardless of how the module is\n// resolved.\n// tslint:disable-next-line:no-any\nlet globalNameSpace:

{_tfGlobals: Map<string, any>};\n// tslint:disable-next-line:no-any\nexport function getGlobalNamespace(): {_tfGlobals: Map<string, any>} {\n if (globalNameSpace == null) {\n   // tslint:disable-next-line:no-any\n   let ns: any;\n   if (typeof (window) !== 'undefined') {\n   ns = window;\n   } else if (typeof (global) !== 'undefined') {\n   ns = global;\n   } else if (typeof (process) !== 'undefined') {\n   ns = process;\n   } else if (typeof (self) !== 'undefined') {\n   ns = self;\n   } else {\n   throw new Error('Could not find a global object');\n   }\n   globalNameSpace = ns;\n }\n return globalNameSpace;\n}\n\n// tslint:disable-next-line:no-any\nfunction getGlobalMap(): Map<string, any> {\n const ns = getGlobalNamespace();\n if (ns._tfGlobals == null) {\n   ns._tfGlobals = new Map();\n }\n return ns._tfGlobals;\n}\n\n/**\n * Returns a globally accessible 'singleton' object.\n *\n * @param key the name of the object\n * @param init a function to initialize to initialize this object\n *   the first time it is fetched.\n */\nexport function getGlobal<T>(key: string, init: () => T): T {\n const globalMap = getGlobalMap();\n if (globalMap.has(key)) {\n   return globalMap.get(key);\n } else {\n   const singleton = init();\n   globalMap.set(key, singleton);\n   return globalMap.get(key);\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n
 * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n//
Allow UpperCamelCase variable names\n// tslint:disable: variable-name\n// Unfortunately just enabling PascalCase per file (tslint:enable:\n// allow-pascal-case) doesn't work.\nimport {NamedTensorInfoMap, TensorInfo} from './kernel_registry';\nimport {ExplicitPadding} from './ops/conv_util';\nimport {Activation} from './ops/fused_types';\nimport
 {DataType, PixelData} from './types';\n\nexport const Abs = 'Abs';\nexport type AbsInputs = UnaryInputs;\n\nexport const Acos = 'Acos';\nexport type AcosInputs = UnaryInputs;\n\nexport const Acosh = 'Acosh';\nexport type AcoshInputs = UnaryInputs;\n\nexport const Add = 'Add';\nexport type AddInputs = BinaryInputs;\n\nexport const AddN = 'AddN';\nexport type AddNInputs = TensorInfo[];\n\nexport const All = 'All';\nexport type AllInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface AllAttrs {\n axis: number|number[];\n keepDims: boolean;\n}\n\nexport const Any = 'Any';\nexport type AnyInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface AnyAttrs {\n axis: number|number[];\n keepDims: boolean;\n}\n\nexport const ArgMax = 'ArgMax';\nexport type ArgMaxInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface ArgMaxAttrs {\n axis: number;\n}\n\nexport const ArgMin = 'ArgMin';\nexport type ArgMinInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface ArgMinAttrs {\n axis: number;\n}\n\nexport const Asin = 'Asin';\nexport type AsinInputs = UnaryInputs;\n\nexport const Asinh = 'Asinh';\nexport type AsinhInputs = UnaryInputs;\n\nexport const Atan = 'Atan';\nexport type AtanInputs = UnaryInputs;\n\nexport const Atanh = 'Atanh';\nexport type AtanhInputs = UnaryInputs;\n\nexport const Atan2 = 'Atan2';\nexport type Atan2Inputs = BinaryInputs;\n\nexport const AvgPool = 'AvgPool';\nexport type AvgPoolInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface AvgPoolAttrs {\n filterSize: [number, number]|number;\n strides: [number, number]|number;\n pad: 'valid'|'same'|number;\n dimRoundingMode?: 'floor'|'round'|'ceil';\n}\n\nexport const AvgPoolGrad = 'AvgPoolGrad';\nexport type AvgPoolGradInputs = Pick<NamedTensorInfoMap, 'dy'|'input'>;\nexport interface AvgPoolGradAttrs {\n filterSize: [number, number]|number;\n strides: [number, number]|number;\n pad: 'valid'|'same'|number;\n}\n\nexport const AvgPool3D = 'AvgPool3D';\nexport type AvgPool3DInputs = Pick<NamedTensorInfoMap,
 'x'>;\nexport interface AvgPool3DAttrs {\n filterSize: [number, number, number]|number;\n strides: [number, number, number]|number;\n pad: 'valid'|'same'|number;\n dimRoundingMode?: 'floor'|'round'|'ceil';\n dataFormat: 'NDHWC'|'NCDHW';\n}\n\nexport const AvgPool3DGrad = 'AvgPool3DGrad';\nexport type AvgPool3DGradInputs = Pick<NamedTensorInfoMap, 'dy'|'input'>;\nexport interface AvgPool3DGradAttrs {\n

filterSize: [number, number, number]|number;\n strides: [number, number, number]|number;\n pad: 'valid'|'same'|number;\n dimRoundingMode?: 'floor'|'round'|'ceil';\n}\n\nexport const BatchMatMul = 'BatchMatMul';\nexport type BatchMatMulInputs = Pick<NamedTensorInfoMap, 'a'|'b'>;\nexport interface BatchMatMulAttrs {\n transposeA: boolean;\n transposeB: boolean;\n}\n\nexport const BatchToSpaceND = 'BatchToSpaceND';\nexport type BatchToSpaceNDInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface BatchToSpaceNDAttrs {\n blockShape: number[];\n crops: number[][];\n}\n\nexport type BinaryInputs = Pick<NamedTensorInfoMap, 'a'|'b'>;\n\nexport const Bincount = 'Bincount';\nexport type BincountInputs = Pick<NamedTensorInfoMap, 'x'|'weights'>;\nexport interface BincountAttrs {\n size: number;\n}\n\nexport const BroadcastTo = 'BroadcastTo';\nexport type BroadcastToInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface BroadCastToAttrs {\n shape: number[];\n inputShape: number[]; // for gradient\n}\n\nexport const Cast = 'Cast';\nexport type CastInputs = UnaryInputs;\nexport interface CastAttrs {\n dtype: DataType;\n}\n\nexport const Ceil = 'Ceil';\nexport type CeilInputs = UnaryInputs;\n\nexport const ClipByValue = 'ClipByValue';\nexport type ClipByValueInputs = UnaryInputs;\nexport interface ClipByValueAttrs {\n clipValueMin: number;\n clipValueMax: number;\n}\n\nexport const Complex = 'Complex';\nexport type ComplexInputs = Pick<NamedTensorInfoMap, 'real'|'imag'>;\n\nexport const ComplexAbs = 'ComplexAbs';\nexport type ComplexAbsInputs = UnaryInputs;\n\nexport const Concat = 'Concat';\nexport type ConcatInputs = TensorInfo[];\nexport interface ConcatAttrs {\n axis: number;\n}\n\nexport const Conv2D = 'Conv2D';\nexport type Conv2DInputs = Pick<NamedTensorInfoMap, 'x'|'filter'>;\nexport interface Conv2DAttrs {\n strides: [number, number]|number;\n pad: 'valid'|'same'|number|ExplicitPadding;\n dataFormat: 'NHWC'|'NCHW';\n dilations: [number, number]|number;\n dimRoundingMode?: 'floor'|'round'|'ceil';\n}\n\nexport const Conv2DBackpropFilter = 'Conv2DBackpropFilter';\nexport type Conv2DBackpropFilterInputs = Pick<NamedTensorInfoMap, 'x'|'dy'>;\nexport interface Conv2DBackpropFilterAttrs {\n strides: [number, number]|number;\n pad: 'valid'|'same'|number|ExplicitPadding;\n dataFormat: 'NHWC'|'NCHW';\n dimRoundingMode?: 'floor'|'round'|'ceil';\n filterShape: [number, number, number, number];\n}\n\nexport const Conv2DBackpropInput = 'Conv2DBackpropInput';\nexport type Conv2DBackpropInputInputs = Pick<NamedTensorInfoMap, 'dy'|'filter'>;\nexport interface Conv2DBackpropInputAttrs {\n strides: [number, number]|number;\n pad: 'valid'|'same'|number|ExplicitPadding;\n dataFormat: 'NHWC'|'NCHW';\n dimRoundingMode?: 'floor'|'round'|'ceil';\n inputShape: [number, number, number, number];\n}\n\nexport const Conv3D = 'Conv3D';\nexport type Conv3DInputs = Pick<NamedTensorInfoMap, 'x'|'filter'>;\nexport interface Conv3DAttrs {\n strides: [number, number, number]|number;\n pad: 'valid'|'same';\n dataFormat: 'NDHWC'|'NCDHW';\n dilations: [number, number, number]|number;\n}\n\nexport const Conv3DBackpropFilterV2 = 'Conv3DBackpropFilterV2';\nexport type Conv3DBackpropFilterV2Inputs = Pick<NamedTensorInfoMap, 'x'|'dy'>;\n\nexport interface Conv3DBackpropFilterV2Attrs {\n strides: [number, number, number]|number;\n pad: 'valid'|'same';\n filterShape: [number, number, number, number, number];\n}\n\nexport const Conv3DBackpropInputV2 = 'Conv3DBackpropInputV2';\nexport type Conv3DBackpropInputV2Inputs =\n   Pick<NamedTensorInfoMap, 'dy'|'filter'>;\nexport interface Conv3DBackpropInputV2Attrs {\n strides: [number, number, number]|number;\n pad: 'valid'|'same';\n inputShape: [number, number, number, number, number];\n}\n\nexport const Cos = 'Cos';\nexport type CosInputs = UnaryInputs;\n\nexport const Cosh = 'Cosh';\nexport type CoshInputs = UnaryInputs;\n\nexport const Cumsum = 'Cumsum';\nexport type CumsumInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface CumsumAttrs {\n axis: number;\n exclusive: boolean;\n reverse: boolean;\n}\n\nexport const CropAndResize = 'CropAndResize';\nexport type CropAndResizeInputs =\n Pick<NamedTensorInfoMap, 'image'|'boxes'|'boxInd'>;\nexport interface CropAndResizeAttrs {\n cropSize: [number, number];\n method: 'bilinear'|'nearest';\n extrapolationValue: number;\n}\n\nexport const DenseBincount = 'DenseBincount';\nexport type DenseBincountInputs = Pick<NamedTensorInfoMap, 'x'|'weights'>;\nexport interface DenseBincountAttrs {\n size: number;\n binaryOutput?: boolean;\n}\n\nexport const DepthToSpace = 'DepthToSpace';\nexport type DepthToSpaceInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface DepthToSpaceAttrs {\n blockSize:

number;\n dataFormat: 'NHWC'|'NCHW';\n}\n\nexport const DepthwiseConv2dNative = 'DepthwiseConv2dNative';\nexport type DepthwiseConv2dNativeInputs =\n   Pick<NamedTensorInfoMap, 'x'|'filter'>;\nexport interface DepthwiseConv2dNativeAttrs {\n strides: [number, number]|number;\n pad: 'valid'|'same'|number;\n dataFormat: 'NHWC'|'NCHW';\n dilations: [number, number]|number;\n dimRoundingMode?: 'floor'|'round'|'ceil';\n}\n\nexport const DepthwiseConv2dNativeBackpropFilter =\n 'DepthwiseConv2dNativeBackpropFilter';\nexport type DepthwiseConv2dNativeBackpropFilterInputs =\n Pick<NamedTensorInfoMap, 'x'|'dy'>;\nexport interface DepthwiseConv2dNativeBackpropFilterAttrs {\n strides: [number, number]|number;\n dilations: [number, number]|number;\n pad: 'valid'|'same'|number;\n dimRoundingMode?:
 'floor'|'round'|'ceil';\n filterShape: [number, number, number, number];\n}\n\nexport const DepthwiseConv2dNativeBackpropInput =\n   'DepthwiseConv2dNativeBackpropInput';\nexport type DepthwiseConv2dNativeBackpropInputInputs =\n   Pick<NamedTensorInfoMap, 'dy'|'filter'>;\nexport interface DepthwiseConv2dNativeBackpropInputAttrs {\n strides: [number, number]|number;\n dilations: [number, number]|number;\n pad: 'valid'|'same'|number;\n dimRoundingMode?: 'floor'|'round'|'ceil';\n inputShape: [number, number, number, number];\n}\n\nexport const Diag = 'Diag';\nexport type DiagInputs = Pick<NamedTensorInfoMap, 'x'>;\n\nexport const Dilation2D = 'Dilation2D';\nexport type Dilation2DInputs = Pick<NamedTensorInfoMap, 'x'|'filter'>;\nexport interface Dilation2DAttrs {\n strides: [number, number]|number;\n pad: 'valid'|'same'|number;\n dilations: [number, number]|number;\n}\n\nexport const Dilation2DBackpropInput = 'Dilation2DBackpropInput';\nexport type Dilation2DBackpropInputInputs
 =\n   Pick<NamedTensorInfoMap, 'x'|'filter'|'dy'>;\n\nexport const Dilation2DBackpropFilter = 'Dilation2DBackpropFilter';\nexport type Dilation2DBackpropFilterInputs =\n   Pick<NamedTensorInfoMap, 'x'|'filter'|'dy'>;\n\nexport const RealDiv = 'RealDiv';\nexport type RealDivInputs = BinaryInputs;\n\nexport const Elu = 'Elu';\nexport type EluInputs = Pick<NamedTensorInfoMap, 'x'>;\n\nexport const EluGrad = 'EluGrad';\nexport type EluGradInputs = Pick<NamedTensorInfoMap, 'dy'|'y'>;\n\nexport const Erf = 'Erf';\nexport type ErfInputs = UnaryInputs;\n\nexport const Equal = 'Equal';\nexport type EqualInputs = BinaryInputs;\n\nexport const Exp = 'Exp';\nexport type ExpInputs = UnaryInputs;\n\nexport const ExpandDims = 'ExpandDims';\nexport type ExpandDimsInputs = Pick<NamedTensorInfoMap, 'input'>;\nexport interface ExpandDimsAttrs {\n dim: number;\n}\n\nexport const Expm1 = 'Expm1';\nexport type Expm1Inputs = UnaryInputs;\n\nexport const FFT = 'FFT';\nexport type FFTInputs =
 Pick<NamedTensorInfoMap, 'input'>;\n\nexport const Fill = 'Fill';\nexport interface FillAttrs {\n shape: number[];\n value: number|string;\n dtype: DataType;\n}\n\nexport const FlipLeftRight = 'FlipLeftRight';\nexport type FlipLeftRightInputs = Pick<NamedTensorInfoMap, 'image'>;\n\nexport const Floor = 'Floor';\nexport type FloorInputs = UnaryInputs;\n\nexport const FloorDiv = 'FloorDiv';\nexport type FloorDivInputs = BinaryInputs;\n\nexport const FusedBatchNorm = 'FusedBatchNorm';\nexport type FusedBatchNormInputs =\n Pick<NamedTensorInfoMap, 'x'|'scale'|'offset'|'mean'|'variance'>;\nexport interface FusedBatchNormAttrs {\n varianceEpsilon: number;\n}\n\nexport const GatherV2 = 'GatherV2';\nexport type GatherV2Inputs = Pick<NamedTensorInfoMap, 'x'|'indices'>;\nexport interface GatherV2Attrs {\n axis: number;\n batchDims: number;\n}\n\nexport const GatherNd = 'GatherNd';\nexport type GatherNdInputs = Pick<NamedTensorInfoMap, 'params'|'indices'>;\n\nexport const Greater = 'Greater';\nexport
 type GreaterInputs = BinaryInputs;\n\nexport const GreaterEqual = 'GreaterEqual';\nexport type GreaterEqualInputs = BinaryInputs;\n\nexport const Identity = 'Identity';\nexport type IdentityInputs = Pick<NamedTensorInfoMap, 'x'>;\n\nexport const IFFT = 'IFFT';\nexport type IFFTInputs = Pick<NamedTensorInfoMap, 'input'>;\n\nexport const Imag = 'Imag';\nexport type ImagInputs = Pick<NamedTensorInfoMap, 'input'>;\n\nexport const IsFinite = 'IsFinite';\nexport type IsFiniteInputs = UnaryInputs;\n\nexport const IsInf = 'IsInf';\nexport type IsInfInputs = UnaryInputs;\n\nexport const IsNan = 'IsNan';\nexport type IsNanInputs = UnaryInputs;\n\nexport const LeakyRelu = 'LeakyRelu';\nexport type LeakyReluInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface LeakyReluAttrs {\n alpha: number;\n}\n\nexport const Less = 'Less';\nexport type LessInputs = BinaryInputs;\n\nexport const LessEqual = 'LessEqual';\nexport type LessEqualInputs = BinaryInputs;\n\nexport const LinSpace =

'LinSpace';\nexport interface LinSpaceAttrs {\n start: number;\n stop: number;\n num: number;\n}\nexport const Log = 'Log';\nexport type LogInputs = UnaryInputs;\n\nexport const Log1p = 'Log1p';\nexport type Log1pInputs = UnaryInputs;\n\nexport const LogicalAnd = 'LogicalAnd';\nexport type LogicalAndInputs = BinaryInputs;\n\nexport const LogicalNot = 'LogicalNot';\nexport type LogicalNotInputs = Pick<NamedTensorInfoMap, 'x'>;\n\nexport const LogicalOr = 'LogicalOr';\nexport type LogicalOrInputs = BinaryInputs;\n\nexport const LogSoftmax = 'LogSoftmax';\nexport type LogSoftmaxInputs = Pick<NamedTensorInfoMap, 'logits'>;\nexport interface LogSoftmaxAttrs {\n axis: number;\n}\n\nexport const LRN = 'LRN';\nexport type LRNInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface LRNAttrs {\n depthRadius: number;\n bias: number;\n alpha: number;\n beta: number;\n}\n\nexport const LRNGrad = 'LRNGrad';\nexport type LRNGradInputs = Pick<NamedTensorInfoMap, 'x'|'y'|'dy'>;\nexport interface
LRNGradAttrs {\n depthRadius: number;\n bias: number;\n alpha: number;\n beta: number;\n}\n\nexport const Max = 'Max';\nexport type MaxInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface MaxAttrs {\n reductionIndices: number|number[];\n keepDims: boolean;\n}\n\nexport const Maximum = 'Maximum';\nexport type MaximumInputs = BinaryInputs;\n\nexport const MaxPool = 'MaxPool';\nexport type MaxPoolInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface MaxPoolAttrs {\n filterSize: [number, number]|number;\n strides: [number, number]|number;\n pad: 'valid'|'same'|number;\n dimRoundingMode?: 'floor'|'round'|'ceil';\n}\n\nexport const MaxPoolGrad = 'MaxPoolGrad';\nexport type MaxPoolGradInputs = Pick<NamedTensorInfoMap, 'dy'|'input'|'output'>;\nexport interface MaxPoolGradAttrs {\n filterSize: [number, number]|number;\n strides: [number, number]|number;\n pad: 'valid'|'same'|number;\n dimRoundingMode?: 'floor'|'round'|'ceil';\n}\n\nexport const MaxPool3D = 'MaxPool3D';\nexport
type MaxPool3DInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface MaxPool3DAttrs {\n filterSize: [number, number, number]|number;\n strides: [number, number, number]|number;\n pad: 'valid'|'same'|number;\n dataFormat: 'NDHWC'|'NCDHW';\n dimRoundingMode?: 'floor'|'round'|'ceil';\n}\n\nexport const MaxPool3DGrad = 'MaxPool3DGrad';\nexport type MaxPool3DGradInputs =\n   Pick<NamedTensorInfoMap, 'dy'|'input'|'output'>;\nexport interface MaxPool3DGradAttrs {\n filterSize: [number, number, number]|number;\n strides: [number, number, number]|number;\n pad: 'valid'|'same'|number;\n dimRoundingMode?: 'floor'|'round'|'ceil';\n}\n\nexport const MaxPoolWithArgmax = 'MaxPoolWithArgmax';\nexport type MaxPoolWithArgmaxInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface MaxPoolWithArgmaxAttrs {\n filterSize: [number, number]|number;\n strides: [number, number]|number;\n pad: 'valid'|'same'|number;\n includeBatchInIndex: boolean;\n}\n\nexport const Mean = 'Mean';\nexport
type MeanInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface MeanAttrs {\n axis: number|number[];\n keepDims: boolean;\n}\n\nexport const Min = 'Min';\nexport type MinInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface MinAttrs {\n axis: number|number[];\n keepDims: boolean;\n}\n\nexport const Minimum = 'Minimum';\nexport type MinimumInputs = BinaryInputs;\n\nexport const MirrorPad = 'MirrorPad';\nexport type MirrorPadInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface MirrorPadAttrs {\n paddings: Array<[number, number]>;\n mode: 'reflect'|'symmetric';\n}\n\nexport const Mod = 'Mod';\nexport type ModInputs = BinaryInputs;\n\nexport const Multinomial = 'Multinomial';\nexport type MultinomialInputs = Pick<NamedTensorInfoMap, 'logits'>;\nexport interface MultinomialAttrs {\n numSamples: number;\n seed: number;\n normalized: boolean;\n}\n\nexport const Multiply = 'Multiply';\nexport type MultiplyInputs = BinaryInputs;\n\nexport const Neg = 'Neg';\nexport type
NegInputs = UnaryInputs;\n\nexport const NotEqual = 'NotEqual';\nexport type NotEqualInputs = BinaryInputs;\n\nexport const NonMaxSuppressionV3 = 'NonMaxSuppressionV3';\nexport type NonMaxSuppressionV3Inputs =\n   Pick<NamedTensorInfoMap, 'boxes'|'scores'>;\nexport interface NonMaxSuppressionV3Attrs {\n maxOutputSize: number;\n iouThreshold: number;\n scoreThreshold: number;\n}\n\nexport const NonMaxSuppressionV4 = 'NonMaxSuppressionV4';\nexport type NonMaxSuppressionV4Inputs =\n   Pick<NamedTensorInfoMap, 'boxes'|'scores'>;\nexport interface NonMaxSuppressionV4Attrs {\n maxOutputSize: number;\n iouThreshold: number;\n scoreThreshold: number;\n padToMaxOutputSize: boolean;\n}\n\nexport const NonMaxSuppressionV5 = 'NonMaxSuppressionV5';\nexport

type NonMaxSuppressionV5Inputs =\n Pick<NamedTensorInfoMap, 'boxes'|'scores'>;\nexport interface NonMaxSuppressionV5Attrs {\n maxOutputSize: number;\n iouThreshold: number;\n scoreThreshold: number;\n softNmsSigma: number;\n}\n\nexport
 const OnesLike = 'OnesLike';\nexport type OnesLikeInputs = UnaryInputs;\n\nexport const OneHot = 'OneHot';\nexport type OneHotInputs = Pick<NamedTensorInfoMap, 'indices'>;\nexport interface OneHotAttrs {\n depth: number;\n onValue: number;\n offValue: number;\n}\n\nexport const Pack = 'Pack';\nexport type PackInputs = TensorInfo[];\nexport interface PackAttrs {\n axis: number;\n}\n\nexport const PadV2 = 'PadV2';\nexport type PadV2Inputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface PadV2Attrs {\n paddings: Array<[number, number]>;\n constantValue: number;\n}\n\nexport const Pool = 'Pool';\nexport type PoolInputs = Pick<NamedTensorInfoMap, 'input'>;\n\nexport const Pow = 'Pow';\nexport type PowInputs = BinaryInputs;\n\nexport const Prelu = 'Prelu';\nexport type PreluInputs = Pick<NamedTensorInfoMap, 'x'|'alpha'>;\n\nexport const Prod = 'Prod';\nexport type ProdInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface ProdAttrs {\n axis: number|number[];\n keepDims: boolean;\n}\n\nexport
 const Range = 'Range';\nexport interface RangeAttrs {\n start: number;\n stop: number;\n step: number;\n dtype: 'float32'|'int32';\n}\n\nexport const Real = 'Real';\nexport type RealInputs = Pick<NamedTensorInfoMap, 'input'>;\n\nexport const Reciprocal = 'Reciprocal';\nexport type ReciprocalInputs = UnaryInputs;\n\nexport const Relu = 'Relu';\nexport type ReluInputs = Pick<NamedTensorInfoMap, 'x'>;\n\nexport const Reshape = 'Reshape';\nexport type ReshapeInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface ReshapeAttrs {\n shape: number[];\n}\n\nexport const ResizeNearestNeighbor = 'ResizeNearestNeighbor';\nexport type ResizeNearestNeighborInputs = Pick<NamedTensorInfoMap, 'images'>;\nexport interface ResizeNearestNeighborAttrs {\n alignCorners: boolean;\n halfPixelCenters: boolean;\n size: [number, number];\n}\n\nexport const ResizeNearestNeighborGrad = 'ResizeNearestNeighborGrad';\nexport type ResizeNearestNeighborGradInputs =\n Pick<NamedTensorInfoMap,
 'images'|'dy'>;\nexport type ResizeNearestNeighborGradAttrs = ResizeNearestNeighborAttrs;\n\nexport const ResizeBilinear = 'ResizeBilinear';\nexport type ResizeBilinearInputs = Pick<NamedTensorInfoMap, 'images'>;\nexport interface ResizeBilinearAttrs {\n alignCorners: boolean;\n halfPixelCenters: boolean;\n size: [number, number];\n}\n\nexport const ResizeBilinearGrad = 'ResizeBilinearGrad';\nexport type ResizeBilinearGradInputs = Pick<NamedTensorInfoMap, 'images'|'dy'>;\nexport type ResizeBilinearGradAttrs = ResizeBilinearAttrs;\n\nexport const Relu6 = 'Relu6';\nexport type Relu6Inputs = Pick<NamedTensorInfoMap, 'x'>;\n\nexport const Reverse = 'Reverse';\nexport type ReverseInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface ReverseAttrs {\n dims: number|number[];\n}\n\nexport const Round = 'Round';\nexport type RoundInputs = UnaryInputs;\n\nexport const Rsqrt = 'Rsqrt';\nexport type RsqrtInputs = UnaryInputs;\n\nexport const ScatterNd = 'ScatterNd';\nexport type ScatterNdInputs
 = Pick<NamedTensorInfoMap, 'indices'|'updates'>;\nexport interface ScatterNdAttrs {\n shape: number[];\n}\n\nexport const Select = 'Select';\nexport type SelectInputs = Pick<NamedTensorInfoMap, 'condition'|'t'|'e'>;\n\nexport const Selu = 'Selu';\nexport type SeluInputs = Pick<NamedTensorInfoMap, 'x'>;\n\nexport const Slice = 'Slice';\nexport type SliceInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface SliceAttrs {\n begin: number|number[];\n size: number|number[];\n}\nexport const Sin = 'Sin';\nexport type SinInputs = UnaryInputs;\n\nexport const Sinh = 'Sinh';\nexport type SinhInputs = UnaryInputs;\n\nexport const Sign = 'Sign';\nexport type SignInputs = UnaryInputs;\n\nexport const Sigmoid = 'Sigmoid';\nexport type SigmoidInputs = UnaryInputs;\n\nexport const Softplus = 'Softplus';\nexport type SoftplusInputs = UnaryInputs;\n\nexport const Sqrt = 'Sqrt';\nexport type SqrtInputs = UnaryInputs;\n\nexport const Sum = 'Sum';\nexport type SumInputs = Pick<NamedTensorInfoMap,
 'x'>;\nexport interface SumAttrs {\n axis: number|number[];\n keepDims: boolean;\n}\n\nexport const SpaceToBatchND = 'SpaceToBatchND';\nexport type SpaceToBatchNDInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface SpaceToBatchNDAttrs {\n blockShape: number[];\n paddings: number[][];\n}\n\nexport const SplitV = 'SplitV';\nexport type SplitVInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface SplitVAttrs {\n numOrSizeSplits: number[]|number;\n axis: number;\n}\n\nexport const Softmax = 'Softmax';\nexport type

SoftmaxInputs = Pick<NamedTensorInfoMap, 'logits'>;\nexport interface SoftmaxAttrs {\n dim: number;\n}\n\nexport const SquaredDifference = 'SquaredDifference';\nexport type SquaredDifferenceInputs = BinaryInputs;\n\nexport const Square = 'Square';\nexport type SquareInputs = Pick<NamedTensorInfoMap, 'x'>;\n\nexport const Sub = 'Sub';\nexport type SubInputs = BinaryInputs;\n\nexport const SparseToDense = 'SparseToDense';\nexport type SparseToDenseInputs =\n Pick<NamedTensorInfoMap, 'sparseIndices'|'sparseValues'|'defaultValue'>;\nexport interface SparseToDenseAttrs {\n outputShape: number[];\n}\n\nexport const StridedSlice = 'StridedSlice';\nexport type StridedSliceInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface StridedSliceAttrs {\n begin: number[];\n end: number[];\n strides: number[];\n beginMask: number;\n endMask: number;\n ellipsisMask: number;\n newAxisMask: number;\n shrinkAxisMask: number;\n}\n\nexport const Tan = 'Tan';\nexport type TanInputs = UnaryInputs;\n\nexport const Tanh = 'Tanh';\nexport type TanhInputs = UnaryInputs;\n\nexport const Tile = 'Tile';\nexport type TileInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface TileAttrs {\n reps: number[];\n}\n\nexport const TopK = 'TopK';\nexport type TopKInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface TopKAttrs {\n k: number;\n sorted: boolean;\n}\n\nexport const Transpose = 'Transpose';\nexport type TransposeInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface TransposeAttrs {\n perm: number[];\n}\n\nexport const Unique = 'Unique';\nexport type UniqueInputs = Pick<NamedTensorInfoMap, 'x'>;\nexport interface UniqueAttrs {\n axis: number;\n}\n\nexport type UnaryInputs = Pick<NamedTensorInfoMap, 'x'>;\n\nexport const Unpack = 'Unpack';\nexport type UnpackInputs = Pick<NamedTensorInfoMap, 'value'>;\nexport interface UnpackAttrs {\n axis: number;\n}\n\nexport const UnsortedSegmentSum = 'UnsortedSegmentSum';\nexport type UnsortedSegmentSumInputs =\n   Pick<NamedTensorInfoMap, 'x'|'segmentIds'>;\nexport interface UnsortedSegmentSumAttrs {\n numSegments: number;\n}\n\nexport const ZerosLike = 'ZerosLike';\nexport type ZerosLikeInputs = UnaryInputs;\n\n/**\n * TensorFlow.js-only kernels\n */\nexport const Step = 'Step';\nexport type StepInputs = UnaryInputs;\nexport interface StepAttrs {\n alpha: number;\n}\n\nexport const FromPixels = 'FromPixels';\nexport interface FromPixelsInputs {\n pixels: PixelData|ImageData|HTMLImageElement|HTMLCanvasElement|\n   HTMLVideoElement|ImageBitmap;\n}\nexport interface FromPixelsAttrs {\n numChannels: number;\n}\n\nexport const RotateWithOffset = 'RotateWithOffset';\nexport type RotateWithOffsetInputs = Pick<NamedTensorInfoMap, 'image'>;\nexport interface RotateWithOffsetAttrs {\n radians: number;\n fillValue: number|[number, number, number];\n center: number|[number, number];\n}\n\nexport const _FusedMatMul = '_FusedMatMul';\n// tslint:disable-next-line: class-name\nexport interface _FusedMatMulInputs extends NamedTensorInfoMap {\n a: TensorInfo;\n b: TensorInfo;\n bias?: TensorInfo;\n preluActivationWeights?: TensorInfo;\n}\n\n// tslint:disable-next-line: class-name\nexport interface _FusedMatMulAttrs {\n transposeA: boolean;\n transposeB: boolean;\n activation: Activation;\n leakyreluAlpha?: number;\n}\n\nexport const FusedConv2D = 'FusedConv2D';\nexport interface FusedConv2DInputs extends NamedTensorInfoMap {\n x: TensorInfo;\n filter: TensorInfo;\n bias?: TensorInfo;\n preluActivationWeights?: TensorInfo;\n}\nexport interface FusedConv2DAttrs {\n strides: [number, number]|number;\n pad: 'valid'|'same'|number|ExplicitPadding;\n dataFormat: 'NHWC'|'NCHW';\n dilations: [number, number]|number;\n dimRoundingMode: 'floor'|'round'|'ceil';\n activation: Activation;\n leakyreluAlpha?: number;\n}\n\nexport const FusedDepthwiseConv2D = 'FusedDepthwiseConv2D';\nexport interface FusedDepthwiseConv2DInputs extends NamedTensorInfoMap {\n x: TensorInfo;\n filter: TensorInfo;\n bias?: TensorInfo;\n preluActivationWeights?: TensorInfo;\n}\nexport interface FusedDepthwiseConv2DAttrs {\n strides: [number, number]|number;\n pad: 'valid'|'same'|number;\n dataFormat: 'NHWC'|'NCHW';\n dilations: [number, number]|number;\n dimRoundingMode: 'floor'|'round'|'ceil';\n activation: Activation;\n leakyreluAlpha?: number;\n}\n",

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applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\nimport {env} from './environment';\n\nimport {getGlobal} from './global_util';\nimport {NamedGradientMap} from './tape';\nimport {Tensor} from './tensor';\nimport {DataType, RecursiveArray} from './types';\n\nconst kernelRegistry =\n getGlobal('kernelRegistry', () => new Map<string, KernelConfig>());\nconst gradRegistry =\n getGlobal('gradRegistry', () => new Map<string, GradConfig>());\n\nexport type DataId = object;\n\ntype AttributeValue =\n number|number[]|boolean|boolean[]|string|string[]|NamedAttrMap;\n\n/** These are extra non-tensor/primitive params passed to kernel functions. */\nexport type Attribute = AttributeValue|RecursiveArray<AttributeValue>;\n\n/** Specifies the code to run when executing a kernel. */\nexport type KernelFunc = (params: {\n inputs: NamedTensorInfoMap,\n backend: {},\n attrs?: NamedAttrMap,\n}) => TensorInfo|TensorInfo[];\n\n/** The function to run when computing a gradient during backprop. */\nexport type GradFunc =\n (dy: Tensor|Tensor[], saved: Tensor[], attrs: NamedAttrMap) =>\n NamedGradientMap;\n\n/** Function that gets called after the backend initializes. */\nexport type KernelSetupFunc = (backend: {}) => void;\n/** Function that gets called right before the backend is disposed. */\nexport type KernelDisposeFunc = KernelSetupFunc;\n\n/** Config object for registering a kernel in the global registry. */\nexport interface KernelConfig {\n kernelName: string;\n backendName: string;\n kernelFunc: KernelFunc;\n setupFunc?: KernelSetupFunc;\n disposeFunc?: KernelDisposeFunc;\n}\n\n/** Config object for registering a gradient in the global registry. */\nexport interface GradConfig {\n kernelName: string;\n inputsToSave?: string[];\n // When saveAllInputs is true, all inputs will be saved. Only use this flag\n // if inputs is an array of Tensors.\n saveAllInputs?: boolean;\n outputsToSave?: boolean[];\n gradFunc: GradFunc;\n}\n\n/** Holds metadata for a given tensor. */\nexport interface TensorInfo {\n dataId: DataId;\n shape: number[];\n dtype: DataType;\n}\n\nexport interface NamedTensorInfoMap {\n [name: string]: TensorInfo;\n}\n\nexport interface NamedAttrMap {\n [name: string]: Attribute;\n}\n\n/**\n * Returns the kernel function (code) associated with the provided names.\n *\n * @param kernelName The official name of the kernel.\n * @param backendName The official name of the backend.\n */\nexport function getKernel(\n kernelName: string, backendName: string): KernelConfig {\n const key = makeKey(kernelName, backendName);\n return kernelRegistry.get(key);\n}\n\n/**\n * Returns the registered gradient info associated with the provided kernel.\n * @param kernelName The official TF kernel name.\n */\nexport function getGradient(kernelName: string): GradConfig {\n return gradRegistry.get(kernelName);\n}\n\nexport function getKernelsForBackend(backendName: string): KernelConfig[] {\n const it = kernelRegistry.entries();\n const result: KernelConfig[] = [];\n\n while (true) {\n const {done, value} = it.next();\n if (done) {\n break;\n }\n const [key, config] = value;\n const [backend,] = key.split('_');\n if (backend === backendName) {\n result.push(config);\n }\n }\n return result;\n}\n\n/**\n * Registers the function (forward pass) for the kernel in a global registry.\n *\n * @param config A config object with the following properties:\n * - `kernelName` The official name of the kernel.\n * - `backendName` The official name of the backend.\n * - `kernelFunc` The function to run during the forward pass of the kernel.\n * - `setupFunc` Optional. Gets called once, after the backend initializes.\n * - `disposeFunc` Optional. Gets called once, right before the backend is\n * disposed.\n */\nexport function registerKernel(config: KernelConfig) {\n const {kernelName, backendName} = config;\n const key = makeKey(kernelName, backendName);\n if (kernelRegistry.has(key)) {\n console.warn(\n `The kernel '${kernelName}' for backend ` +\n `'${backendName}' is already registered`);\n }\n kernelRegistry.set(key, config);\n}\n\n/**\n * Registers a gradient function for a given kernel in the global registry,\n * to be used during the back-propagation of that kernel.\n *\n * @param config An object with the following properties:\n * - `kernelName` The name of the kernel that the gradient function is for.\n * - `gradFunc` The function to run during back-propagation.\n */\nexport function registerGradient(config: GradConfig) {\n const {kernelName} = config;\n\n if (gradRegistry.has(kernelName)) {\n

// TODO (yassogba) after 3.0 assess whether we need to keep this gated\n // to debug mode.\n if (env().getBool('DEBUG')) {\n console.warn(`Overriding the gradient for '${kernelName}'`);\n }\n }\n gradRegistry.set(kernelName, config);\n}\n\n/**\n * Removes the kernel function from the registry.\n *\n * @param kernelName The official name of the kernel.\n * @param backendName The official name of the backend.\n *\n */\nexport function unregisterKernel(\n kernelName: string, backendName: string): void {\n const key = makeKey(kernelName, backendName);\n if (!kernelRegistry.has(key)) {\n throw new Error(\n `The kernel '${kernelName}' for backend ` +\n `'${backendName}' is not registered`);\n }\n kernelRegistry.delete(key);\n}\n\n/**
Removes the registered gradient from the global registry. */\nexport function unregisterGradient(kernelName: string): void {\n if (!gradRegistry.has(kernelName)) {\n throw new Error(\n `The gradient '${kernelName}' for backend is not registered`);\n }\n gradRegistry.delete(kernelName);\n}\n\n/**\n * Finds kernels that have already been registered to a backend and re-registers\n * them for a new backend. Useful for registering custom backends.\n * @param registeredBackendName Already registered backend.\n * @param newBackendName New backend.\n */\nexport function copyRegisteredKernels(\n registeredBackendName: string, newBackendName: string): void {\n const kernels = getKernelsForBackend(registeredBackendName);\n kernels.forEach(kernelConfig => {\n const newKernelConfig =\n Object.assign({}, kernelConfig, {backendName: newBackendName});\n registerKernel(newKernelConfig);\n });\n}\n\nfunction makeKey(kernelName: string, backendName: string) {\n return `${backendName}_${kernelName}`;\n}\n","/**\n
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==\n */\n\nimport {env} from './environment';\nimport {BackendValues, DataType, TensorLike, TypedArray} from './types';\nimport * as base from './util_base';\nexport * from './util_base';\n\n/**\n * Create typed array for scalar value. Used for storing
in `DataStorage`.\n */\nexport function createScalarValue(\n value: DataType, dtype: DataType): BackendValues {\n if (dtype === 'string') {\n return encodeString(value);\n }\n\n return toTypedArray([value], dtype);\n}\n\nfunction noConversionNeeded(a: TensorLike, dtype: DataType): boolean {\n return (a instanceof Float32Array && dtype === 'float32') ||\n (a instanceof Int32Array && dtype === 'int32') ||\n (a instanceof Uint8Array && dtype === 'bool');\n}\n\nexport function toTypedArray(a: TensorLike, dtype: DataType): TypedArray {\n if (dtype === 'string') {\n throw new Error('Cannot convert a string[] to a TypedArray');\n }\n if (Array.isArray(a)) {\n a = base.flatten(a);\n }\n\n if (env().getBool('DEBUG')) {\n base.checkConversionForErrors(a as number[], dtype);\n }\n if (noConversionNeeded(a, dtype)) {\n return a as TypedArray;\n }\n if (dtype == null || dtype === 'float32' || dtype === 'complex64') {\n return new Float32Array(a as number[]);\n
} else if (dtype === 'int32') {\n return new Int32Array(a as number[]);\n } else if (dtype === 'bool') {\n const bool = new Uint8Array((a as number[]).length);\n for (let i = 0; i < bool.length; ++i) {\n if (Math.round((a as number[])[i]) !== 0) {\n bool[i] = 1;\n }\n }\n return bool;\n } else {\n throw new Error(`Unknown data type ${dtype}`);\n }\n}\n\n/**\n * Returns the current high-resolution time in milliseconds relative to an\n * arbitrary time in the past. It works across different platforms (node.js,\n * browsers).\n *\n * ```js\n * console.log(tf.util.now());\n * ```\n *\n * @doc {heading: 'Util', namespace: 'util'}\n */\nexport function now(): number {\n return env().platform.now();\n}\n\n/**\n * Returns a platform-specific implementation of\n * [`fetch`](https://developer.mozilla.org/en-US/docs/Web/API/Fetch_API).\n *\n * If `fetch` is defined on the global object (`window`, `process`, etc.),\n * `tf.util.fetch` returns that

function.\n *\n * If not, `tf.util.fetch` returns a platform-specific solution.\n *\n * ```js\n * const resource = await tf.util.fetch('https://unpkg.com/@tensorflow/tfjs');\n * // handle response\n * ```\n *\n * @doc {heading: 'Util'}\n */\nexport function fetch(\n path: string, requestInits?: RequestInit): Promise<Response> {\n return env().platform.fetch(path, requestInits);\n}\n\n/**\n * Encodes the provided string into bytes using the provided encoding scheme.\n *\n * @param s The string to encode.\n * @param encoding The encoding scheme. Defaults to utf-8.\n *\n * @doc {heading: 'Util'}\n */\nexport function encodeString(s: string, encoding = 'utf-8'): Uint8Array {\n encoding = encoding || 'utf-8';\n return env().platform.encode(s, encoding);\n}\n\n/**\n * Decodes the provided bytes into a string using the provided encoding scheme.\n * @param bytes The bytes to decode.\n *\n * @param encoding The encoding scheme. Defaults to utf-8.\n *\n * @doc {heading: 'Util'}\n */\nexport function decodeString(bytes: Uint8Array, encoding = 'utf-8'): string {\n encoding = encoding || 'utf-8';\n return env().platform.decode(bytes, encoding);\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {BackendTimer, BackendTimingInfo} from './backends/backend';\nimport {env} from './environment';\nimport
{Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {DataType, DataTypeMap, TypedArray} from './types';\nimport * as util from './util';\n\nexport type KernelProfile = {\n kernelName: string,\n outputs: Tensor[],\n inputs: NamedTensorMap,\n timeMs: Promise<number|{error: string}>,\n extraInfo: Promise<string>\n};\n\nexport class Profiler {\n constructor(private backendTimer: BackendTimer, private logger?: Logger) {\n if (logger == null) {\n this.logger = new Logger();\n }\n }\n\n profileKernel(kernelName: string, inputs: NamedTensorMap, f: () => Tensor[]):\n KernelProfile {\n let outputs: Tensor[];\n const holdResultWrapperFn = () => {\n outputs = f();\n };\n let timer: Promise<BackendTimingInfo>;\n const start = util.now();\n if (this.backendTimer.timerAvailable()) {\n timer = this.backendTimer.time(holdResultWrapperFn);\n } else {\n holdResultWrapperFn();\n outputs.map(output => output.dataSync());\n
timer = Promise.resolve({kernelMs: util.now() - start});\n }\n if (env().getBool('CHECK_COMPUTATION_FOR_ERRORS')) {\n for (let i = 0; i < outputs.length; i++) {\n const output = outputs[i];\n // Dangling promise here because we don't want to propagate up\n // asynchronicity.\n output.data().then(tensorVals => {\n checkComputationForErrors(tensorVals, output.dtype, kernelName);\n });\n }\n }\n\n const kernelProfile = {\n kernelName,\n outputs,\n inputs,\n timeMs: timer.then(timing => timing.kernelMs),\n extraInfo: timer.then(\n timing => timing.getExtraProfileInfo != null ?\n timing.getExtraProfileInfo() :\n '')\n };\n return kernelProfile;\n }\n\n logKernelProfile(kernelProfile: KernelProfile): void {\n const {kernelName, outputs, timeMs, inputs, extraInfo} = kernelProfile;\n\n outputs.forEach(result => {\n Promise.all([result.data(), timeMs, extraInfo]).then(valueContainer => {\n this.logger.logKernelProfile(\n kernelName, result, valueContainer[0], valueContainer[1], inputs,\n valueContainer[2]);\n });\n });\n }\n}\n\nexport function checkComputationForErrors<D extends DataType>(\n vals: DataTypeMap[D], dtype: D, kernelName: string): boolean {\n if (dtype !== 'float32') {\n // Only floating point computations will generate NaN values\n return false;\n }\n for (let i = 0; i < vals.length; i++) {\n const num = vals[i] as number;\n if (isNaN(num) || !isFinite(num)) {\n // Throwing custom exception so behavior is testable.\n console.warn(`Found ${num} in the result of '${kernelName}'`);\n return true;\n }\n }\n return false;\n}\n\nexport class Logger {\n logKernelProfile(\n name: string, result: Tensor, vals: TypedArray,\n timeMs: number|{error: string}, inputs: NamedTensorMap,\n extraInfo?: string) {\n const time

```
 = typeof timeMs === 'number' ? util.rightPad(`${timeMs}ms`, 9) :\n                                    timeMs['error'];\n
 const paddedName = util.rightPad(name, 25);\n    const rank = result.rank;\n    const size = result.size;\n    const
shape = util.rightPad(result.shape.toString(), 14);\n    let inputShapesDescription = '';\n\n    for (const name in
inputs) {\n      const input = inputs[name];\n      if (input != null) {\n        // The input might be a non-tensor (e.g
HTMLImageElement), in which case\n        // we claim the output shape as input shape.\n        const inputShape =
input.shape || result.shape;\n        const inputRank = inputShape.length;\n        inputShapesDescription +=\n
`${name}: ${inputRank}D ${inputRank > 0 ? inputShape : ''} `;\n      }\n    }\n\n    console.log(\n
`%c${paddedName}\\t%c${time}\\t%c${rank}D ${shape}\\t%c${size}\\t%c${\n
inputShapesDescription}\\t%c${extraInfo}`,\n        'font-weight:bold', 'color:red',
 'color:blue', 'color: orange',\n        'color: green', 'color: steelblue');\n  }\n}\n","/**\n * @license\n * Copyright 2017
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==========================================================================\n
*/\n\nimport {Tensor} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport * as util from
'./util';\n\nexport interface TapeNode {\n  id: number;\n  kernelName: string;\n
  outputs: Tensor[];\n  inputs: NamedTensorMap;\n  // Optional params, defined only for ops with gradient impl.\n
gradient?: (dys: Tensor[]) => NamedGradientMap;\n  saved?: Tensor[];\n}\n\nexport type NamedGradientMap = {\n
[inputName: string]: () => Tensor;\n};\n\n/**\n * Computes a list of TapeNodes that connect x to y, filtering
everything else\n * out and preserving the order of the original tape elements.\n *\n * @param tape The tape
elements to filter.\n * @param xs The input Tensors.\n * @param y The output Tensor.\n */\nexport function
getFilteredNodesXToY(\n    tape: TapeNode[], xs: Tensor[], y: Tensor): TapeNode[] {\n  // Forward pass to
compute all the nodes and Tensors that are transitively a\n  // function of x.\n  const tensorsFromX: {[tensorId:
number]: boolean} = {};\n  const nodesFromX: {[nodeId: number]: boolean} = {};\n  for (let i = 0; i < xs.length;
i++) {\n    tensorsFromX[xs[i].id] = true;\n  }\n\n  for (let i = 0; i < tape.length; i++) {\n    const node = tape[i];\n
    const nodeInputs = node.inputs;\n    for (const inputName in nodeInputs) {\n      const input =
nodeInputs[inputName];\n\n      let anyInputFromX = false;\n      for (let j = 0; j < xs.length; j++) {\n        if
(tensorsFromX[input.id]) {\n          node.outputs.forEach(output => tensorsFromX[output.id] = true);\n
anyInputFromX = true;\n          nodesFromX[node.id] = true;\n          break;\n        }\n      }\n\n      if
(anyInputFromX) {\n        break;\n      }\n    }\n  }\n\n  // Backward pass to find all of the nodes and Tensors that
lead to y.\n  const tensorsLeadToY: {[tensorId: number]: boolean} = {};\n  tensorsLeadToY[y.id] = true;\n  const
nodesToY: {[nodeId: number]: boolean} = {};\n\n  for (let i = tape.length - 1; i >= 0; i--) {\n    const node =
tape[i];\n    const nodeInputs = node.inputs;\n\n    // If any of the outputs lead to y, mark all of the inputs as leading
to y.\n    for (let j = 0; j < node.outputs.length; j++) {\n      if (tensorsLeadToY[node.outputs[j].id])
 {\n        for (const inputName in nodeInputs) {\n          tensorsLeadToY[nodeInputs[inputName].id] = true;\n
nodesToY[node.id] = true;\n        }\n        break;\n      }\n    }\n  }\n\n  // Return the paths that come from x and lead
to y.\n  const filteredTape: TapeNode[] = [];\n  for (let i = 0; i < tape.length; i++) {\n    const node = tape[i];\n\n    if
(nodesFromX[node.id] && nodesToY[node.id]) {\n      // Prune the inputs from the node that aren't a function of
x.\n      const prunedInputs: {[inputName: string]: Tensor} = {};\n      for (const inputName in node.inputs) {\n
const nodeInput = node.inputs[inputName];\n        if (tensorsFromX[nodeInput.id]) {\n
prunedInputs[inputName] = nodeInput;\n        }\n      }\n\n      // Copy the node and overwrite inputsAndArgs to the
pruned version.\n      const prunedNode = Object.assign({}, node);\n      prunedNode.inputs = prunedInputs;\n
prunedNode.outputs = node.outputs;\n\n      filteredTape.push(prunedNode);\n
    }\n  }\n\n  return filteredTape;\n}\n\n/**\n * Backpropagate gradients through the filtered TapeNodes.\n *\n *
@param tensorAccumulatedGradientMap A map of Tensor to its gradient. This map\n * is mutated by this
```

method.\n * @param filteredTape The filtered TapeNodes to backprop through.\n */\nexport function backpropagateGradients(\n tensorAccumulatedGradientMap: {[tensorId: number]: Tensor},\n filteredTape: TapeNode[], tidy: (f: Function) => Tensor,\n add: (a: Tensor, b: Tensor) => Tensor) {\n // Walk the tape backward and keep a map of Tensor to its gradient.\n for (let i = filteredTape.length - 1; i >= 0; i--) {\n const node = filteredTape[i];\n\n const dys: Tensor[] = [];\n node.outputs.forEach(o => {\n const gradTensor = tensorAccumulatedGradientMap[o.id];\n if (gradTensor != null) {\n dys.push(gradTensor);\n } else {\n // This particular output is not in the back-propagation subgraph, so it\n // does not affect the final output, thus we put null for its dy.\n dys.push(null);\n }\n });\n\n if (node.gradient == null) {\n throw new Error(\n `Cannot compute gradient: gradient function not found ` +\n `for ${node.kernelName}.`);\n }\n\n // Backprop dy through this node and accumulate gradients over the inputs.\n const inputGradients = node.gradient(dys);\n\n for (const inputName in node.inputs) {\n if (!(inputName in inputGradients)) {\n throw new Error(\n `Cannot backprop through input ${inputName}. ` +\n `Available gradients found: ${Object.keys(inputGradients)}.`);\n }\n\n // Call the gradient function.\n const dx = tidy(() => inputGradients[inputName]());\n if (dx.dtype !== 'float32') {\n throw new Error(\n `Error in gradient for op ${\n node.kernelName}. The gradient of input ` +\n `${inputName} must have 'float32' dtype, but\n has '${dx.dtype}'`);\n }\n const x = node.inputs[inputName];\n if (!util.arraysEqual(dx.shape, x.shape)) {\n throw new Error(\n `Error in gradient for op ${\n node.kernelName}. The gradient of input ` +\n `'${inputName}' has shape '${dx.shape}', which does not match ` +\n `the shape of the input '${x.shape}'`);\n }\n\n if (tensorAccumulatedGradientMap[x.id] == null) {\n tensorAccumulatedGradientMap[x.id] = dx;\n } else {\n const curGradient = tensorAccumulatedGradientMap[x.id];\n tensorAccumulatedGradientMap[x.id] = add(curGradient, dx);\n curGradient.dispose();\n }\n }\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {DataType, TypedArray} from './types';\nimport {computeStrides, isString, rightPad, sizeFromShape} from './util';\n\n// Maximum number of values before we decide to show ellipsis.\nconst FORMAT_LIMIT_NUM_VALS = 20;\n// Number of first and last values to show when displaying a, b,...,y, z.\nconst FORMAT_NUM_FIRST_LAST_VALS = 3;\n// Number of significant digits to show.\nconst FORMAT_NUM_SIG_DIGITS = 7;\n\nexport function tensorToString(\n vals: TypedArray|string[], shape: number[], dtype: DataType,\n verbose: boolean) {\n const strides = computeStrides(shape);\n const padPerCol = computeMaxSizePerColumn(vals, shape, dtype, strides);\n const rank = shape.length;\n const valsLines = subTensorToString(vals, shape, dtype, strides, padPerCol);\n const lines = ['Tensor'];\n if (verbose) {\n lines.push(` dtype: ${dtype}`);\n lines.push(` rank: ${rank}`);\n lines.push(` shape: [${shape}]`);\n lines.push(` values:`);\n }\n lines.push(valsLines.map(l => ' ' + l).join('\\n'));\n return lines.join('\\n');\n}\n\nfunction computeMaxSizePerColumn(\n vals: TypedArray|string[], shape: number[], dtype: DataType,\n strides: number[]): number[] {\n const n = sizeFromShape(shape);\n const numCols = strides[strides.length - 1];\n const padPerCol = new Array(numCols).fill(0);\n const rank = shape.length;\n const valuesOrTuples =\n dtype === 'complex64' ? createComplexTuples(vals) : vals;\n\n if (rank > 1) {\n for (let row = 0; row < n / numCols; row++) {\n const offset = row * numCols;\n for (let j = 0; j < numCols; j++) {\n padPerCol[j] = Math.max(\n padPerCol[j],\n valToString(valuesOrTuples[offset + j], 0, dtype).length);\n }\n }\n }\n return padPerCol;\n}\n\nfunction

```
valToString(\n    val: number|string|[number, number], pad: number, dtype: DataType) {\n  let valStr: string;\n  if (Array.isArray(val)) {\n    valStr = `${parseFloat(val[0].toFixed(FORMAT_NUM_SIG_DIGITS))} + ` +\n        `${parseFloat(val[1].toFixed(FORMAT_NUM_SIG_DIGITS))}j`;\n  } else if (isString(val)) {\n    valStr = `'${val}'`;\n  } else if (dtype === 'bool') {\n    valStr = boolNumToString(val);\n  } else {\n    valStr = parseFloat(val.toFixed(FORMAT_NUM_SIG_DIGITS)).toString();\n  }\n\n  return rightPad(valStr, pad);\n}\n\nfunction boolNumToString(v: number): string {\n  return v === 0 ? 'false' : 'true';\n}\n\nfunction subTensorToString(\n    vals: TypedArray|string[], shape: number[], dtype: DataType,\n    strides: number[], padPerCol: number[], isLast = true):
 string[] {\n  const storagePerElement = dtype === 'complex64' ? 2 : 1;\n\n  const size = shape[0];\n  const rank = shape.length;\n  if (rank === 0) {\n    if (dtype === 'complex64') {\n      const complexTuple = createComplexTuples(vals);\n      return [valToString(complexTuple[0], 0, dtype)];\n    }\n    if (dtype === 'bool') {\n      return [boolNumToString(vals[0] as number)];\n    }\n    return [vals[0].toString()];\n  }\n\n  if (rank === 1) {\n    if (size > FORMAT_LIMIT_NUM_VALS) {\n      const firstValsSize = FORMAT_NUM_FIRST_LAST_VALS * storagePerElement;\n\n      let firstVals = Array.from<number|string|[number, number]>(\n          vals.slice(0, firstValsSize));\n      let lastVals = Array.from<number|string|[number, number]>(vals.slice(\n          (size - FORMAT_NUM_FIRST_LAST_VALS) * storagePerElement,\n          size * storagePerElement));\n      if (dtype === 'complex64') {\n        firstVals = createComplexTuples(firstVals);\n        lastVals = createComplexTuples(lastVals);\n      }\n      return [\n        '[' +\n        firstVals.map((x, i) => valToString(x, padPerCol[i], dtype))\n            .join(', ') +\n        ', ..., ' +\n        lastVals\n            .map(\n                (x, i) => valToString(\n                    x, padPerCol[size - FORMAT_NUM_FIRST_LAST_VALS + i], dtype))\n            .join(', ') +\n        ']'\n      ];\n    }\n    const displayVals: Array<number|string|[number, number]> =\n        dtype === 'complex64' ? createComplexTuples(vals) :\n                                Array.from<number|string>(vals);\n\n    return [\n      '[' +\n      displayVals.map((x, i) => valToString(x, padPerCol[i], dtype))\n          .join(', ') +\n      ']'\n    ];\n  }\n\n  // The array is rank 2 or more.\n  const subshape = shape.slice(1);\n  const substrides = strides.slice(1);\n  const stride = strides[0] * storagePerElement;\n  const lines: string[] = [];\n  if (size > FORMAT_LIMIT_NUM_VALS) {\n    for (let i = 0; i < FORMAT_NUM_FIRST_LAST_VALS;
 i++) {\n      const start = i * stride;\n      const end = start + stride;\n      lines.push(...subTensorToString(\n          vals.slice(start, end), subshape, dtype, substrides, padPerCol,\n          false /* isLast */));\n    }\n    lines.push('...');\n    for (let i = size - FORMAT_NUM_FIRST_LAST_VALS; i < size; i++) {\n      const start = i * stride;\n      const end = start + stride;\n      lines.push(...subTensorToString(\n          vals.slice(start, end), subshape, dtype, substrides, padPerCol,\n          i === size - 1 /* isLast */));\n    }\n  } else {\n    for (let i = 0; i < size; i++) {\n      const start = i * stride;\n      const end = start + stride;\n      lines.push(...subTensorToString(\n          vals.slice(start, end), subshape, dtype, substrides, padPerCol,\n          i === size - 1 /* isLast */));\n    }\n  }\n  const sep = rank === 2 ? ',' : '';\n  lines[0] = '[' + lines[0] + sep;\n  for (let i = 1; i < lines.length - 1; i++) {\n    lines[i] = ' ' + lines[i] + sep;\n  }\n  let newLineSep = ',\\n';\n  for (let i = 2; i < rank; i++) {\n    newLineSep += '\\n';\n  }\n  lines[lines.length - 1] =\n      ' ' + lines[lines.length - 1] + ']' + (isLast ? '' : newLineSep);\n  return lines;\n}\n\nfunction createComplexTuples(vals: Array<{}>|\n                             TypedArray): Array<[number, number]> {\n  const complexTuples: Array<[number, number]> = [];\n  for (let i = 0; i < vals.length; i += 2) {\n    complexTuples.push([vals[i], vals[i + 1]] as [number, number]);\n  }\n  return complexTuples;\n}\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
 BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========================================================================\n */\n\nimport {getGlobal} from './global_util';\nimport {tensorToString} from './tensor_format';\nimport {ArrayMap,
```

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BackendValues, DataType, DataTypeMap, DataValues, NumericDataType, Rank, ShapeMap, SingleValueMap,
TypedArray} from './types';\nimport * as util from './util';\nimport {computeStrides, toNestedArray} from
'./util';\n\nexport interface TensorData<D extends DataType> {\n  dataId?: DataId;\n  values?:
DataTypeMap[D];\n}\n\n// This interface mimics KernelBackend (in backend.ts), which would create a\n// circular
dependency if imported.\nexport interface Backend {}\n\n/**\n * A mutable object, similar to `tf.Tensor`, that
allows users to set values\n * at locations before converting to an immutable `tf.Tensor`.\n
 *\n * See `tf.buffer` for creating a tensor buffer.\n *\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n
*/\nexport class TensorBuffer<R extends Rank, D extends DataType = 'float32'> {\n  size: number;\n  shape:
ShapeMap[R];\n  strides: number[];\n  values: DataTypeMap[D];\n\n  constructor(shape: ShapeMap[R], public
dtype: D, values?: DataTypeMap[D]) {\n    this.shape = shape.slice() as ShapeMap[R];\n    this.size =
util.sizeFromShape(shape);\n\n    if (values != null) {\n      const n = values.length;\n      util.assert(\n          n ===
this.size,\n          () => `Length of values '${n}' does not match the size ` +\n              `inferred by the shape
'${this.size}'.`);\n    }\n    if (dtype === 'complex64') {\n      throw new Error(\n          `complex64 dtype
TensorBuffers are not supported. Please create ` +\n          `a TensorBuffer for the real and imaginary parts
separately and ` +\n          `call tf.complex(real, imag).`);\n    }\n    this.values = values ||
 util.getArrayFromDType(dtype, this.size);\n    this.strides = computeStrides(shape);\n  }\n\n  /**\n   * Sets a value
in the buffer at a given location.\n   *\n   * @param value The value to set.\n   * @param locs  The location
indices.\n   *\n   * @doc {heading: 'Tensors', subheading: 'Creation'}\n   */\n  set(value: SingleValueMap[D], ...locs:
number[]): void {\n    if (locs.length === 0) {\n      locs = [0];\n    }\n    util.assert(\n        locs.length === this.rank,\n
    () => `The number of provided coordinates (${locs.length}) must ` +\n          `match the rank
(${this.rank})`);\n\n    const index = this.locToIndex(locs);\n    this.values[index] = value as number;\n  }\n\n  /**\n
* Returns the value in the buffer at the provided location.\n   *\n   * @param locs The location indices.\n   *\n   *
@doc {heading: 'Tensors', subheading: 'Creation'}\n   */\n  get(...locs: number[]): SingleValueMap[D] {\n    if
(locs.length === 0) {\n      locs = [0];\n    }\n    let i = 0;\n
    for (const loc of locs) {\n      if (loc < 0 || loc >= this.shape[i]) {\n        const msg = `Requested out of range
element at ${locs}. ` +\n            `  Buffer shape=${this.shape}`;\n        throw new Error(msg);\n      }\n      i++;\n
}\n    let index = locs[locs.length - 1];\n    for (let i = 0; i < locs.length - 1; ++i) {\n      index += this.strides[i] *
locs[i];\n    }\n    return this.values[index] as SingleValueMap[D];\n  }\n\n  locToIndex(locs: number[]): number {\n
 if (this.rank === 0) {\n      return 0;\n    } else if (this.rank === 1) {\n      return locs[0];\n    }\n    let index =
locs[locs.length - 1];\n    for (let i = 0; i < locs.length - 1; ++i) {\n      index += this.strides[i] * locs[i];\n    }\n
return index;\n  }\n\n  indexToLoc(index: number): number[] {\n    if (this.rank === 0) {\n      return [];\n    } else if
(this.rank === 1) {\n      return [index];\n    }\n    const locs: number[] = new Array(this.shape.length);\n    for (let i =
0; i < locs.length
 - 1; ++i) {\n      locs[i] = Math.floor(index / this.strides[i]);\n      index -= locs[i] * this.strides[i];\n    }\n
locs[locs.length - 1] = index;\n    return locs;\n  }\n\n  get rank() {\n    return this.shape.length;\n  }\n\n  /**\n   *
Creates an immutable `tf.Tensor` object from the buffer.\n   *\n   * @doc {heading: 'Tensors', subheading:
'Creation'}\n   */\n  toTensor(): Tensor<R> {\n    return trackerFn().makeTensor(this.values, this.shape, this.dtype)
as\n        Tensor<R>;\n  }\n}\n\nexport interface TensorTracker {\n  makeTensor(\n      values: DataValues, shape:
number[], dtype: DataType,\n      backend?: Backend): Tensor;\n  makeVariable(\n      initialValue: Tensor,
trainable?: boolean, name?: string,\n      dtype?: DataType): Variable;\n  incRef(a: Tensor, backend: Backend):
void;\n  disposeTensor(t: Tensor): void;\n  disposeVariable(v: Variable): void;\n  read(dataId: DataId):
Promise<BackendValues>;\n  readSync(dataId: DataId): BackendValues;\n}\n\n/**\n
 * The Tensor class calls into this handler to delegate chaining operations.\n */\nexport interface OpHandler {\n
cast<T extends Tensor>(x: T, dtype: DataType): T;\n  buffer<R extends Rank, D extends DataType>(\n      shape:
ShapeMap[R], dtype: D,\n      values?: DataTypeMap[D]): TensorBuffer<R, D>;\n  print<T extends Tensor>(x: T,
verbose: boolean): void;\n  clone<T extends Tensor>(x: T): T;\n  // TODO(yassogba) bring reshape back?\n}\n\n//
For tracking tensor creation and disposal.\nlet trackerFn: () => TensorTracker = null;\n// Used by chaining methods
to call into ops.\nlet opHandler: OpHandler = null;\n// Used to warn about deprecated methods.\nlet
```

deprecationWarningFn: (msg: string) => void = null;\n// This here so that we can use this method on dev branches and keep the\n// functionality at master.\n// tslint:disable-next-line:no-unused-expression\n[deprecationWarningFn];\n\n/**\n * An external consumer can register itself as the tensor tracker. This way\n * the Tensor class can
notify the tracker for every tensor created and\n * disposed.\n */\nexport function setTensorTracker(fn: () => TensorTracker) {\n trackerFn = fn;\n}\n\n/**\n * An external consumer can register itself as the op handler. This way the\n * Tensor class can have chaining methods that call into ops via the op\n * handler.\n */\nexport function setOpHandler(handler: OpHandler) {\n opHandler = handler;\n}\n\n/**\n * Sets the deprecation warning function to be used by this file. This way the\n * Tensor class can be a leaf but still use the environment.\n */\nexport function setDeprecationWarningFn(fn: (msg: string) => void) {\n deprecationWarningFn = fn;\n}\n\n/**\n * We wrap data id since we use weak map to avoid memory leaks.\n * Since we have our own memory management, we have a reference counter\n * mapping a tensor to its data, so there is always a pointer (even if that\n * data is otherwise garbage collectable).\n * See https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/\n * Global_Objects/WeakMap\n */\nexport type DataId = object; // object instead of {} to force non-primitive.\n\n// Declare this namespace to make Tensor class augmentation work in google3.\nexport declare namespace Tensor {}\n/**\n * A `tf.Tensor` object represents an immutable, multidimensional array of\n * numbers that has a shape and a data type.\n *\n * See `tf.tensor` for details on how to create a `tf.Tensor`.\n *\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n */\nexport class Tensor<R extends Rank = Rank> {\n /** Unique id of this tensor. */\n readonly id: number;\n /**\n * Id of the bucket holding the data for this tensor. Multiple arrays can\n * point to the same bucket (e.g. when calling array.reshape()).\n */\n dataId: DataId;\n /** The shape of the tensor. */\n readonly shape: ShapeMap[R];\n /** Number of elements in the tensor. */\n readonly size: number;\n /** The data type for the array. */\n readonly dtype: DataType;\n /** The rank type for
the array (see `Rank` enum). */\n readonly rankType: R;\n\n /** Whether this tensor has been globally kept. */\n kept = false;\n /** The id of the scope this tensor is being tracked in. */\n scopeId: number;\n\n /**\n * Number of elements to skip in each dimension when indexing. See\n * https://docs.scipy.org/doc/numpy/reference/generated/\\\n * numpy.ndarray.strides.html\n */\n readonly strides: number[];\n\n constructor(shape: ShapeMap[R], dtype: DataType, dataId: DataId, id: number) {\n this.shape = shape.slice() as ShapeMap[R];\n this.dtype = dtype || 'float32';\n this.size = util.sizeFromShape(shape);\n this.strides = computeStrides(shape);\n this.dataId = dataId;\n this.id = id;\n this.rankType = (this.rank < 5 ? this.rank.toString() : 'higher') as R;\n }\n\n get rank(): number {\n return this.shape.length;\n }\n\n /**\n * Returns a promise of `tf.TensorBuffer` that holds the underlying data.\n *\n * @doc {heading: 'Tensors', subheading:
'Classes'}\n */\n async buffer<D extends DataType = 'float32'>(): Promise<TensorBuffer<R, D>> {\n const vals = await this.data<D>();\n return opHandler.buffer(this.shape, this.dtype as D, vals);\n }\n\n /**\n * Returns a `tf.TensorBuffer` that holds the underlying data.\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n */\n bufferSync<D extends DataType = 'float32'>(): TensorBuffer<R, D> {\n return opHandler.buffer(this.shape, this.dtype as D, this.dataSync());\n }\n\n /**\n * Returns the tensor data as a nested array. The transfer of data is done\n * asynchronously.\n *\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n */\n async array(): Promise<ArrayMap[R]> {\n const vals = await this.data();\n return toNestedArray(this.shape, vals) as ArrayMap[R];\n }\n\n /**\n * Returns the tensor data as a nested array. The transfer of data is done\n * synchronously.\n *\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n */\n arraySync(): ArrayMap[R] {\n return toNestedArray(this.shape, this.dataSync()) as ArrayMap[R];\n }\n\n /**\n * Asynchronously downloads the values from the `tf.Tensor`. Returns a\n * promise of `TypedArray` that resolves when the computation has finished.\n *\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n */\n async data<D extends DataType = NumericDataType>(): Promise<DataTypeMap[D]> {\n this.throwIfDisposed();\n const data = trackerFn().read(this.dataId);\n if (this.dtype === 'string') {\n const bytes = await data as Uint8Array[];\n try {\n return bytes.map(b => util.decodeString(b)) as DataTypeMap[D];\n } catch {\n throw new Error(\n 'Failed to decode the string bytes into utf-8. ' +\n 'To get the original bytes, call

tensor.bytes().');\n }\n }\n return data as Promise<DataTypeMap[D]>;\n }\n\n /**\n * Synchronously downloads the values from the `tf.Tensor`. This blocks the\n * UI
thread until the values are ready, which can cause performance issues.\n *\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n */\n dataSync<D extends DataType = NumericDataType>(): DataTypeMap[D] {\n this.throwIfDisposed();\n const data = trackerFn().readSync(this.dataId);\n if (this.dtype === 'string') {\n try {\n return (data as Uint8Array[]).map(b => util.decodeString(b)) as\n DataTypeMap[D];\n } catch {\n throw new Error(\n 'Failed to decode the string bytes into utf-8. ' +\n 'To get the original bytes, call tensor.bytes().');\n }\n }\n return data as DataTypeMap[D];\n }\n\n /** Returns the underlying bytes of the tensor's data. */\n async bytes(): Promise<Uint8Array[]|Uint8Array> {\n this.throwIfDisposed();\n const data = await trackerFn().read(this.dataId);\n if (this.dtype === 'string') {\n return data as Uint8Array[];\n } else {\n return new Uint8Array((data as TypedArray).buffer);\n
}\n }\n\n /**\n * Disposes `tf.Tensor` from memory.\n *\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n */\n dispose(): void {\n if (this.isDisposed) {\n return;\n }\n trackerFn().disposeTensor(this);\n this.isDisposedInternal = true;\n }\n\n protected isDisposedInternal = false;\n get isDisposed(): boolean {\n return this.isDisposedInternal;\n }\n\n throwIfDisposed() {\n if (this.isDisposed) {\n throw new Error(`Tensor is disposed.`);\n }\n }\n\n /**\n * Prints the `tf.Tensor`. See `tf.print` for details.\n *\n * @param verbose Whether to print verbose information about the tensor,\n * including dtype and size.\n *\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n */\n print(verbose = false): void {\n return opHandler.print(this, verbose);\n }\n\n /**\n * Returns a copy of the tensor. See `tf.clone` for details.\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n */\n clone<T
extends Tensor>(this: T): T {\n this.throwIfDisposed();\n return opHandler.clone(this);\n }\n\n /**\n * Returns a human-readable description of the tensor. Useful for logging.\n *\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n */\n toString(verbose = false): string {\n const vals = this.dataSync();\n return tensorToString(vals, this.shape, this.dtype, verbose);\n }\n\n cast<T extends this>(dtype: DataType): T {\n this.throwIfDisposed();\n return opHandler.cast(this as T, dtype);\n }\n variable(trainable = true, name?: string, dtype?: DataType): Variable<R> {\n this.throwIfDisposed();\n return trackerFn().makeVariable(this, trainable, name, dtype) as\n Variable<R>;\n }\n}\nObject.defineProperty(Tensor, Symbol.hasInstance, {\n value: (instance: Tensor) => {\n // Implementation note: we should use properties of the object that will be\n // defined before the constructor body has finished executing (methods).\n // This
is because when this code is transpiled by babel, babel will call\n // classCallCheck before the constructor body is run.\n // See https://github.com/tensorflow/tfjs/issues/3384 for backstory.\n return !!instance && instance.data != null && instance.dataSync != null &&\n instance.throwIfDisposed != null;\n }\n});\n\nexport function getGlobalTensorClass() {\n // Use getGlobal so that we can augment the Tensor class across package\n // boundaries becase the node resolution alg may result in different modules\n // being returned for this file depending on the path they are loaded from.\n return getGlobal('Tensor', () => {\n return Tensor;\n });\n}\n\n// Global side effect. Cache global reference to Tensor class\ngetGlobalTensorClass();\n\nexport interface NumericTensor<R extends Rank = Rank> extends Tensor<R> {\n dtype: NumericDataType;\n dataSync<D extends DataType = NumericDataType>(): DataTypeMap[D];\n data<D extends DataType = NumericDataType>(): Promise<DataTypeMap[D]>;\n}\n\nexport
interface StringTensor<R extends Rank = Rank> extends Tensor<R> {\n dtype: 'string';\n dataSync<D extends DataType = 'string'>(): DataTypeMap[D];\n data<D extends DataType = 'string'>(): Promise<DataTypeMap[D]>;\n}\n\n/** @doclink Tensor */\nexport type Scalar = Tensor<Rank.R0>;\n/** @doclink Tensor */\nexport type Tensor1D = Tensor<Rank.R1>;\n/** @doclink Tensor */\nexport type Tensor2D = Tensor<Rank.R2>;\n/** @doclink Tensor */\nexport type Tensor3D = Tensor<Rank.R3>;\n/** @doclink Tensor */\nexport type Tensor4D = Tensor<Rank.R4>;\n/** @doclink Tensor */\nexport type Tensor5D = Tensor<Rank.R5>;\n/** @doclink Tensor */\nexport type Tensor6D = Tensor<Rank.R6>;\n\n/**\n * A mutable `tf.Tensor`, useful for persisting state, e.g. for training.\n *\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n */\nexport class Variable<R extends Rank = Rank> extends Tensor<R> {\n name: string;\n\n constructor(\n

initialValue: Tensor<R>, public trainable: boolean,
name: string,\n tensorId: number) {\n super(\n initialValue.shape, initialValue.dtype, initialValue.dataId, tensorId);\n this.name = name;\n }\n\n /**\n * Assign a new `tf.Tensor` to this variable. The new `tf.Tensor` must have\n * the same shape and dtype as the old `tf.Tensor`.\n *\n * @param newValue New tensor to be assigned to this variable.\n *\n * @doc {heading: 'Tensors', subheading: 'Classes'}\n */\n assign(newValue: Tensor<R>): void {\n if (newValue.dtype !== this.dtype) {\n throw new Error(\n `dtype of the new value (${newValue.dtype}) and ` +\n `previous value (${this.dtype}) must match`);\n }\n if (!util.arraysEqual(newValue.shape, this.shape)) {\n throw new Error(\n `shape of the new value (${newValue.shape}) and ` +\n `previous value (${this.shape}) must match`);\n }\n trackerFn().disposeTensor(this);\n this.dataId = newValue.dataId;\n trackerFn().incRef(this, null /* backend */);\n }\n\n dispose(): void {\n trackerFn().disposeVariable(this);\n this.isDisposedInternal = true;\n }\n}\n\nObject.defineProperty(Variable, Symbol.hasInstance, {\n value: (instance: Variable) => {\n return instance instanceof Tensor && instance.assign != null &&\n instance.assign instanceof Function;\n }\n});\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\n/** @docalias number[] */\nexport interface ShapeMap {\n R0: number[];\n R1: [number];\n R2: [number, number];\n R3: [number, number, number];\n R4: [number, number, number, number];\n R5: [number, number, number, number, number];\n R6: [number, number, number, number, number, number];\n}\n\n/** @docalias number[] */\nexport interface ArrayMap {\n R0: number;\n R1: number[];\n R2: number[][];\n R3: number[][][];\n R4: number[][][][];\n R5: number[][][][][];\n R6: number[][][][][][];\n}\n\nexport interface DataTypeMap {\n float32: Float32Array;\n int32: Int32Array;\n bool: Uint8Array;\n complex64: Float32Array;\n string: string[];\n}\n\nexport interface SingleValueMap {\n bool: boolean;\n int32: number;\n float32: number;\n complex64: number;\n string: string;\n}\n\n/** @docalias 'float32'|'int32'|'bool'|'complex64'|'string' */\nexport type DataType = keyof DataTypeMap;\nexport type NumericDataType = 'float32'|'int32'|'bool'|'complex64';\nexport type TypedArray = Float32Array|Int32Array|Uint8Array;\n/** Tensor data used in tensor creation and user-facing API. */\nexport type DataValues = DataTypeMap[DataType];\n/** The underlying tensor data that gets stored in a backend. */\nexport type BackendValues = Float32Array|Int32Array|Uint8Array|Uint8Array[];\n\nexport enum Rank {\n R0 = 'R0',\n R1 = 'R1',\n R2 = 'R2',\n R3 = 'R3',\n R4 = 'R4',\n R5 = 'R5',\n R6 = 'R6'\n}\n\nexport type FlatVector = boolean[]|number[]|TypedArray;\nexport type RegularArray<T> = \n T[]|T[][]|T[][][]|T[][][][]|T[][][][][]|T[][][][][][];\n\n// tslint:disable-next-line:no-any\nexport interface RecursiveArray<T extends any> {\n [index: number]: T|RecursiveArray<T>;\n}\n\n// Looks for upcasting types. Used, for example, in operations with mixed dtype\n// inputs.\nenum UpcastInt32AndMap {\n 'float32' = 'float32',\n 'int32' = 'int32',\n 'bool' = 'int32',\n 'complex64' = 'complex64'\n}\n\nenum UpcastBoolAndMap {\n 'float32' = 'float32',\n 'int32' = 'int32',\n 'bool' = 'bool',\n 'complex64' = 'complex64'\n}\n\nenum UpcastFloat32AndMap {\n 'float32' = 'float32',\n 'int32' = 'float32',\n 'bool' = 'float32',\n 'complex64' = 'complex64'\n}\n\nenum UpcastComplex64AndMap {\n 'float32' = 'complex64',\n 'int32' = 'complex64',\n 'bool' = 'complex64',\n 'complex64' = 'complex64'\n}\n\nconst upcastTypeMap = {\n 'float32': UpcastFloat32AndMap,\n 'int32': UpcastInt32AndMap,\n 'bool': UpcastBoolAndMap,\n 'complex64': UpcastComplex64AndMap\n};\n\nexport function upcastType(typeA: DataType, typeB: DataType): DataType {\n if (typeA === 'string' || typeB === 'string') {\n if (typeA === 'string' && typeB === 'string') {\n return 'string';\n }\n throw new Error(`Can not upcast ${typeA} with ${typeB}`);\n }\n return upcastTypeMap[typeA][typeB];\n}\n\n/** Returns the output type after summation. */\nexport function

```
sumOutType(type: DataType): DataType {\n  return
 upcastType(type, 'int32');\n}\n\n/** @docalias TypedArray|Array */\nexport type TensorLike =\n
TypedArray|number|boolean|string|RecursiveArray<number|number[]|TypedArray>|\n
RecursiveArray<boolean>|RecursiveArray<string>|Uint8Array[];\nexport type ScalarLike =
number|boolean|string|Uint8Array;\n/** @docalias TypedArray|Array */\nexport type TensorLike1D =
TypedArray|number[]|boolean[]|string[]|Uint8Array[];\n/** @docalias TypedArray|Array */\nexport type
TensorLike2D = TypedArray|number[]|number[][]|boolean[]|boolean[][]|\n
string[]|string[][]|Uint8Array[]|Uint8Array[][];\n/** @docalias TypedArray|Array */\nexport type TensorLike3D =
TypedArray|number[]|number[][][]|boolean[]|\n
boolean[][][]|string[]|string[][][]|Uint8Array[]|Uint8Array[][][];\n/** @docalias TypedArray|Array */\nexport type
TensorLike4D = TypedArray|number[]|number[][][][]|boolean[]|\n
boolean[][][][]|string[]|string[][][][]|Uint8Array[]|Uint8Array[][][][];\n/** @docalias TypedArray|Array */\nexport
 type TensorLike5D =\n    TypedArray|number[]|number[][][][][]|boolean[]|boolean[][][][][]|string[]|\n
string[][][][][]|Uint8Array[]|Uint8Array[][][][][];\n/** @docalias TypedArray|Array */\nexport type TensorLike6D
=\n    TypedArray|number[]|number[][][][][][]|boolean[]|boolean[][][][][][]|\n
string[]|string[][][][][][]|Uint8Array[]|Uint8Array[][][][][];\n\n/** Type for representing image data in Uint8Array
type. */\nexport interface PixelData {\n  width: number;\n  height: number;\n  data: Uint8Array;\n}\n","/**\n *
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2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR
 CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing
permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {Tensor} from './tensor';\nimport {TensorContainer, TensorContainerArray} from
'./tensor_types';\nimport {upcastType} from './types';\nimport {assert} from './util';\n\nexport function
makeTypesMatch<T extends Tensor>(a: T, b: T): [T, T] {\n  if (a.dtype === b.dtype) {\n    return [a, b];\n  }\n
const dtype = upcastType(a.dtype, b.dtype);\n  return [a.cast(dtype), b.cast(dtype)];\n}\n\nexport function
assertTypesMatch(a: Tensor, b: Tensor): void {\n  assert(\n      a.dtype === b.dtype,\n      () => `The dtypes of the
first(${a.dtype}) and` +\n          ` second(${b.dtype}) input must match`);\n}\n\nexport function
isTensorInList(tensor: Tensor, tensorList: Tensor[]): boolean {\n  return tensorList.some(x => x.id ===
tensor.id);\n}\n\n/**\n
 * Extracts any `Tensor`s found within the provided object.\n *\n * @param container an object that may be a
`Tensor` or may directly contain\n *    `Tensor`s, such as a `Tensor[]` or `{key: Tensor, ...}`. In general it\n *    is safe
to pass any object here, except that `Promise`s are not\n *    supported.\n * @returns An array of `Tensors` found
within the passed object. If the\n *    argument is simply a `Tensor', a list containing that `Tensor` is\n *    returned. If
the object is not a `Tensor` or does not\n *    contain `Tensors`, an empty list is returned.\n */\nexport function
getTensorsInContainer(result: TensorContainer): Tensor[] {\n  const list: Tensor[] = [];\n  const seen = new
Set<{}|void>();\n  walkTensorContainer(result, list, seen);\n  return list;\n}\n\nfunction walkTensorContainer(\n
container: TensorContainer, list: Tensor[], seen: Set<{}|void>): void {\n  if (container == null) {\n    return;\n  }\n  if
(container instanceof Tensor) {\n    list.push(container);\n
    return;\n  }\n  if (!isIterable(container)) {\n    return;\n  }\n  // Iteration over keys works also for arrays.\n  const
iterable = container as TensorContainerArray;\n  for (const k in iterable) {\n    const val = iterable[k];\n    if
(!seen.has(val)) {\n      seen.add(val);\n      walkTensorContainer(val, list, seen);\n    }\n  }\n}\n\n// tslint:disable-
next-line:no-any\nfunction isIterable(obj: any): boolean {\n  return Array.isArray(obj) || typeof obj ===
'object';\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
```

License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {BackendTimingInfo, DataMover, KernelBackend} from './backends/backend';\nimport {Environment, setEnvironmentGlobal} from './environment';\nimport {getGlobalNamespace} from './global_util';\nimport {Add, Cast, Identity} from './kernel_names';\nimport {getGradient, getKernel, getKernelsForBackend, GradFunc, NamedAttrMap, TensorInfo} from './kernel_registry';\nimport {KernelProfile, Profiler} from './profiler';\nimport {backpropagateGradients, getFilteredNodesXToY, TapeNode} from './tape';\nimport {DataId, setTensorTracker, Tensor, TensorTracker, Variable} from './tensor';\nimport {GradSaveFunc, NamedTensorMap, NamedVariableMap, TensorContainer} from './tensor_types';\nimport {getTensorsInContainer} from './tensor_util';\nimport {BackendValues, DataType, DataValues} from './types';\nimport * as util from './util';\nimport {bytesFromStringArray, makeOnesTypedArray, now, sizeFromShape} from './util';\n\n/**\n * A function that computes an output. The save function is for saving tensors\n * computed in the forward pass, that we need in the backward pass.\n */\nexport type ForwardFunc<T> = (backend: KernelBackend, save?: GradSaveFunc) => T;\n\n/**\n * @docalias (a: Tensor, b: Tensor,..., save?: Function) => {\n *   value: Tensor,\n *   gradFunc: (dy: Tensor, saved?: NamedTensorMap) => Tensor | Tensor[]\n * }\n */\nexport type CustomGradientFunc<T extends Tensor> =\n   (...inputs: Array<Tensor|GradSaveFunc>) => {\n   value: T;\n   gradFunc: (dy: T, saved: Tensor[]) => Tensor | Tensor[];\n   };\n\nexport type MemoryInfo = {\n numTensors: number; numDataBuffers: number; numBytes: number;\n unreliable?: boolean; reasons: string[];\n};\n\ntype KernelInfo = {\n name: string; bytesAdded: number; totalBytesSnapshot: number;\n tensorsAdded: number;\n totalTensorsSnapshot: number;\n inputShapes: number[][];\n outputShapes: number[][];\n kernelTimeMs: number | {error: string} | Promise<number|{error: string}>;\n extraInfo: string | Promise<string>;\n};\n\nexport type ProfileInfo = {\n newBytes: number; newTensors: number; peakBytes: number;\n kernels: KernelInfo[];\n result: TensorContainer;\n kernelNames: string[];\n};\n\nexport interface TimingInfo extends BackendTimingInfo {\n wallMs: number;\n}\n\n/** @docalias Function */\nexport type ScopeFn<T extends TensorContainer> = () => T;\n\ninterface ScopeState {\n track: Tensor[];\n name: string;\n id: number;\n}\n\ninterface RegisteredKernelInvocation<I extends NamedTensorMap> {\n kernelName: string;\n inputs: I;\n attrs?: NamedAttrMap;\n}\n\ninterface CustomGradKernelInvocation<T extends Tensor|Tensor[],\n   I extends NamedTensorMap> {\n forwardFunc: ForwardFunc<T>;\n backwardsFunc: (dy: T, saved: Tensor[]) => {\n   [P in keyof I]: () => I[P]\n };\n inputs: I;\n attrs?: NamedAttrMap;\n}\n\nfunction isRegisteredKernelInvocation<T extends Tensor|Tensor[],\n   I extends NamedTensorMap>(\n   kernelInvocation: RegisteredKernelInvocation<I>|\n   CustomGradKernelInvocation<T, I>):\n   kernelInvocation is RegisteredKernelInvocation<I> {\n return (kernelInvocation as RegisteredKernelInvocation<I>).kernelName !=\n   null;\n}\n\nclass EngineState {\n // Public since optimizers will use it.\n registeredVariables: NamedVariableMap = {};\n\n nextTapeNodeId = 0;\n numBytes = 0;\n numTensors = 0;\n numStringTensors = 0;\n numDataBuffers = 0;\n\n activeTape: TapeNode[];\n // Number of nested tf.grad() statements when computing higher-order\n // gradients. E.g. `1` for first-order gradients and `2` for second-order\n // gradients. Used to track if the tape should be removed after a backprop.\n gradientDepth = 0;\n // Number of nested kernel calls. When kernel depth is greater than 1, we turn\n // off the tape.\n kernelDepth = 0;\n\n // Keep Tensors that parallel the tapes.\n activeScope: ScopeState;\n scopeStack: ScopeState[] = [];\n /**\n   * Keeps track of the number of data moves during a kernel execution. We\n   * maintain a stack since kernels can call other kernels, recursively.\n   */\n numDataMovesStack: number[] = [];\n nextScopeId = 0;\n\n tensorInfo = new WeakMap<DataId, {\n   backend: KernelBackend,\n   bytes: number,\n   dtype: DataType,\n   shape: number[]\n }>();\n\n profiling = false;\n

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activeProfile: ProfileInfo = {\n    newBytes: 0,\n    newTensors: 0,\n    peakBytes: 0,\n    kernels: [],\n    result: null,\n    get kernelNames():\n        string[] {\n        return Array.from(new Set(this.kernels.map(k => k.name)));\n    }\n  };\n\n  dispose() {\n    for (const variableName in this.registeredVariables) {\n this.registeredVariables[variableName].dispose();\n    }\n  }\n}\n\nexport class Engine implements  TensorTracker, DataMover {\n  state: EngineState;\n  backendName: string;\n  registry: {[id: string]: KernelBackend} = {};\n  registryFactory: {\n    [id: string]: {\n      factory: () => KernelBackend | Promise<KernelBackend>,\n      priority: number\n    }\n  } = {};\n\n  private profiler: Profiler;\n  private backendInstance: KernelBackend;\n  private pendingBackendInit: Promise<boolean>;\n  private pendingBackendInitId = 0;\n\n  constructor(public ENV: Environment) {\n    this.state = new EngineState();\n  }\n\n async ready(): Promise<void> {\n    if (this.pendingBackendInit != null) {\n      return this.pendingBackendInit.then(() => {});\n    }\n    if (this.backendInstance != null) {\n      return;\n    }\n    const sortedBackends = this.getSortedBackends();\n\n    for (let i = 0; i < sortedBackends.length; i++) {\n      const backendName = sortedBackends[i];\n      const success = await this.initializeBackend(backendName).success;\n      if (success) {\n        await this.setBackend(backendName);\n        return;\n      }\n    }\n\n    throw new Error(\n        `Could not initialize any backends, all backend initializations ` +\n        `failed.`);\n  }\n\n  get backend(): KernelBackend {\n    if (this.pendingBackendInit != null) {\n      throw new Error(\n          `Backend '${this.backendName}' has not yet been initialized. Make ` +\n          `sure to await tf.ready() or await tf.setBackend() before calling ` +\n          `other methods`);\n    }\n    if (this.backendInstance == null) {\n      const {name, asyncInit} = this.initializeBackendsAndReturnBest();\n      if (asyncInit) {\n        throw new Error(\n            `The highest priority backend '${name}' has not yet been ` +\n            `initialized. Make sure to await tf.ready() or ` +\n            `await tf.setBackend() before calling other methods`);\n      }\n      this.setBackend(name);\n    }\n    return this.backendInstance;\n  }\n\n  backendNames(): string[] {\n    return Object.keys(this.registryFactory);\n  }\n\n  findBackend(backendName: string): KernelBackend {\n    if (!(backendName in this.registry)) {\n      // If the backend hasn't been initialized but we have a registry entry for\n      // it, initialize it and return it.\n      if (backendName in this.registryFactory) {\n        const {asyncInit} = this.initializeBackend(backendName);\n        if (asyncInit) {\n          // Backend is not ready yet.\n          return null;\n        }\n      } else {\n        return null;\n      }\n    }\n    return this.registry[backendName];\n  }\n\n  findBackendFactory(backendName: string):\n      () => KernelBackend | Promise<KernelBackend> {\n    if (!(backendName in this.registryFactory)) {\n      return null;\n    }\n    return this.registryFactory[backendName].factory;\n  }\n\n  registerBackend(\n      backendName: string,\n      factory: () => KernelBackend | Promise<KernelBackend>,\n      priority = 1): boolean {\n    if (backendName in this.registryFactory) {\n      console.warn(\n          `${backendName} backend was already registered. ` +\n          `Reusing existing backend factory.`);\n      return false;\n    }\n    this.registryFactory[backendName] = {factory, priority};\n    return true;\n  }\n\n  async setBackend(backendName: string): Promise<boolean> {\n    if (this.registryFactory[backendName] == null) {\n      throw new Error(`Backend name '${backendName}' not found in registry`);\n    }\n    this.backendName = backendName;\n    if (this.registry[backendName] == null) {\n      this.backendInstance = null;\n      const {success, asyncInit} = this.initializeBackend(backendName);\n      const result = asyncInit ? await success : success;\n      if (!result) {\n        return false;\n      }\n    }\n    this.backendInstance = this.registry[backendName];\n    this.setupRegisteredKernels();\n    // Reset the profiler.\n    this.profiler = new Profiler(this.backendInstance);\n\n    return true;\n  }\n\n  private setupRegisteredKernels():  void {\n    const kernels = getKernelsForBackend(this.backendName);\n    kernels.forEach(kernel => {\n      if (kernel.setupFunc != null) {\n        kernel.setupFunc(this.backendInstance);\n      }\n    });\n  }\n\n  private disposeRegisteredKernels(backendName: string): void {\n    const kernels = getKernelsForBackend(backendName);\n    kernels.forEach(kernel => {\n      if (kernel.disposeFunc != null) {\n        kernel.disposeFunc(this.registry[backendName]);\n      }\n    });\n  }\n\n  /**\n   * Initializes a backend by looking up the backend name in the factory\n   * registry and calling the factory method. Returns a boolean representing\n   * whether the initialization of the backend suceeded. Throws an error if\n   * there is no backend in the factory
```

```
registry.\n   */\n  private initializeBackend(backendName: string):\n      {success: boolean|Promise<boolean>,
asyncInit: boolean} {\n    const registryFactoryEntry = this.registryFactory[backendName];\n    if
(registryFactoryEntry
 == null) {\n      throw new Error(\n          `Cannot initialize backend ${backendName}, no registration found.`);\n
}\n\n    try {\n      const backend = registryFactoryEntry.factory();\n      /* Test if the factory returns a promise.\n
Done in a more liberal way than\n      previous 'Promise.resolve(backend)===backend'\n      as we needed to account
for custom Promise\n      implementations (e.g. Angular) */\n      if (backend && !(backend instanceof
KernelBackend) &&\n          typeof backend.then === 'function') {\n        const promiseId =
++this.pendingBackendInitId;\n        const success =\n            backend\n                .then(backendInstance => {\n
        // Outdated promise. Another backend was set in the meantime.\n                if (promiseId <
this.pendingBackendInitId) {\n                  return false;\n                }\n                this.registry[backendName] =
backendInstance;\n                this.pendingBackendInit = null;\n
            return true;\n                })\n                .catch(err => {\n                  // Outdated promise. Another backend
was set in the meantime.\n                  if (promiseId < this.pendingBackendInitId) {\n                    return false;\n
      }\n                  this.pendingBackendInit = null;\n                  console.warn(\n                      `Initialization of
backend ${backendName} failed`);\n                  console.warn(err.stack || err.message);\n                  return false;\n
        });\n        this.pendingBackendInit = success;\n        return {success, asyncInit: true};\n      } else {\n
this.registry[backendName] = backend as KernelBackend;\n        return {success: true, asyncInit: false};\n      }\n    }
catch (err) {\n      console.warn(`Initialization of backend ${backendName} failed`);\n      console.warn(err.stack ||
err.message);\n      return {success: false, asyncInit: false};\n    }\n  }\n\n  removeBackend(backendName:
 string): void {\n    if (!(backendName in this.registryFactory)) {\n      throw new Error(`${backendName} backend
not found in registry`);\n    }\n    if (this.backendName === backendName && this.pendingBackendInit != null) {\n
  // There is a pending promise of the backend we want to remove. Make it\n      // obsolete.\n
this.pendingBackendInitId++;\n    }\n\n    if (backendName in this.registry) {\n
this.disposeRegisteredKernels(backendName);\n      this.registry[backendName].dispose();\n      delete
this.registry[backendName];\n    }\n\n    delete this.registryFactory[backendName];\n\n    // Unset the backend if it is
active.\n    if (this.backendName === backendName) {\n      this.pendingBackendInit = null;\n      this.backendName
= null;\n      this.backendInstance = null;\n    }\n  }\n\n  private getSortedBackends(): string[] {\n    if
(Object.keys(this.registryFactory).length === 0) {\n      throw new Error('No backend found in registry.');\n    }\n
  return Object.keys(this.registryFactory).sort((a: string, b: string) => {\n      // Highest priority comes first.\n
return this.registryFactory[b].priority -\n          this.registryFactory[a].priority;\n    });\n  }\n\n  private
initializeBackendsAndReturnBest():\n      {name: string, asyncInit: boolean} {\n    const sortedBackends =
this.getSortedBackends();\n\n    for (let i = 0; i < sortedBackends.length; i++) {\n      const backendName =
sortedBackends[i];\n      const {success, asyncInit} = this.initializeBackend(backendName);\n      if (asyncInit ||
success) {\n        return {name: backendName, asyncInit};\n      }\n    }\n    throw new Error(\n        `Could not
initialize any backends, all backend initializations ` +\n        `failed.`);\n  }\n\n  moveData(backend: KernelBackend,
dataId: DataId) {\n    const info = this.state.tensorInfo.get(dataId);\n    const srcBackend = info.backend;\n    const
values = this.readSync(dataId);\n    const refCount = srcBackend.refCount(dataId);\n
  // Delete the tensor from the old backend and move it to the new\n    // backend.\n
srcBackend.disposeData(dataId, true);\n    info.backend = backend;\n    backend.move(dataId, values, info.shape,
info.dtype, refCount);\n    if (this.shouldCheckForMemLeaks()) {\n      // Track the number of moves during a kernel
execution to correctly\n      // detect memory leaks.\n
this.state.numDataMovesStack[this.state.numDataMovesStack.length - 1]++;\n    }\n  }\n\n  tidy<T extends
TensorContainer>(nameOrFn: string|ScopeFn<T>, fn?: ScopeFn<T>):\n      T {\n    let name: string = null;\n    if (fn
== null) {\n      // Called with only 1 argument.\n      if (typeof nameOrFn !== 'function') {\n        throw new
Error('Please provide a function to tidy()');\n      }\n      fn = nameOrFn;\n    } else {\n      // Called with 2
arguments.\n      if (typeof nameOrFn !== 'string' && !(nameOrFn instanceof String)) {\n        throw new Error(\n
    'When calling with two arguments,
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 the first argument ' +\n 'to tidy() must be a string');\n }\n if (typeof fn !== 'function') {\n throw new Error(\n 'When calling with two arguments, the 2nd argument ' +\n 'to tidy() must be a function');\n }\n name = nameOrFn as string;\n // TODO(nsthorat,smilkov): Do operation logging and performance\n // profiling.\n }\n let result: T;\n return this.scopedRun(\n () => this.startScope(name), () => this.endScope(result), () => {\n result = fn();\n if (result instanceof Promise) {\n console.error('Cannot return a Promise inside of tidy.');\n }\n return result;\n });\n }\n\n private scopedRun<T>(start: () => void, end: () => void, f: () => T): T {\n start();\n try {\n const res = f();\n end();\n return res;\n } catch (ex) {\n end();\n throw ex;\n }\n }\n\n private static nextTensorId = 0;\n private nextTensorId():
 number {\n return Engine.nextTensorId++;\n }\n\n private static nextVariableId = 0;\n private nextVariableId(): number {\n return Engine.nextVariableId++;\n }\n\n /**\n * This method is called instead of the public-facing tensor.clone() when\n * saving a tensor for backwards pass. It makes sure to add the clone\n * operation to the tape regardless of being called inside a kernel\n * execution.\n */\n private clone(x: Tensor): Tensor {\n const y: Tensor = ENGINE.runKernel(Identity, {x} as {} as NamedTensorMap);\n const inputs = {x};\n const grad = (dy: Tensor) => ({\n x: () => {\n const dtype = 'float32';\n const gradInputs = {x: dy};\n const attrs = {dtype};\n\n return ENGINE.runKernel(\n Cast, gradInputs as {} as NamedTensorMap,\n // tslint:disable-next-line: no-unnecessary-type-assertion\n attrs as {} as NamedAttrMap) as Tensor;\n }\n });\n const
 saved: Tensor[] = [];\n this.addTapeNode(this.state.activeScope.name, inputs, [y], grad, saved, {});\n return y;\n }\n\n /**\n * Execute a kernel with the given name and return the output tensor.\n *\n * @param kernelName The name of the kernel to execute.\n * @param inputs A map of input names to tensors.\n * @param attrs A map of attribute names to their values. An attribute is a\n * primitive (non-tensor) input to the kernel.\n * @param inputsToSave A list of tensors, inputs to save for the backprop\n * computation.\n * @param outputsToSave A list of booleans, specifying which output to save\n * for the backprop computation. These are booleans since the output\n * tensors are not visible to the user.\n */\n runKernel<T extends Tensor|Tensor[]>(\n kernelName: string, inputs: NamedTensorMap, attrs?: NamedAttrMap): T {\n const hasKernel = getKernel(kernelName, this.backendName) != null;\n if (!hasKernel) {\n throw new Error(`Kernel
 '${kernelName}' not registered for backend '${\n this.backendName}'`);\n }\n return this.runKernelFunc({kernelName, inputs, attrs});\n }\n\n private shouldCheckForMemLeaks(): boolean {\n return this.ENV.getBool('IS_TEST');\n }\n\n private checkKernelForMemLeak(\n kernelName: string, numDataIdsBefore: number,\n outInfos: TensorInfo[]): void {\n const numDataIdsAfter = this.backend.numDataIds();\n\n // Count the number of data ids associated with the result of the kernel.\n let numOutputDataIds = 0;\n outInfos.forEach(info => {\n // Complex numbers allocate 3 data ids, one for 'real', one for\n // 'imaginary', and one for the container that holds the former two.\n numOutputDataIds += (info.dtype === 'complex64' ? 3 : 1);\n });\n\n // Account for the number of moves during kernel execution. A \"data move\"\n // can happen in the middle of a kernel execution, placing a new (key,value)\n // pair in the data storage.
 Since data moves have net zero effect (we\n // always remove the data from the old backend), we have to cancel them out\n // when detecting memory leaks.\n const numMoves =\n this.state.numDataMovesStack[this.state.numDataMovesStack.length - 1];\n const dataIdsLeaked =\n numDataIdsAfter - numDataIdsBefore - numOutputDataIds - numMoves;\n if (dataIdsLeaked > 0) {\n throw new Error(\n `Backend '${this.backendName}' has an internal memory leak ` +\n `(${dataIdsLeaked} data ids) after running '${kernelName}'`);\n }\n }\n\n /**\n * Internal helper method to execute a kernel Func\n *\n * Use `runKernel` to execute kernels from outside of engine.\n */\n private runKernelFunc<T extends Tensor|Tensor[], I extends NamedTensorMap>(\n kernelParams: RegisteredKernelInvocation<I>|\n CustomGradKernelInvocation<T, I>): T {\n let outputs: Tensor[];\n let saved: Tensor[] = [];\n const isTapeOn = this.isTapeOn();\n\n
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    const startingBytecount = this.state.numBytes;\n    const startingNumTensors = this.state.numTensors;\n\n    if (this.shouldCheckForMemLeaks()) {\n      this.state.numDataMovesStack.push(0);\n    }\n\n    let kernelFunc: () => Tensor[];\n    if (this.backendName == null) {\n      // backend has not been initialized yet (backend initialization is lazy\n      // can be deferred until an op/ kernel is run).\n      // The below getter has side effects that will try to initialize the\n      // backend and set properties like this.backendName\n      // tslint:disable-next-line: no-unused-expression\n      this.backend;\n    }\n\n    let out: TensorInfo|TensorInfo[];\n\n    const kernelOrScopeName = isRegisteredKernelInvocation(kernelParams) ?\n        kernelParams.kernelName :\n        this.state.activeScope != null ? this.state.activeScope.name : '';\n\n    // Create the kernelFunc from either a registered kernel OR passed in\n    // forward/backward functions (used by custom grad). In
 this context a\n    // kernelFunc wraps a kernel implementation with some bookkeeping.\n\n    if (isRegisteredKernelInvocation(kernelParams)) {\n      const {kernelName, inputs, attrs} = kernelParams;\n      if (this.backendName == null) {\n        // backend has not been initialized yet (backend initialization is lazy\n        // can be deferred until an op/ kernel is run).\n        // The below getter has side effects that will try to initialize the\n
 // backend and set properties like this.backendName\n        // tslint:disable-next-line: no-unused-expression\n
this.backend;\n      }\n      const kernel = getKernel(kernelName, this.backendName);\n      util.assert(\n          kernel != null,\n          () => `Cannot find registered kernel '${kernelName}' for backend '${\n
this.backendName}'`);\n\n      kernelFunc = () => {\n        const numDataIdsBefore = this.backend.numDataIds();\n
    out = kernel.kernelFunc({inputs, attrs, backend: this.backend});\n
        const outInfos = Array.isArray(out) ? out : [out];\n        if (this.shouldCheckForMemLeaks()) {\n
this.checkKernelForMemLeak(kernelName, numDataIdsBefore, outInfos);\n        }\n\n        const outTensors =
outInfos.map((outInfo: TensorInfo|Tensor) => {\n          // todo (yassogba) remove this option (Tensor) when node
backend\n          // methods have been modularized and they all return tensorInfo.\n          // TensorInfos do not have
a rank attribute.\n          if ((outInfo as Tensor).rank != null) {\n            return outInfo as Tensor;\n          }\n
const {dataId, shape, dtype} = outInfo as TensorInfo;\n          return this.makeTensorFromDataId(dataId, shape,
dtype);\n        });\n\n        // Save any required inputs and outputs.\n\n        // Do not save unless we are recording to
the tape. Otherwise it would\n        // cause a mem leak since there would be no backprop for these tensors\n        //
(which would otherwise dispose them).\n
    if (isTapeOn) {\n          const tensorsToSave =\n              this.getTensorsForGradient(kernelName, inputs,
outTensors);\n          saved = this.saveTensorsForBackwardMode(tensorsToSave);\n        }\n        return
outTensors;\n      };\n    } else {\n      const {forwardFunc} = kernelParams;\n      // Running a customGrad op.\n
const saveFunc: GradSaveFunc = (tensors) => {\n        // Do not save unless we are recording to the tape. Otherwise
it would\n        // cause a mem leak since we would never run backprop, which disposes\n        // the kept tensors.\n
  if (!isTapeOn) {\n          return;\n        }\n        saved = tensors.map(tensor => this.keep(this.clone(tensor)));\n
};\n\n      kernelFunc = () => {\n        const numDataIdsBefore = this.backend.numDataIds();\n        out = this.tidy(()
=> forwardFunc(this.backend, saveFunc));\n        const outs = (Array.isArray(out) ? out : [out]) as Tensor[];\n        if
(this.shouldCheckForMemLeaks()) {\n
  // Scope name is used to print a more helpful error message if needed.\n
this.checkKernelForMemLeak(kernelOrScopeName, numDataIdsBefore, outs);\n        }\n        return outs;\n      };\n
}\n\n    //\n    // Run the kernelFunc. Optionally profiling it.\n    //\n    const {inputs, attrs} = kernelParams;\n    const
backwardsFunc = isRegisteredKernelInvocation(kernelParams) ?\n        null :\n
kernelParams.backwardsFunc;\n\n    let kernelProfile: KernelProfile;\n    this.scopedRun(\n        // Stop recording to
a tape when running a kernel.\n        () => this.state.kernelDepth++, () => this.state.kernelDepth--, () => {\n          if
(!this.ENV.getBool('DEBUG') && !this.state.profiling) {\n            outputs = kernelFunc();\n          } else {\n
kernelProfile = this.profiler.profileKernel(\n                kernelOrScopeName, inputs, () => kernelFunc());\n            if
(this.ENV.getBool('DEBUG')) {\n              this.profiler.logKernelProfile(kernelProfile);\n
        }\n            outputs = kernelProfile.outputs;\n          }\n        });\n\n    if (isTapeOn) {\n
this.addTapeNode(\n          kernelOrScopeName, inputs, outputs, backwardsFunc, saved, attrs);\n    }\n\n    if
(this.state.profiling) {\n      this.state.activeProfile.kernels.push({\n        name: kernelOrScopeName,\n
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bytesAdded: this.state.numBytes - startingBytecount,\n        totalBytesSnapshot: this.state.numBytes,\n
tensorsAdded: this.state.numTensors - startingNumTensors,\n        totalTensorsSnapshot: this.state.numTensors,\n
  inputShapes: Object.keys(inputs).map(\n            key => inputs[key] != null ? inputs[key].shape : null),\n
outputShapes: outputs.map(item => item.shape),\n        kernelTimeMs: kernelProfile.timeMs,\n        extraInfo:
kernelProfile.extraInfo\n      });\n    }\n    return (Array.isArray(out) ? outputs : outputs[0]) as T;\n  }\n\n  /**\n   *
Saves tensors used in forward mode for use in backward mode.\n   *\n
   * @param tensors the list of tensors to save.\n   */\n  private saveTensorsForBackwardMode(tensors: Tensor[]):
Tensor[] {\n    const saved = tensors.map(tensor => this.keep(this.clone(tensor)));\n    return saved;\n  }\n\n  /**\n   *
Returns a list of tensors to save for a given gradient calculation.\n   *\n   * @param kernelName name of kernel to
look up gradient for.\n   * @param inputs a map of input tensors.\n   * @param outputs an array of output tensors
from forward mode of kernel.\n   */\n  private getTensorsForGradient(\n      kernelName: string, inputs:
NamedTensorMap,\n      outputs: Tensor[]): Tensor[]|null {\n    const gradConfig = getGradient(kernelName);\n    if
(gradConfig != null) {\n      const inputsToSave: string[] = gradConfig.inputsToSave || [];\n      const outputsToSave:
boolean[] = gradConfig.outputsToSave || [];\n\n      // If saveAllInputs is true, all inputs will be saved. Otherwise,
inputs\n      // specified in inputsToSave will be saved.\n      let inputTensorsToSave:
 Tensor[];\n      if (gradConfig.saveAllInputs) {\n        util.assert(\n            Array.isArray(inputs),\n            () =>
'saveAllInputs is true, expected inputs to be an array.');\n\n        inputTensorsToSave =
Object.keys(inputs).map((key) => inputs[key]);\n      } else {\n        inputTensorsToSave =
inputsToSave.map((inputName) => inputs[inputName]);\n      }\n\n      const outputTensorsToSave: Tensor[] =\n
  outputs.filter((_, i) => outputsToSave[i]);\n\n      return inputTensorsToSave.concat(outputTensorsToSave);\n    }\n
  // We return an empty list rather than throw an error because the kernel we\n    // are looking up may not actually be
relevant to backproping through the\n    // overall function\n    //\n    // See 'does not error if irrelevant (pruned) ops
are missing grads' test\n    // in gradients_test.ts for an example.\n    return [];\n  }\n\n  /**\n   * Internal method used
by public APIs for tensor creation. Makes a new\n   * tensor with
 the provided shape, dtype and values. It always\n   * creates a new data id and writes the values to the underlying
backend.\n   */\n  makeTensor(\n      values: DataValues, shape: number[], dtype: DataType,\n      backend?:
KernelBackend): Tensor {\n    if (values == null) {\n      throw new Error('Values passed to engine.makeTensor() are
null');\n    }\n    dtype = dtype || 'float32';\n    backend = backend || this.backend;\n    let backendVals = values as
BackendValues;\n    if (dtype === 'string' && util.isString(values[0])) {\n      backendVals = (values as
string[]).map(d => util.encodeString(d));\n    }\n    const dataId = backend.write(backendVals, shape, dtype);\n
const t = new Tensor(shape, dtype, dataId, this.nextTensorId());\n    this.trackTensor(t, backend);\n\n    // Count
bytes for string tensors.\n    if (dtype === 'string') {\n      const info = this.state.tensorInfo.get(dataId);\n      const
newBytes = bytesFromStringArray(backendVals as Uint8Array[]);\n      this.state.numBytes
 += newBytes - info.bytes;\n      info.bytes = newBytes;\n    }\n    return t;\n  }\n\n  /**\n   * Internal method used by
backends. Makes a new tensor\n   * that is a wrapper around an existing data id. It doesn't create\n   * a new data id,
only increments the ref count used in memory tracking.\n   */\n  makeTensorFromDataId(\n      dataId: DataId,
shape: number[], dtype: DataType,\n      backend?: KernelBackend): Tensor {\n    dtype = dtype || 'float32';\n    const
t = new Tensor(shape, dtype, dataId, this.nextTensorId());\n    this.trackTensor(t, backend);\n    return t;\n  }\n\n
makeVariable(\n      initialValue: Tensor, trainable = true, name?: string,\n      dtype?: DataType): Variable {\n
name = name || this.nextVariableId().toString();\n    if (dtype != null && dtype !== initialValue.dtype) {\n
initialValue = initialValue.cast(dtype);\n    }\n    const v = new Variable(initialValue, trainable, name,
this.nextTensorId());\n    if (this.state.registeredVariables[v.name]
 != null) {\n      throw new Error(`Variable with name ${v.name} was already registered`);\n    }\n
this.state.registeredVariables[v.name] = v;\n    this.incRef(v, this.backend);\n    return v;\n  }\n\n  trackTensor(a:
Tensor, backend: KernelBackend): void {\n    this.state.numTensors++;\n    if (a.dtype === 'string') {\n
this.state.numStringTensors++;\n    }\n    // Bytes for complex numbers are counted by their components. Bytes for\n
  // string tensors are counted when writing values.\n    let bytes = 0;\n    if (a.dtype !== 'complex64' && a.dtype !==
'string') {\n      bytes = a.size * util.bytesPerElement(a.dtype);\n    }\n    this.state.numBytes += bytes;\n\n    if
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(!this.state.tensorInfo.has(a.dataId)) {\n      this.state.numDataBuffers++;\n      this.state.tensorInfo.set(a.dataId, {\n
  backend: backend || this.backend,\n        dtype: a.dtype,\n        shape: a.shape,\n        bytes\n      });\n    }\n\n    if
(!(a instanceof Variable)) {\n      this.track(a);\n
    }\n  }\n\n  // Track the tensor by dataId and increase the refCount for the dataId in the\n  // backend.\n  //
TODO(pyu10055): This is currently used by makeVariable method, to increase\n  // refCount on the backend for the
dataId. It can potentially be replaced with\n  // Identity op indead of calling backend directly.\n  incRef(a: Tensor,
backend: KernelBackend): void {\n    this.trackTensor(a, backend);\n    this.backend.incRef(a.dataId);\n  }\n\n
removeDataId(dataId: DataId, backend: KernelBackend) {\n    if (this.state.tensorInfo.has(dataId) &&\n
this.state.tensorInfo.get(dataId).backend === backend) {\n      this.state.tensorInfo.delete(dataId);\n
this.state.numDataBuffers--;\n    }\n  }\n  disposeTensor(a: Tensor): void {\n    if
(!this.state.tensorInfo.has(a.dataId)) {\n      return;\n    }\n    const info = this.state.tensorInfo.get(a.dataId);\n\n
this.state.numTensors--;\n    if (a.dtype === 'string') {\n      this.state.numStringTensors--;\n
      this.state.numBytes -= info.bytes;\n    }\n    // Don't count bytes for complex numbers as they are counted by
their\n    // components.\n    if (a.dtype !== 'complex64' && a.dtype !== 'string') {\n      const bytes = a.size *
util.bytesPerElement(a.dtype);\n      this.state.numBytes -= bytes;\n    }\n\n    // Remove the reference to dataId if
backend dispose the data successfully\n    if (info.backend.disposeData(a.dataId)) {\n
this.removeDataId(a.dataId, info.backend);\n    }\n\n    // TODO(nsthorat): Construct an error and save the stack
trace for\n    // debugging when in debug mode. Creating a stack trace is too expensive\n    // to do unconditionally.\n
}\n\n  disposeVariables(): void {\n    for (const varName in this.state.registeredVariables) {\n      const v =
this.state.registeredVariables[varName];\n      this.disposeVariable(v);\n    }\n  }\n\n  disposeVariable(v: Variable):
void {\n    this.disposeTensor(v);\n    if (this.state.registeredVariables[v.name] != null)
  {\n      delete this.state.registeredVariables[v.name];\n    }\n  }\n\n  memory(): MemoryInfo {\n    const info =
this.backend.memory() as MemoryInfo;\n    info.numTensors = this.state.numTensors;\n    info.numDataBuffers =
this.state.numDataBuffers;\n    info.numBytes = this.state.numBytes;\n    if (this.state.numStringTensors > 0) {\n
info.unreliable = true;\n      if (info.reasons == null) {\n        info.reasons = [];\n      }\n      info.reasons.push(\n
'Memory usage by string tensors is approximate ' +\n          '(2 bytes per character)');\n    }\n    return info;\n  }\n\n
async profile(query: () => (TensorContainer | Promise<TensorContainer>)):\n      Promise<ProfileInfo> {\n
this.state.profiling = true;\n\n    const startBytes = this.state.numBytes;\n    const startNumTensors =
this.state.numTensors;\n\n    this.state.activeProfile.kernels = [];\n    this.state.activeProfile.result = await
query();\n\n    this.state.profiling = false;\n\n    this.state.activeProfile.peakBytes
  = Math.max(\n        ...this.state.activeProfile.kernels.map(d => d.totalBytesSnapshot));\n
this.state.activeProfile.newBytes = this.state.numBytes - startBytes;\n    this.state.activeProfile.newTensors =\n
this.state.numTensors - startNumTensors;\n    for (const kernel of this.state.activeProfile.kernels) {\n
kernel.kernelTimeMs = await kernel.kernelTimeMs;\n      kernel.extraInfo = await kernel.extraInfo;\n    }\n    return
this.state.activeProfile;\n  }\n\n  isTapeOn(): boolean {\n    return this.state.gradientDepth > 0 &&
this.state.kernelDepth === 0;\n  }\n\n  private addTapeNode(\n      kernelName: string, inputs: NamedTensorMap,
outputs: Tensor[],\n      gradientsFunc: GradFunc, saved: Tensor[], attrs: NamedAttrMap): void {\n    const
tapeNode: TapeNode =\n        {id: this.state.nextTapeNodeId++, kernelName, inputs, outputs, saved};\n\n    const
gradConfig = getGradient(kernelName);\n    if (gradConfig != null) {\n      gradientsFunc = gradConfig.gradFunc;\n
    }\n    if (gradientsFunc != null) {\n      tapeNode.gradient = (dys: Tensor[]) => {\n        // TODO(smilkov): To
optimize back-prop, pass dys that are not used in\n        // the backprop graph to the user as null instead of zeros\n
dys = dys.map((dy, i) => {\n          if (dy == null) {\n            const output = outputs[i];\n            const vals =
util.makeZerosTypedArray(output.size, output.dtype);\n            return this.makeTensor(vals, output.shape,
output.dtype);\n          }\n          return dy;\n        });\n        // Grad functions of ops with single outputs expect a dy,
while ops\n        // with multiple outputs expect dys (array of dy).\n        return gradientsFunc(dys.length > 1 ? dys :
dys[0], saved, attrs);\n      };\n    }\n    this.state.activeTape.push(tapeNode);\n  }\n\n  keep<T extends
Tensor>(result: T): T {\n    result.kept = true;\n    return result;\n  }\n\n  private startTape() {\n    if
(this.state.gradientDepth === 0) {\n
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    this.state.activeTape = [];\n    }\n    this.state.gradientDepth++;\n  }\n\n  private endTape() {\n
this.state.gradientDepth--;\n  }\n\n  /**\n   * Start a scope. Use this with endScope() to achieve the same
functionality\n   * as scope() without the need for a function closure.\n   */\n  startScope(name?: string) {\n    const
scopeInfo: ScopeState = {\n      track: [],\n      name: 'unnamed scope',\n      id: this.state.nextScopeId++\n    };\n    if
(name) {\n      scopeInfo.name = name;\n    }\n    this.state.scopeStack.push(scopeInfo);\n    this.state.activeScope =
scopeInfo;\n  }\n\n  /**\n   * End a scope. Use this with startScope() to achieve the same functionality\n   * as
scope() without the need for a function closure.\n   */\n  endScope(result?: TensorContainer) {\n    const
tensorsToTrackInParent = getTensorsInContainer(result);\n    const tensorsToTrackInParentSet =\n        new
Set(tensorsToTrackInParent.map(t => t.id));\n\n    // Dispose the arrays tracked in this
 scope.\n    for (let i = 0; i < this.state.activeScope.track.length; i++) {\n      const tensor =
this.state.activeScope.track[i];\n      if (!tensor.kept && !tensorsToTrackInParentSet.has(tensor.id)) {\n
tensor.dispose();\n      }\n    }\n\n    const oldScope = this.state.scopeStack.pop();\n    this.state.activeScope =
this.state.scopeStack.length === 0 ?\n        null :\n        this.state.scopeStack[this.state.scopeStack.length - 1];\n\n    //
Track the current result in the parent scope.\n    tensorsToTrackInParent.forEach(tensor => {\n      // Only track the
tensor if was allocated in the inner scope and is not\n      // globally kept.\n      if (!tensor.kept && tensor.scopeId
=== oldScope.id) {\n        this.track(tensor);\n      }\n    });\n  }\n\n  /**\n   * Returns gradients of `f` with respect to
each of the `xs`. The gradients\n   * returned are of the same length as `xs`, but some might be null if `f`\n   * was
not a function of that `x`. It also takes optional dy
 to multiply the\n   * gradient, which defaults to `1`.\n   */\n  gradients<T extends Tensor>(\n      f: () => T, xs:
Tensor[], dy?: T,\n      allowNoGradients = false): {value: T, grads: Tensor[]} {\n    util.assert(\n        xs.length > 0,
() => 'gradients() received an empty list of xs.');\n    if (dy != null && dy.dtype !== 'float32') {\n      throw new
Error(`dy must have 'float32' dtype, but has '${dy.dtype}'`);\n    }\n\n    const y = this.scopedRun(\n        () =>
this.startTape(), () => this.endTape(),\n        () => this.tidy('forward', f));\n\n    util.assert(\n        y instanceof
Tensor,\n        () => 'The result y returned by f() must be a tensor.');\n    // Filter out the nodes that don't connect x =>
y.\n    const filteredTape = getFilteredNodesXToY(this.state.activeTape, xs, y);\n    if (!allowNoGradients &&
filteredTape.length === 0 && xs.length > 0) {\n      throw new Error(\n          'Cannot compute gradient of y=f(x)
with respect to x. Make sure ' +\n          'that
 the f you passed encloses all operations that lead from x ' +\n          'to y.');\n    }\n\n    return this.tidy('backward', ()
=> {\n      const accumulatedGradientMap: {[tensorId: number]: Tensor} = {};\n      accumulatedGradientMap[y.id]
= (dy == null) ? ones(y.shape) : dy;\n\n      // Backprop gradients through the filtered nodes.\n
backpropagateGradients(\n          accumulatedGradientMap, filteredTape,\n          // Pass the tidy function to avoid
circular dep with `tape.ts`.\n          f => this.tidy(f as ScopeFn<Tensor>),\n          // Pass an add function to avoide a
circular dep with `tape.ts`.\n          add);\n      const grads = xs.map(x => accumulatedGradientMap[x.id]);\n\n      if
(this.state.gradientDepth === 0) {\n        // This means that we are not computing higher-order gradients\n        // and
can clean up the tape.\n        this.state.activeTape.forEach(node => {\n          for (const tensor of node.saved) {\n
  tensor.dispose();\n          }\n
      });\n        this.state.activeTape = null;\n      }\n      return {value: y, grads};\n    });\n  }\n\n  customGrad<T
extends Tensor>(f: CustomGradientFunc<T>):\n      (...args: Array<Tensor|GradSaveFunc>) => T {\n    util.assert(\n
    util.isFunction(f),\n        () => 'The f passed in customGrad(f) must be a function.');\n    return (...inputs:
Tensor[]): T => {\n      util.assert(\n          inputs.every(t => t instanceof Tensor),\n          () => 'The args passed in
customGrad(f)(x1, x2,...) must all be ' +\n              'tensors');\n\n      let res: {\n        value: T,\n        gradFunc: (dy: T,
saved: Tensor[]) => Tensor | Tensor[],\n      };\n      const inputMap: NamedTensorMap = {};\n
inputs.forEach((input, i) => {\n        inputMap[i] = input;\n      });\n\n      const forwardFunc: ForwardFunc<T> = (_,
save) => {\n        res = f(...[...inputs, save]);\n        util.assert(\n            res.value instanceof Tensor,\n            () =>
'The function f passed in
 customGrad(f) must return an ' +\n                'object where `obj.value` is a tensor');\n        util.assert(\n
util.isFunction(res.gradFunc),\n            () => 'The function f passed in customGrad(f) must return an ' +\n
'object where `obj.gradFunc` is a function.');\n        return res.value;\n      };\n\n      const backwardsFunc = (dy: T,
```

saved: Tensor[]) => {\n const gradRes = res.gradFunc(dy, saved);\n const grads: Tensor[] = Array.isArray(gradRes) ? gradRes : [gradRes];\n util.assert(\n grads.length === inputs.length,\n () => 'The function f passed in customGrad(f) must return an ' +\n 'object where `obj.gradFunc` is a function that returns ' +\n 'the same number of tensors as inputs passed to f(...).');\n util.assert(\n grads.every(t => t instanceof Tensor),\n () => 'The function f passed in customGrad(f) must return an ' +\n 'object where `obj.gradFunc` is a function that returns ' +\n 'a list of only tensors.');\n const gradMap: {[key: string]: () => Tensor} = {};\n grads.forEach((grad, i) => {\n gradMap[i] = () => grad;\n });\n return gradMap;\n };\n\n return this.runKernelFunc({\n forwardFunc,\n backwardsFunc,\n inputs: inputMap,\n });\n };\n }\n\n readSync(dataId: DataId): BackendValues {\n // Route the read to the correct backend.\n const info = this.state.tensorInfo.get(dataId);\n return info.backend.readSync(dataId);\n }\n read(dataId: DataId): Promise<BackendValues> {\n // Route the read to the correct backend.\n const info = this.state.tensorInfo.get(dataId);\n return info.backend.read(dataId);\n }\n\n async time(query: () => void): Promise<TimingInfo> {\n const start = now();\n const timingInfo = await this.backend.time(query) as TimingInfo;\n timingInfo.wallMs = now() - start;\n return timingInfo;\n }\n\n /**\n * Tracks a Tensor in the current scope to be automatically cleaned up\n * when the current scope ends, and returns the value.\n *\n * @param result The Tensor to track in the current scope.\n */\n private track<T extends Tensor>(result: T): T {\n if (this.state.activeScope != null) {\n result.scopeId = this.state.activeScope.id;\n this.state.activeScope.track.push(result);\n }\n\n return result;\n }\n\n get registeredVariables(): NamedVariableMap {\n return this.state.registeredVariables;\n }\n\n /**\n * Resets the engine state. Removes all backends but does not remove\n * registered backend factories.\n */\n reset(): void {\n // Make any pending promise obsolete.\n this.pendingBackendInitId++;\n\n this.state.dispose();\n this.ENV.reset();\n this.state = new EngineState();\n\n for (const backendName in this.registry) {\n this.disposeRegisteredKernels(backendName);\n this.registry[backendName].dispose();\n delete this.registry[backendName];\n }\n this.backendName = null;\n this.backendInstance = null;\n this.pendingBackendInit = null;\n }\n}\n\nfunction ones(shape: number[]): Tensor {\n const values = makeOnesTypedArray(sizeFromShape(shape), 'float32');\n return ENGINE.makeTensor(values, shape, 'float32');\n}\n\nexport function getOrMakeEngine(): Engine {\n const ns = getGlobalNamespace() as {} as {_tfengine: Engine};\n if (ns._tfengine == null) {\n const environment = new Environment(ns);\n ns._tfengine = new Engine(environment);\n }\n setEnvironmentGlobal(ns._tfengine.ENV);\n\n // Tell the current tensor interface that the global engine is responsible\n // for tracking.\n setTensorTracker(() => ns._tfengine);\n return ns._tfengine;\n}\n\nexport const ENGINE = getOrMakeEngine();\n\n/**\n * A implementation of the add op for use within engine and tape.\n *\n * This allows us to avoid a circular dependency between add.ts and engine.\n * It is exported to be available in tape tests.\n */\nexport function add(a: Tensor, b: Tensor): Tensor {\n // We duplicate Add here to avoid a circular dependency with add.ts.\n const inputs = {a, b};\n return ENGINE.runKernel(Add, inputs as {} as NamedTensorMap);\n}\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\n// tslint:disable-next-line:no-any\nfunction _isNavigatorDefined(): boolean {\n return typeof navigator !== 'undefined' && navigator != null;\n}\n\nexport function isMobile(): boolean {\n if (_isNavigatorDefined()) {\n // tslint:disable-next-line:no-any\n const a = navigator.userAgent || navigator.vendor || (window as any).opera;\n // tslint:disable-next-line:max-line-length\n return /(android|bb\\d+|meego).+mobile|avantgo|bada\\/|blackberry|blazer|compal|elaine|fennec|hiptop|iemobile|ip(hone|od)|

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ce|xda|xiino/i\n .test(a) ||\n // tslint:disable-next-line:max-line-length\n
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|kyo(c|k)|le(no|xi)|lg(g|\\/(k|l|u)|50|54|\\-[a-w])|libw|lynx|m1\\-w|m3ga|m50\\/|ma(te|ui|xo)|mc(01|21|ca)|m\\-
cr|me(rc|ri)|mi(o8|oa|ts)|mmef|mo(01|02|bi|de|do|t(\\-| |o|v)|zz)|mt(50|p1|v)|mwbp|mywa|n10[0-2]|n20[2-
3]|n30(0|2)|n50(0|2|5)|n7(0(0|1)|10)|ne((c|m)\\-
|on|tf|wf|wg|wt)|nok(6|i)|nzph|o2im|op(ti|wv)|oran|owg1|p800|pan(a|d|t)|pdxg|pg(13|\\-([1-
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)|qtek|r380|r600|raks|rim9|ro(ve|zo)|s55\\/|sa(ge|ma|mm|ms|ny|va)|sc(01|h\\-|oo|p\\-)|sdk\\/|se(c(\\-
|0|1)|47|mc|nd|ri)|sgh\\-|shar|sie(\\-|m)|sk\\-0|sl(45|id)|sm(al|ar|b3|it|t5)|so(ft|ny)|sp(01|h\\-|v\\-|v
)|sy(01|mb)|t2(18|50)|t6(00|10|18)|ta(gt|lk)|tcl\\-|tdg\\-|tel(i|m)|tim\\-|t\\-mo|to(pl|sh)|ts(70|m\\-|m3|m5)|tx\\-
9|up(\\.b|g1|si)|utst|v400|v750|veri|vi(rg|te)|vk(40|5[0-3]|\\-
v)|vm40|voda|vulc|vx(52|53|60|61|70|80|81|83|85|98)|w3c(\\-|)|webc|whit|wi(g |nc|nw)|wmlb|wonu|x700|yas\\-
|your|zeto|zte\\-/i\n .test(a.substr(0, 4));\n }\n return false;\n}\n\nexport function isBrowser(): boolean {\n
return (typeof window !== 'undefined' && window.document != null) ||\n //@ts-ignore\n (typeof
WorkerGlobalScope !== 'undefined');\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
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distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either
express or implied.\n * See the License for the specific language governing permissions and\n * limitations under
the License.\n *
==\n
*/\nimport './engine';\n\nimport * as device_util from './device_util';\nimport {env} from './environment';\n\nconst
ENV = env();\n\n/**\n * This file contains environment-related flag registrations.\n */\n\n/** Whether to enable
debug mode. */\nENV.registerFlag('DEBUG', () => false, debugValue => {\n if (debugValue) {\n
console.warn(\n 'Debugging mode is ON. The output of every math call will ' +\n 'be downloaded to CPU
and checked for NaNs. ' +\n 'This significantly impacts performance.');\n }\n});\n\n/** Whether
we are in a browser (as versus, say, node.js) environment. */\nENV.registerFlag('IS_BROWSER', () =>
device_util.isBrowser());\n\n/** Whether we are in a browser (as versus, say, node.js) environment.
*/\nENV.registerFlag(\n 'IS_NODE',\n () => (typeof process !== 'undefined') &&\n (typeof process.versions
!== 'undefined') &&\n (typeof process.versions.node !== 'undefined'));\n\n/** Whether this browser is Chrome.
*/\nENV.registerFlag(\n 'IS_CHROME',\n () => typeof navigator !== 'undefined' && navigator != null &&\n
navigator.userAgent != null && /Chrome/.test(navigator.userAgent) &&\n /Google
Inc/.test(navigator.vendor));\n\n/**\n * True when the environment is \"production\" where we disable safety
checks\n * to gain performance.\n */\nENV.registerFlag('PROD', () => false);\n\n/**\n * Whether to do sanity
checks when inferring a shape from user-provided\n * values, used when creating a new tensor.\n
*/\nENV.registerFlag(\n 'TENSORLIKE_CHECK_SHAPE_CONSISTENCY',

```
() => ENV.getBool('DEBUG'));\n\n/** Whether deprecation warnings are enabled.
*/\nENV.registerFlag('DEPRECATION_WARNINGS_ENABLED', () => true);\n\n/** True if running unit tests.
*/\nENV.registerFlag('IS_TEST', () => false);\n\n/** Whether to check computation result for errors.
*/\nENV.registerFlag('CHECK_COMPUTATION_FOR_ERRORS', () => true);\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n
 * =============================================================================\n
*/\n\nimport {ENGINE} from './engine';\nimport {env} from './environment';\nimport {Tensor} from './tensor';\nimport {DataType, TensorLike} from './types';\nimport {assert, flatten, inferDtype, isTypedArray, toTypedArray} from './util';\n\nexport function inferShape(val: TensorLike, dtype?: DataType): number[] {\n  let firstElem: typeof val = val;\n\n  if (isTypedArray(val)) {\n    return dtype === 'string' ? [] : [val.length];\n  }\n  if (!Array.isArray(val)) {\n    return [];  // Scalar.\n  }\n  const shape: number[] = [];\n\n  while (Array.isArray(firstElem) ||\n         isTypedArray(firstElem) && dtype !== 'string') {\n    shape.push(firstElem.length);\n    firstElem = firstElem[0];\n  }\n  if (Array.isArray(val) &&\n      env().getBool('TENSORLIKE_CHECK_SHAPE_CONSISTENCY')) {\n    deepAssertShapeConsistency(val, shape, []);\n  }\n\n  return shape;\n}\n\nfunction deepAssertShapeConsistency(\n    val: TensorLike, shape: number[], indices: number[]) {\n  indices = indices || [];\n  if (!(Array.isArray(val)) && !isTypedArray(val)) {\n    assert(\n        shape.length === 0,\n        () => `Element arr[${indices.join('][')}] is a primitive, ` +\n            `but should be an array/TypedArray of ${shape[0]} elements`);\n    return;\n  }\n  assert(\n      shape.length > 0,\n      () => `Element arr[${indices.join('][')}] should be a primitive, ` +\n          `but is an array of ${val.length} elements`);\n  assert(\n      val.length === shape[0],\n      () => `Element arr[${indices.join('][')}] should have ${shape[0]} ` +\n          `elements, but has ${val.length} elements`);\n  const subShape = shape.slice(1);\n  for (let i = 0; i < val.length; ++i) {\n    deepAssertShapeConsistency(val[i], subShape, indices.concat(i));\n  }\n}\n\nfunction assertDtype(\n    expectedDtype: DataType|'numeric'|'string_or_numeric',\n actualDType: DataType, argName: string, functionName: string)
 {\n  if (expectedDtype === 'string_or_numeric') {\n    return;\n  }\n  if (expectedDtype == null) {\n    throw new Error(`Expected dtype cannot be null.`);\n  }\n  if (expectedDtype !== 'numeric' && expectedDtype !== actualDType ||\n      expectedDtype === 'numeric' && actualDType === 'string') {\n    throw new Error(\n `Argument '${argName}' passed to '${functionName}' must ` +\n        `be ${expectedDtype} tensor, but got ${actualDType} tensor`);\n  }\n}\n\nexport function convertToTensor<T extends Tensor>(\n    x: T|TensorLike, argName: string, functionName: string,\n    parseAsDtype: DataType|'numeric'|'string_or_numeric' = 'numeric'): T {\n  if (x instanceof Tensor) {\n    assertDtype(parseAsDtype, x.dtype, argName, functionName);\n    return x;\n  }\n  let inferredDtype = inferDtype(x);\n  // If the user expects a bool/int/float, use that info to update the\n  // inferredDtype when it is not a string.\n  if (inferredDtype !== 'string' &&\n      ['bool', 'int32', 'float32'].indexOf(parseAsDtype)
 >= 0) {\n    inferredDtype = parseAsDtype as DataType;\n  }\n  assertDtype(parseAsDtype, inferredDtype, argName, functionName);\n\n  if ((x == null) ||\n      (!isTypedArray(x) && !Array.isArray(x) && typeof x !== 'number' &&\n       typeof x !== 'boolean' && typeof x !== 'string')) {\n    const type = x == null ? 'null' : (x as {}).constructor.name;\n    throw new Error(\n        `Argument '${argName}' passed to '${functionName}' must be a ` +\n        `Tensor or TensorLike, but got '${type}'`);\n  }\n  const inferredShape = inferShape(x, inferredDtype);\n  if (!isTypedArray(x) && !Array.isArray(x)) {\n    x = [x] as number[];\n  }\n  const skipTypedArray = true;\n  const values = inferredDtype !== 'string' ?\n      toTypedArray(x, inferredDtype as DataType) :\n      flatten(x as string[], [], skipTypedArray) as string[];\n  return ENGINE.makeTensor(values, inferredShape, inferredDtype) as T;\n}\n\nexport function convertToTensorArray<T extends Tensor>(\n    arg:
```

Array<T|TensorLike>, argName: string, functionName: string,\n parseAsDtype: DataType|'numeric'|'string_or_numeric' = 'numeric'): T[] {\n if (!Array.isArray(arg)) {\n throw new Error(\n `Argument ${argName} passed to ${functionName} must be a ` +\n '`Tensor[]` or `TensorLike[]`');\n }\n const tensors = arg as T[];\n return tensors.map(\n (t, i) =>\n convertToTensor(t, `${argName}[${i}]`, functionName, parseAsDtype));\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n *\n See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\nimport {ENGINE} from '../engine';\nimport {isPromise} from '../util';\n\nexport const OP_SCOPE_SUFFIX = '__op';\n\n/**\n * Used for wrapping functions that perform math operations on\n * Tensors. The function will be wrapped in a named scope that cleans all\n * memory usage after the function is done.\n */\nexport function op<T extends Function>(f: {[name: string]: T}): T {\n const keys = Object.keys(f);\n if (keys.length !== 1) {\n throw new Error(\n `Please provide an object with a single key ` +\n `(operation name) mapping to a function. Got an object with ` +\n `${keys.length} keys.`);\n }\n\n let opName = keys[0];\n const fn = f[opName];\n\n // Strip the underscore from the end of the function name.\n if (opName.endsWith('_')) {\n opName = opName.substring(0,\n opName.length - 1);\n }\n\n // add an __op suffix to distinguish ops from kernels in tf.profile\n opName = opName + OP_SCOPE_SUFFIX;\n\n // tslint:disable-next-line:no-any\n const f2 = (...args: any[]) => {\n ENGINE.startScope(opName);\n try {\n const result = fn(...args);\n if (isPromise(result)) {\n console.error('Cannot return a Promise inside of tidy.');\n }\n ENGINE.endScope(result);\n return result;\n } catch (ex) {\n ENGINE.endScope(null);\n throw ex;\n }\n };\n Object.defineProperty(f2, 'name', {value: opName, configurable: true});\n\n // tslint:disable-next-line:no-any\n return f2 as any as T;\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\nimport {ENGINE} from '../engine';\nimport {Complex, ComplexInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {op} from './operation';\n\n/**\n * Converts two real numbers to a complex number.\n *\n * Given a tensor `real` representing the real part of a complex number, and a\n * tensor `imag` representing the imaginary part of a complex number, this\n * operation returns complex numbers elementwise
of the form [r0, i0, r1, i1],\n * where r represents the real part and i represents the imag part.\n *\n * The input tensors real and imag must have the same shape.\n *\n * ```js\n * const real = tf.tensor1d([2.25, 3.25]);\n * const imag = tf.tensor1d([4.75, 5.75]);\n * const complex = tf.complex(real, imag);\n *\n * complex.print();\n * ```\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nfunction complex_<T extends Tensor>(real: T|TensorLike, imag: T|TensorLike): T {\n const $real = convertToTensor(real, 'real', 'complex');\n const $imag = convertToTensor(imag, 'imag', 'complex');\n util.assertShapesMatch(\n $real.shape, $imag.shape,\n `real and imag shapes, ${$real.shape} and ${$imag.shape}, ` +\n `must match in call to tf.complex().`);\n\n const inputs: ComplexInputs = {real: $real, imag: $imag};\n return ENGINE.runKernel(Complex, inputs as {} as NamedTensorMap);\n}\n\nexport const complex = op({complex_});\n","/**\n * @license\n * Copyright

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==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Tensor} from '../tensor';\nimport {TensorLike, TypedArray} from '../types';\nimport {DataType} from '../types';\nimport {assert, assertNonNegativeIntegerDimensions, flatten, inferDtype, isTypedArray, sizeFromShape, toTypedArray} from '../util';\n\n/** This is shared code across all tensor creation methods. */\nexport function makeTensor(\n values: TensorLike, shape: number[], inferredShape: number[],\n dtype?: DataType): Tensor {\n if (dtype == null) {\n dtype = inferDtype(values);\n }\n if (dtype === 'complex64') {\n throw new Error(\n `Cannot construct a complex64 tensor directly. ` +\n `Please use tf.complex(real, imag).`);\n }\n if (!isTypedArray(values) && !Array.isArray(values) &&\n typeof values !== 'number' && typeof values !== 'boolean' &&\n typeof values !== 'string') {\n throw new Error(\n 'values passed to tensor(values) must be a number/boolean/string or ' +\n 'an array of numbers/booleans/strings, or a TypedArray');\n }\n if (shape != null) {\n assertNonNegativeIntegerDimensions(shape);\n\n const providedSize = sizeFromShape(shape);\n const inferredSize = sizeFromShape(inferredShape);\n assert(\n providedSize === inferredSize,\n () =>\n `Based on the provided shape, [${shape}], the tensor should have ` +\n `${providedSize} values but has ${inferredSize}`);\n\n for (let i = 0; i < inferredShape.length; ++i) {\n const inferred = inferredShape[i];\n const flatDimsDontMatch = i === inferredShape.length - 1 ?\n inferred !== sizeFromShape(shape.slice(i)) :\n true;\n assert(\n inferredShape[i] === shape[i] || !flatDimsDontMatch,\n () => `Error creating a new Tensor. Inferred shape ` +\n `(${inferredShape}) does not match the provided ` +\n `shape (${shape}). `);\n }\n }\n\n if (!isTypedArray(values) && !Array.isArray(values)) {\n values = [values] as number[];\n }\n\n shape = shape || inferredShape;\n values = dtype !== 'string' ?\n toTypedArray(values, dtype) :\n flatten(values as string[], [], true) as string[];\n return ENGINE.makeTensor(values as TypedArray, shape, dtype);\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {Tensor} from '../tensor';\nimport {inferShape} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {DataType, Rank, ShapeMap} from '../types';\n\nimport {makeTensor} from './tensor_ops_util';\n\n/**\n * Creates a `tf.Tensor` with the provided values, shape and dtype.\n *\n * ```js\n * // Pass an array of values to create a vector.\n * tf.tensor([1, 2, 3, 4]).print();\n * ```\n *\n * ```js\n * // Pass a nested array of values to make a matrix or a higher\n * // dimensional tensor.\n * tf.tensor([[1, 2], [3, 4]]).print();\n * ```\n *\n * ```js\n * // Pass a flat array and specify a shape yourself.\n * tf.tensor([1, 2, 3, 4], [2, 2]).print();\n * ```\n *\n * @param values The values of the tensor. Can be nested array of numbers,\n * or a flat array, or a `TypedArray`. If the values are strings,\n * they will be encoded as utf-8 and kept as `Uint8Array[]`.\n * @param shape The shape of the tensor. Optional. If not provided,\n * it is inferred from `values`.\n * @param dtype The data type.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function tensor<R extends Rank>(\n values: TensorLike, shape?: ShapeMap[R], dtype?: DataType): Tensor<R> {\n const inferredShape = inferShape(values, dtype);\n return makeTensor(values,

shape, inferredShape, dtype) as Tensor<R>;\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\n/* Type definitions for exporting and importing of models. */\n\n/**\n * A map from Tensor dtype to number of bytes per element of the Tensor.\n */\nexport const DTYPE_VALUE_SIZE_MAP: {[dtype: string]: number} = {\n 'float32':
4,\n 'float16': 2,\n 'int32': 4,\n 'uint16': 2,\n 'uint8': 1,\n 'bool': 1,\n 'complex64': 8\n};\n\n/**\n * A weight manifest.\n *\n * The weight manifest consists of an ordered list of weight-manifest groups.\n * Each weight-manifest group (\"group\" for short hereafter) consists of a\n * number of weight values stored in a number of paths.\n * See the documentation of `WeightManifestGroupConfig` below for more details.\n */\nexport declare type WeightsManifestConfig = WeightsManifestGroupConfig[];\n\n/**\n * A weight-manifest group.\n *\n * Consists of an ordered list of weight values encoded in binary format,\n * stored in an ordered list of paths.\n */\nexport declare interface WeightsManifestGroupConfig {\n /**\n * An ordered list of paths.\n *\n * Paths are intentionally abstract in order to be general. For example, they\n * can be relative URL paths or relative paths on the file system.\n */\n paths: string[];\n\n /**\n * Specifications of the weights
stored in the paths.\n */\n weights: WeightsManifestEntry[];\n}\n\n/**\n * Group to which the weight belongs.\n *\n * - 'optimizer': Weight from a stateful optimizer.\n */\nexport type WeightGroup = 'model'|'optimizer';\n\n/**\n * An entry in the weight manifest.\n *\n * The entry contains specification of a weight.\n */\nexport declare interface WeightsManifestEntry {\n /**\n * Name of the weight, e.g., 'Dense_1/bias'\n */\n name: string;\n\n /**\n * Shape of the weight.\n */\n shape: number[];\n\n /**\n * Data type of the weight.\n */\n dtype: 'float32'|'int32'|'bool'|'string'|'complex64';\n\n /**\n * Type of the weight.\n *\n * Optional.\n *\n * The value 'optimizer' indicates the weight belongs to an optimizer\n * (i.e., used only during model training and not during inference).\n */\n group?: WeightGroup;\n\n /**\n * Information for dequantization of the weight.\n */\n quantization?: {\n scale?: number, // The scaling constant to multiply
by.\n min?: number, // The (possibly nudged) minimum weight to add.\n dtype: 'uint16'|'uint8'|'float16' // The dtype of the quantized weights.\n };\n}\n\n/**\n * Options for saving a model.\n * @innamespace io\n */\nexport interface SaveConfig {\n /**\n * Whether to save only the trainable weights of the model, ignoring the\n * non-trainable ones.\n */\n trainableOnly?: boolean;\n\n /**\n * Whether the optimizer will be saved (if exists).\n *\n * Default: `false`.\n */\n includeOptimizer?: boolean;\n}\n\n/**\n * Result of a saving operation.\n */\nexport interface SaveResult {\n /**\n * Information about the model artifacts saved.\n */\n modelArtifactsInfo: ModelArtifactsInfo;\n\n /**\n * HTTP responses from the server that handled the model-saving request (if\n * any). This is applicable only to server-based saving routes.\n */\n responses?: Response[];\n\n /**\n * Error messages and related data (if any).\n */\n errors?: Array<{}|string>;\n}\n\nexport declare interface ModelArtifactsInfo {\n /**\n * Timestamp for when the model is saved.\n */\n dateSaved: Date;\n\n /**\n * TODO (cais,yassogba) consider removing GraphDef as GraphDefs now\n * come in a JSON format and none of our IOHandlers support a non json\n * format. We could conder replacing this with 'Binary' if we want to\n * allow future handlers to save to non json formats (though they will\n * probably want more information than 'Binary').\n * Type of the model topology\n *\n * Type of the model topology\n *\n * Possible values:\n * - JSON: JSON config (human-readable, e.g., Keras JSON).\n * - GraphDef: TensorFlow\n * [GraphDef](https://www.tensorflow.org/extend/tool_developers/#graphdef)\n * protocol buffer (binary).\n */\n modelTopologyType: 'JSON'|'GraphDef';\n\n /**\n * Size of model topology (Keras JSON or GraphDef), in bytes.\n */\n modelTopologyBytes?: number;\n\n /**\n * Size of weight

specification or manifest, in bytes.\n */\n weightSpecsBytes?: number;\n\n /**\n * Size of weight value data, in bytes.\n */\n weightDataBytes?: number;\n}\n\n/** Model training configuration. */\nexport declare interface TrainingConfig {\n // TODO(cais): Tighten the typing once keras spec is available to tfjs-core.\n // See\n // tslint:disable-next-line:max-line-length\n // https://github.com/tensorflow/tfjs-layers/blob/master/src/keras_format/training_config.ts\n /** Optimizer used for the model training. */\n optimizer_config: {};\n\n // TODO(cais): Tighten the typing once keras spec is available to tfjs-core.\n /** Loss function(s) for the model's output(s). */\n loss: string|string[]|{[key: string]: string};\n\n // TODO(cais): Tighten the typing once keras spec is available to tfjs-core.\n /** Metric function(s) for the model's output(s). */\n metrics?: string[]|{[key: string]: string};\n\n // TODO(cais): Tighten the typing once keras spec is available to tfjs-core.\n weighted_metrics?: string[];\n\n // TODO(cais): Tighten the typing once keras spec is available to tfjs-core.\n sample_weight_mode?: string;\n\n loss_weights?: number[]|{[key: string]: number};\n}\n\n/**\n * The serialized artifacts of a model, including topology and weights.\n *\n * The `modelTopology`, `trainingConfig`, `weightSpecs` and `weightData` fields\n * of this interface are optional, in order to support topology- or weights-only\n * saving and loading.\n *\n * Note this interface is used internally in IOHandlers. For the file format\n * written to disk as `model.json`, see `ModelJSON`.\n */\nexport declare interface ModelArtifacts {\n /**\n * Model topology.\n *\n * For Keras-style `tf.Model`s, this is a JSON object.\n * For TensorFlow-style models (e.g., `SavedModel`), this is the JSON\n * encoding of the `GraphDef` protocol buffer.\n */\n modelTopology?: {}|ArrayBuffer;\n\n /**\n * Serialized configuration for the model's training.\n */\n trainingConfig?: TrainingConfig;\n\n /**\n * Weight specifications.\n *\n * This corresponds to the weightsData below.\n */\n weightSpecs?: WeightsManifestEntry[];\n\n /**\n * Binary buffer for all weight values concatenated in the order specified\n * by `weightSpecs`.\n */\n weightData?: ArrayBuffer;\n\n /**\n * Hard-coded format name for models saved from TensorFlow.js or converted\n * by TensorFlow.js Converter.\n */\n format?: string;\n\n /**\n * What library is responsible for originally generating this artifact.\n *\n * Used for debugging purposes. E.g., 'TensorFlow.js v1.0.0'.\n */\n generatedBy?: string;\n\n /**\n * What library or tool is responsible for converting the original model\n * to this format, applicable only if the model is output by a converter.\n *\n * Used for debugging purposes. E.g., 'TensorFlow.js Converter v1.0.0'.\n *\n * A value of `null` means the model artifacts are generated without any\n * conversion process (e.g., saved directly from a TensorFlow.js\n * `tf.LayersModel` instance.)\n */\n convertedBy?: string|null;\n\n /**\n * Inputs and outputs signature for saved model.\n */\n signature?: {};\n\n /**\n * User-defined metadata about the model.\n */\n userDefinedMetadata?: {[key: string]: {}};\n\n /**\n * Initializer for the model.\n */\n modelInitializer?: {};\n}\n\n/**\n * The on-disk format of the `model.json` file.\n *\n * TF.js 1.0 always populates the optional fields when writing model.json.\n * Prior versions did not provide those fields.\n */\nexport declare interface ModelJSON {\n /**\n * Model topology.\n *\n * For Keras-style `tf.Model`s, this is a JSON object.\n * For TensorFlow-style models (e.g., `SavedModel`), this is the JSON\n * encoding of the `GraphDef` protocol buffer.\n */\n modelTopology: {};\n\n /** Model training configuration. */\n trainingConfig?: TrainingConfig;\n\n /**\n * Weights manifest.\n *\n * The weights manifest consists of an ordered list of weight-manifest\n * groups. Each weight-manifest group consists of a number of weight values\n * stored in a number of paths. See the documentation of\n * `WeightsManifestConfig` for more details.\n */\n weightsManifest: WeightsManifestConfig;\n\n /**\n * Hard-coded format name for models saved from TensorFlow.js or converted\n * by TensorFlow.js Converter.\n */\n format?: string;\n\n /**\n * What library is responsible for originally generating this artifact.\n *\n * Used for debugging purposes. E.g., 'TensorFlow.js v1.0.0'.\n */\n generatedBy?: string;\n\n /**\n * What library or tool is responsible for converting the original model\n * to this format, applicable only if the model is output by a converter.\n *\n * Used for debugging purposes. E.g., 'TensorFlow.js Converter v1.0.0'.\n *\n * A value of `null` means the model artifacts are generated without any\n * conversion process (e.g., saved directly from a TensorFlow.js\n * `tf.LayersModel` instance.)\n */\n convertedBy?: string|null;\n\n /**\n * Inputs and outputs signature for saved model.\n */\n signature?: {};\n\n /**\n * User-defined metadata about the model.\n */\n userDefinedMetadata?: {[key: string]: {}};\n\n /**\n * Initializer for the model.\n */\n modelInitializer?:

{};\n}\n\n/**\n * Type definition for handlers of loading operations.\n */\nexport type LoadHandler = () => Promise<ModelArtifacts>;\n\n/**\n * Type definition for handlers of saving operations.\n */\nexport type SaveHandler = (modelArtifact: ModelArtifacts) =>\n Promise<SaveResult>;\n\n/**\n * Interface for a model import/export handler.\n *\n * The `save` and `load` handlers are both optional, in order to allow handlers\n * that support only saving or loading.\n */\n// tslint:disable-next-line:interface-name\nexport interface IOHandler {\n save?: SaveHandler;\n load?: LoadHandler;\n}\n\n/**\n * An interface for the manager of a model store.\n *\n * A model store is defined as a storage medium on which multiple models can\n * be stored. Each stored model has a unique `path` as its identifier.\n * A `ModelStoreManager` for the store allows actions including\n *\n * - Listing the models stored in the store.\n * - Deleting a model from the store.\n */\nexport interface ModelStoreManager {\n /**\n * List all models in the model store.\n *\n * @returns A dictionary mapping paths of existing models to their\n * model artifacts info. Model artifacts info include type of the model's\n * topology, byte sizes of the topology, weights, etc.\n */\n listModels(): Promise<{[path: string]: ModelArtifactsInfo}>;\n\n /**\n * Remove a model specified by `path`.\n *\n * @param path\n * @returns ModelArtifactsInfo of the deleted model (if and only if deletion\n * is successful).\n * @throws Error if deletion fails, e.g., if no model exists at `path`.\n */\n removeModel(path: string): Promise<ModelArtifactsInfo>;\n}\n\n/**\n * Callback for the progress of a long-running action such as an HTTP\n * request for a large binary object.\n *\n * `fraction` should be a number in the [0, 1] interval, indicating how\n * much of the action has completed.\n */\nexport type OnProgressCallback = (fraction: number) => void;\n\n/** @innamespace io */\nexport interface LoadOptions {\n /**\n * RequestInit (options) for HTTP requests.\n *\n * For detailed information on the supported fields, see\n * [https://developer.mozilla.org/en-US/docs/Web/API/Request/Request](\n * https://developer.mozilla.org/en-US/docs/Web/API/Request/Request)\n */\n requestInit?: RequestInit;\n\n /**\n * Progress callback.\n */\n onProgress?: OnProgressCallback;\n\n /**\n * A function used to override the `window.fetch` function.\n */\n fetchFunc?: Function;\n\n /**\n * Strict loading model: whether extraneous weights or missing\n * weights should trigger an `Error`.\n *\n *
If `true`, require that the provided weights exactly match those\n * required by the layers. `false` means that both extra weights\n * and missing weights will be silently ignored.\n *\n * Default: `true`.\n */\n strict?: boolean;\n\n /**\n * Path prefix for weight files, by default this is calculated from the\n * path of the model JSON file.\n *\n * For instance, if the path to the model JSON file is\n * `http://localhost/foo/model.json`, then the default path prefix will be\n * `http://localhost/foo/`. If a weight file has the path value\n * `group1-shard1of2` in the weight manifest, then the weight file will be\n * loaded from `http://localhost/foo/group1-shard1of2` by default. However,\n * if you provide a `weightPathPrefix` value of\n * `http://localhost/foo/alt-weights`, then the weight file will be loaded\n * from the path `http://localhost/foo/alt-weights/group1-shard1of2` instead.\n */\n weightPathPrefix?: string;\n\n /**\n * Whether the module or model is to be loaded from TF Hub.\n *\n * Setting this to `true` allows passing a TF-Hub module URL, omitting the\n * standard model file name and the query parameters.\n *\n * Default: `false`.\n */\n fromTFHub?: boolean;\n\n /**\n * An async function to convert weight file name to URL. The weight file\n * names are stored in model.json's weightsManifest.paths field. By default we\n * consider weight files are colocated with the model.json file. For example:\n * model.json URL: https://www.google.com/models/1/model.json\n * group1-shard1of1.bin url:\n * https://www.google.com/models/1/group1-shard1of1.bin\n *\n * With this func you can convert the weight file name to any URL.\n */\n weightUrlConverter?: (weightFileName: string) => Promise<string>;\n}\n\n/**\n * Additional options for Platform.fetch\n */\nexport interface RequestDetails {\n /**\n * Is this request for a binary file (as opposed to a json file)\n */\n isBinary?: boolean;\n}\n","'use strict'\n\nexports.byteLength = byteLength\nexports.toByteArray = toByteArray\nexports.fromByteArray = fromByteArray\n\nvar lookup = []\nvar revLookup = []\nvar Arr = typeof Uint8Array !== 'undefined' ? Uint8Array : Array\n\nvar code = 'ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz0123456789+/'\nfor (var i = 0, len = code.length; i < len; ++i) {\n lookup[i] = code[i]\n revLookup[code.charCodeAt(i)] = i\n}\n\n// Support decoding

URL-safe base64 strings, as Node.js does.\n// See:
https://en.wikipedia.org/wiki/Base64#URL_applications\nrevLookup['-'.charCodeAt(0)] =
62\nrevLookup['_'.charCodeAt(0)] = 63\n\nfunction getLens (b64) {\n var len = b64.length\n\n if (len % 4 > 0) {\n
throw new Error('Invalid string. Length must be a multiple of 4')\n }\n\n // Trim off extra bytes after placeholder
bytes are found\n // See: https://github.com/beatgammit/base64-js/issues/42\n var validLen = b64.indexOf('=')\n if
(validLen === -1) validLen = len\n\n var
placeHoldersLen = validLen === len\n   ? 0\n   : 4 - (validLen % 4)\n\n return [validLen,
placeHoldersLen]\n}\n\n// base64 is 4/3 + up to two characters of the original data\nfunction byteLength (b64) {\n
var lens = getLens(b64)\n var validLen = lens[0]\n var placeHoldersLen = lens[1]\n return ((validLen +
placeHoldersLen) * 3 / 4) - placeHoldersLen\n}\n\nfunction _byteLength (b64, validLen, placeHoldersLen) {\n
return ((validLen + placeHoldersLen) * 3 / 4) - placeHoldersLen\n}\n\nfunction toByteArray (b64) {\n var tmp\n
var lens = getLens(b64)\n var validLen = lens[0]\n var placeHoldersLen = lens[1]\n\n var arr = new
Arr(_byteLength(b64, validLen, placeHoldersLen))\n\n var curByte = 0\n\n // if there are placeholders, only get up
to the last complete 4 chars\n var len = placeHoldersLen > 0\n   ? validLen - 4\n   : validLen\n\n var i\n for (i = 0;
i < len; i += 4) {\n   tmp =\n   (revLookup[b64.charCodeAt(i)] << 18) |\n   (revLookup[b64.charCodeAt(i + 1)]
<< 12) |\n   (revLookup[b64.charCodeAt(i + 2)] << 6) |\n   revLookup[b64.charCodeAt(i + 3)]\n
arr[curByte++] = (tmp >> 16) & 0xFF\n   arr[curByte++] = (tmp >> 8) & 0xFF\n   arr[curByte++] = tmp & 0xFF\n
}\n\n if (placeHoldersLen === 2) {\n   tmp =\n   (revLookup[b64.charCodeAt(i)] << 2) |\n
(revLookup[b64.charCodeAt(i + 1)] >> 4)\n   arr[curByte++] = tmp & 0xFF\n }\n\n if (placeHoldersLen === 1)
{\n   tmp =\n   (revLookup[b64.charCodeAt(i)] << 10) |\n   (revLookup[b64.charCodeAt(i + 1)] << 4) |\n
(revLookup[b64.charCodeAt(i + 2)] >> 2)\n   arr[curByte++] = (tmp >> 8) & 0xFF\n   arr[curByte++] = tmp &
0xFF\n }\n\n return arr\n}\n\nfunction tripletToBase64 (num) {\n return lookup[num >> 18 & 0x3F] +\n
lookup[num >> 12 & 0x3F] +\n   lookup[num >> 6 & 0x3F] +\n   lookup[num & 0x3F]\n}\n\nfunction
encodeChunk (uint8, start, end) {\n var tmp\n var output = []\n for (var i = start; i < end; i += 3) {\n   tmp =\n
((uint8[i] << 16) & 0xFF0000)
+\n   ((uint8[i + 1] << 8) & 0xFF00) +\n   (uint8[i + 2] & 0xFF)\n   output.push(tripletToBase64(tmp))\n }\n
return output.join('')\n}\n\nfunction fromByteArray (uint8) {\n var tmp\n var len = uint8.length\n var extraBytes =
len % 3 // if we have 1 byte left, pad 2 bytes\n var parts = []\n var maxChunkLength = 16383 // must be multiple of
3\n\n // go through the array every three bytes, we'll deal with trailing stuff later\n for (var i = 0, len2 = len -
extraBytes; i < len2; i += maxChunkLength) {\n   parts.push(encodeChunk(\n   uint8, i, (i + maxChunkLength) >
len2 ? len2 : (i + maxChunkLength)\n   ))\n }\n\n // pad the end with zeros, but make sure to not forget the extra
bytes\n if (extraBytes === 1) {\n   tmp = uint8[len - 1]\n   parts.push(\n   lookup[tmp >> 2] +\n   lookup[(tmp
<< 4) & 0x3F] +\n   '==\n   )\n } else if (extraBytes === 2) {\n   tmp = (uint8[len - 2] << 8) + uint8[len - 1]\n
parts.push(\n   lookup[tmp >> 10] +\n
  lookup[(tmp >> 4) & 0x3F] +\n   lookup[(tmp << 2) & 0x3F] +\n   '=\n   )\n }\n\n return
parts.join('')\n}\n","exports.read = function (buffer, offset, isLE, mLen, nBytes) {\n var e, m\n var eLen = (nBytes
* 8) - mLen - 1\n var eMax = (1 << eLen) - 1\n var eBias = eMax >> 1\n var nBits = -7\n var i = isLE ? (nBytes -
1) : 0\n var d = isLE ? -1 : 1\n var s = buffer[offset + i]\n\n i += d\n\n e = s & ((1 << (-nBits)) - 1)\n s >>= (-
nBits)\n nBits += eLen\n for (; nBits > 0; e = (e * 256) + buffer[offset + i], i += d, nBits -= 8) {}\n\n m = e & ((1
<< (-nBits)) - 1)\n e >>= (-nBits)\n nBits += mLen\n for (; nBits > 0; m = (m * 256) + buffer[offset + i], i += d,
nBits -= 8) {}\n\n if (e === 0) {\n   e = 1 - eBias\n } else if (e === eMax) {\n   return m ? NaN : ((s ? -1 : 1) *
Infinity)\n } else {\n   m = m + Math.pow(2, mLen)\n   e = e - eBias\n }\n return (s ? -1 : 1) * m * Math.pow(2, e
- mLen)\n}\n\nexports.write = function (buffer, value, offset, isLE,
  mLen, nBytes) {\n var e, m, c\n var eLen = (nBytes * 8) - mLen - 1\n var eMax = (1 << eLen) - 1\n var eBias =
eMax >> 1\n var rt = (mLen === 23 ? Math.pow(2, -24) - Math.pow(2, -77) : 0)\n var i = isLE ? 0 : (nBytes - 1)\n
var d = isLE ? 1 : -1\n var s = value < 0 || (value === 0 && 1 / value < 0) ? 1 : 0\n\n value = Math.abs(value)\n\n if
(isNaN(value) || value === Infinity) {\n   m = isNaN(value) ? 1 : 0\n   e = eMax\n } else {\n   e =
Math.floor(Math.log(value) / Math.LN2)\n   if (value * (c = Math.pow(2, -e)) < 1) {\n   e--\n   c *= 2\n   }\n   if

(e + eBias >= 1) {\n value += rt / c\n } else {\n value += rt * Math.pow(2, 1 - eBias)\n }\n if (value * c >= 2) {\n e++\n c /= 2\n }\n\n if (e + eBias >= eMax) {\n m = 0\n e = eMax\n } else if (e + eBias >= 1) {\n m = ((value * c) - 1) * Math.pow(2, mLen)\n e = e + eBias\n } else {\n m = value * Math.pow(2, eBias - 1) * Math.pow(2, mLen)\n e = 0\n }\n }\n\n for (; mLen >= 8; buffer[offset + i] = m & 0xff, i += d, m /= 256, mLen -= 8) {}\n\n e = (e << mLen) | m\n eLen += mLen\n for (; eLen > 0; buffer[offset + i] = e & 0xff, i += d, e /= 256, eLen -= 8) {}\n\n buffer[offset + i - d] |= s * 128\n}\n","var toString = {}.toString;\n\nmodule.exports = Array.isArray || function (arr) {\n return toString.call(arr) == '[object Array]';\n};\n","/*!\n * The buffer module from node.js, for the browser.\n *\n * @author Feross Aboukhadijeh <feross@feross.org> <http://feross.org>\n * @license MIT\n */\n/* eslint-disable no-proto */\n\n'use strict'\n\nvar base64 = require('base64-js')\nvar ieee754 = require('ieee754')\nvar isArray = require('isarray')\n\nexports.Buffer = Buffer\nexports.SlowBuffer = SlowBuffer\nexports.INSPECT_MAX_BYTES = 50\n\n/**\n * If `Buffer.TYPED_ARRAY_SUPPORT`:\n * === true Use Uint8Array implementation (fastest)\n * === false Use Object implementation (most compatible, even IE6)\n *\n * Browsers that support typed arrays are IE 10+, Firefox 4+, Chrome 7+, Safari 5.1+,\n * Opera 11.6+, iOS 4.2+.\n *\n * Due to various browser bugs, sometimes the Object implementation will be used even\n * when the browser supports typed arrays.\n *\n * Note:\n *\n * - Firefox 4-29 lacks support for adding new properties to `Uint8Array` instances,\n * See: https://bugzilla.mozilla.org/show_bug.cgi?id=695438.\n *\n * - Chrome 9-10 is missing the `TypedArray.prototype.subarray` function.\n *\n * - IE10 has a broken `TypedArray.prototype.subarray` function which returns arrays of\n * incorrect length in some situations.\n\n * We detect these buggy browsers and set `Buffer.TYPED_ARRAY_SUPPORT` to `false` so they\n * get the Object implementation, which is slower but behaves correctly.\n */\nBuffer.TYPED_ARRAY_SUPPORT = global.TYPED_ARRAY_SUPPORT !== undefined\n ? global.TYPED_ARRAY_SUPPORT\n : typedArraySupport()\n\n/*\n * Export kMaxLength after typed array support is determined.\n */\nexports.kMaxLength = kMaxLength()\n\nfunction typedArraySupport () {\n try {\n var arr = new Uint8Array(1)\n arr.__proto__ = {__proto__: Uint8Array.prototype, foo: function () { return 42 }}\n return arr.foo() === 42 && // typed array instances can be augmented\n typeof arr.subarray === 'function' && // chrome 9-10 lack `subarray`\n arr.subarray(1, 1).byteLength === 0 // ie10 has broken `subarray`\n } catch (e) {\n return false\n }\n}\n\nfunction kMaxLength () {\n return Buffer.TYPED_ARRAY_SUPPORT\n ? 0x7fffffff\n : 0x3fffffff\n}\n\nfunction createBuffer (that, length) {\n if (kMaxLength() < length) {\n throw new RangeError('Invalid typed array length')\n }\n if (Buffer.TYPED_ARRAY_SUPPORT) {\n // Return an augmented `Uint8Array` instance, for best performance\n that = new Uint8Array(length)\n that.__proto__ = Buffer.prototype\n } else {\n // Fallback: Return an object instance of the Buffer class\n if (that === null) {\n that = new Buffer(length)\n }\n that.length = length\n }\n\n return that\n}\n\n/**\n * The Buffer constructor returns instances of `Uint8Array` that have their\n * prototype changed to `Buffer.prototype`. Furthermore, `Buffer` is a subclass of\n * `Uint8Array`, so the returned instances will have all the node `Buffer` methods\n * and the `Uint8Array` methods. Square bracket notation works as expected -- it\n * returns a single octet.\n *\n * The `Uint8Array` prototype remains unmodified.\n */\n\nfunction Buffer (arg, encodingOrOffset, length) {\n if (!Buffer.TYPED_ARRAY_SUPPORT && !(this instanceof Buffer)) {\n return new Buffer(arg, encodingOrOffset, length)\n }\n\n // Common case.\n if (typeof arg === 'number') {\n if (typeof encodingOrOffset === 'string') {\n throw new Error(\n 'If encoding is specified then the first argument must be a string'\n)\n }\n return allocUnsafe(this, arg)\n }\n return from(this, arg, encodingOrOffset, length)\n}\n\nBuffer.poolSize = 8192 // not used by this implementation\n\n// TODO: Legacy, not needed anymore. Remove in next major version.\nBuffer._augment = function (arr) {\n arr.__proto__ = Buffer.prototype\n return arr\n}\n\nfunction from (that, value, encodingOrOffset, length) {\n if (typeof value === 'number') {\n throw new TypeError('\"value\" argument must not be a number')\n }\n\n if (typeof ArrayBuffer !== 'undefined' && value instanceof ArrayBuffer) {\n return fromArrayBuffer(that, value, encodingOrOffset, length)\n }\n\n if (typeof value === 'string') {\n

return fromString(that, value, encodingOrOffset)\n }\n\n return fromObject(that, value)\n}\n\n/**\n * Functionally equivalent to Buffer(arg, encoding) but throws a TypeError\n * if value is a number.\n * Buffer.from(str[, encoding])\n * Buffer.from(array)\n * Buffer.from(buffer)\n * Buffer.from(arrayBuffer[, byteOffset[, length]])\n **/\nBuffer.from = function (value, encodingOrOffset, length) {\n return
 from(null, value, encodingOrOffset, length)\n}\n\nif (Buffer.TYPED_ARRAY_SUPPORT) {\n Buffer.prototype.__proto__ = Uint8Array.prototype\n Buffer.__proto__ = Uint8Array\n if (typeof Symbol !== 'undefined' && Symbol.species &&\n   Buffer[Symbol.species] === Buffer) {\n   // Fix subarray() in ES2016. See: https://github.com/feross/buffer/pull/97\n   Object.defineProperty(Buffer, Symbol.species, {\n   value: null,\n   configurable: true\n   })\n }\n}\n\nfunction assertSize (size) {\n if (typeof size !== 'number') {\n   throw new TypeError('\"size\" argument must be a number')\n } else if (size < 0) {\n   throw new RangeError('\"size\" argument must not be negative')\n }\n}\n\nfunction alloc (that, size, fill, encoding) {\n assertSize(size)\n if (size <= 0) {\n   return createBuffer(that, size)\n }\n if (fill !== undefined) {\n   // Only pay attention to encoding if it's a string. This\n   // prevents accidentally sending in a number that would\n   // be interpretted
 as a start offset.\n   return typeof encoding === 'string'\n   ? createBuffer(that, size).fill(fill, encoding)\n   : createBuffer(that, size).fill(fill)\n }\n return createBuffer(that, size)\n}\n\n/**\n * Creates a new filled Buffer instance.\n * alloc(size[, fill[, encoding]])\n **/\nBuffer.alloc = function (size, fill, encoding) {\n return alloc(null, size, fill, encoding)\n}\n\nfunction allocUnsafe (that, size) {\n assertSize(size)\n that = createBuffer(that, size < 0 ? 0 : checked(size) | 0)\n if (!Buffer.TYPED_ARRAY_SUPPORT) {\n   for (var i = 0; i < size; ++i) {\n   that[i] = 0\n   }\n }\n return that\n}\n\n/**\n * Equivalent to Buffer(num), by default creates a non-zero-filled Buffer instance.\n * */\nBuffer.allocUnsafe = function (size) {\n return allocUnsafe(null, size)\n}\n/**\n * Equivalent to SlowBuffer(num), by default creates a non-zero-filled Buffer instance.\n */\nBuffer.allocUnsafeSlow = function (size) {\n return allocUnsafe(null, size)\n}\n\nfunction
 fromString (that, string, encoding) {\n if (typeof encoding !== 'string' || encoding === '') {\n   encoding = 'utf8'\n }\n\n if (!Buffer.isEncoding(encoding)) {\n   throw new TypeError('\"encoding\" must be a valid string encoding')\n }\n\n var length = byteLength(string, encoding) | 0\n that = createBuffer(that, length)\n\n var actual = that.write(string, encoding)\n\n if (actual !== length) {\n   // Writing a hex string, for example, that contains invalid characters will\n   // cause everything after the first invalid character to be ignored. (e.g.\n   // 'abxxcd' will be treated as 'ab')\n   that = that.slice(0, actual)\n }\n\n return that\n}\n\nfunction fromArrayLike (that, array) {\n var length = array.length < 0 ? 0 : checked(array.length) | 0\n that = createBuffer(that, length)\n for (var i = 0; i < length; i += 1) {\n   that[i] = array[i] & 255\n }\n return that\n}\n\nfunction fromArrayBuffer (that, array, byteOffset, length) {\n array.byteLength
 // this throws if `array` is not a valid ArrayBuffer\n\n if (byteOffset < 0 || array.byteLength < byteOffset) {\n   throw new RangeError('\\'offset\\' is out of bounds')\n }\n\n if (array.byteLength < byteOffset + (length || 0)) {\n   throw new RangeError('\\'length\\' is out of bounds')\n }\n\n if (byteOffset === undefined && length === undefined) {\n   array = new Uint8Array(array)\n } else if (length === undefined) {\n   array = new Uint8Array(array, byteOffset)\n } else {\n   array = new Uint8Array(array, byteOffset, length)\n }\n\n if (Buffer.TYPED_ARRAY_SUPPORT) {\n   // Return an augmented `Uint8Array` instance, for best performance\n   that = array\n   that.__proto__ = Buffer.prototype\n } else {\n   // Fallback: Return an object instance of the Buffer class\n   that = fromArrayLike(that, array)\n }\n return that\n}\n\nfunction fromObject (that, obj) {\n if (Buffer.isBuffer(obj)) {\n   var len = checked(obj.length) | 0\n   that = createBuffer(that,
 len)\n\n   if (that.length === 0) {\n   return that\n   }\n\n   obj.copy(that, 0, 0, len)\n   return that\n }\n\n if (obj) {\n   if ((typeof ArrayBuffer !== 'undefined' &&\n   obj.buffer instanceof ArrayBuffer) || 'length' in obj) {\n   if (typeof obj.length !== 'number' || isnan(obj.length)) {\n   return createBuffer(that, 0)\n   }\n   return fromArrayLike(that, obj)\n   }\n\n   if (obj.type === 'Buffer' && isArray(obj.data)) {\n   return fromArrayLike(that, obj.data)\n   }\n }\n\n throw new TypeError('First argument must be a string, Buffer, ArrayBuffer, Array, or array-like object.')\n}\n\nfunction checked (length) {\n // Note: cannot use `length < kMaxLength()` here because that fails when\n // length is NaN (which is otherwise coerced to zero.)\n if (length >= kMaxLength()) {\n   throw new RangeError('Attempt to allocate Buffer larger than maximum ' +\n

'size: 0x' + kMaxLength().toString(16) + ' bytes')\n }\n return
length | 0\n}\n\nfunction SlowBuffer (length) {\n if (+length != length) { // eslint-disable-line eqeqeq\n length = 0\n }\n return Buffer.alloc(+length)\n}\n\nBuffer.isBuffer = function isBuffer (b) {\n return !!(b != null && b._isBuffer)\n}\n\nBuffer.compare = function compare (a, b) {\n if (!Buffer.isBuffer(a) || !Buffer.isBuffer(b)) {\n throw new TypeError('Arguments must be Buffers')\n }\n\n if (a === b) return 0\n\n var x = a.length\n var y = b.length\n\n for (var i = 0, len = Math.min(x, y); i < len; ++i) {\n if (a[i] !== b[i]) {\n x = a[i]\n y = b[i]\n break\n }\n }\n\n if (x < y) return -1\n if (y < x) return 1\n return 0\n}\n\nBuffer.isEncoding = function isEncoding (encoding) {\n switch (String(encoding).toLowerCase()) {\n case 'hex':\n case 'utf8':\n case 'utf-8':\n case 'ascii':\n case 'latin1':\n case 'binary':\n case 'base64':\n case 'ucs2':\n case 'ucs-2':\n case 'utf16le':\n case 'utf-16le':\n
return true\n default:\n return false\n }\n}\n\nBuffer.concat = function concat (list, length) {\n if (!isArray(list)) {\n throw new TypeError('\"list\" argument must be an Array of Buffers')\n }\n\n if (list.length === 0) {\n return Buffer.alloc(0)\n }\n\n var i\n if (length === undefined) {\n length = 0\n for (i = 0; i < list.length; ++i) {\n length += list[i].length\n }\n }\n\n var buffer = Buffer.allocUnsafe(length)\n var pos = 0\n for (i = 0; i < list.length; ++i) {\n var buf = list[i]\n if (!Buffer.isBuffer(buf)) {\n throw new TypeError('\"list\" argument must be an Array of Buffers')\n }\n buf.copy(buffer, pos)\n pos += buf.length\n }\n return buffer\n}\n\nfunction byteLength (string, encoding) {\n if (Buffer.isBuffer(string)) {\n return string.length\n }\n if (typeof ArrayBuffer !== 'undefined' && typeof ArrayBuffer.isView === 'function' &&\n (ArrayBuffer.isView(string) || string instanceof ArrayBuffer))
{\n return string.byteLength\n }\n if (typeof string !== 'string') {\n string = '' + string\n }\n\n var len = string.length\n if (len === 0) return 0\n\n // Use a for loop to avoid recursion\n var loweredCase = false\n for (;;) {\n switch (encoding) {\n case 'ascii':\n case 'latin1':\n case 'binary':\n return len\n case 'utf8':\n case 'utf-8':\n case undefined:\n return utf8ToBytes(string).length\n case 'ucs2':\n case 'ucs-2':\n case 'utf16le':\n case 'utf-16le':\n return len * 2\n case 'hex':\n return len >>> 1\n case 'base64':\n
return base64ToBytes(string).length\n default:\n if (loweredCase) return utf8ToBytes(string).length // assume utf8\n encoding = ('' + encoding).toLowerCase()\n loweredCase = true\n }\n}\n\nBuffer.byteLength = byteLength\n\nfunction slowToString (encoding, start, end) {\n var loweredCase = false\n\n // No need
to verify that \"this.length <= MAX_UINT32\" since it's a read-only\n // property of a typed array.\n\n // This behaves neither like String nor Uint8Array in that we set start/end\n // to their upper/lower bounds if the value passed is out of range.\n // undefined is handled specially as per ECMA-262 6th Edition,\n // Section 13.3.3.7 Runtime Semantics: KeyedBindingInitialization.\n if (start === undefined || start < 0) {\n start = 0\n }\n // Return early if start > this.length. Done here to prevent potential uint32\n // coercion fail below.\n if (start > this.length) {\n return ''\n }\n\n if (end === undefined || end > this.length) {\n end = this.length\n }\n\n if (end <= 0) {\n return ''\n }\n\n // Force coersion to uint32. This will also coerce falsey/NaN values to 0.\n end >>>= 0\n start >>>= 0\n\n if (end <= start) {\n return ''\n }\n\n if (!encoding) encoding = 'utf8'\n\n while (true) {\n switch (encoding) {\n case 'hex':\n return
hexSlice(this, start, end)\n\n case 'utf8':\n case 'utf-8':\n return utf8Slice(this, start, end)\n\n case 'ascii':\n return asciiSlice(this, start, end)\n\n case 'latin1':\n case 'binary':\n return latin1Slice(this, start, end)\n\n case 'base64':\n return base64Slice(this, start, end)\n\n case 'ucs2':\n case 'ucs-2':\n case 'utf16le':\n case 'utf-16le':\n return utf16leSlice(this, start, end)\n\n default:\n if (loweredCase) throw new TypeError('Unknown encoding: ' + encoding)\n encoding = (encoding + '').toLowerCase()\n loweredCase = true\n }\n }\n}\n\n// The property is used by `Buffer.isBuffer` and `is-buffer` (in Safari 5-7) to detect\n// Buffer instances.\nBuffer.prototype._isBuffer = true\n\nfunction swap (b, n, m) {\n var i = b[n]\n b[n] = b[m]\n b[m] = i\n}\n\nBuffer.prototype.swap16 = function swap16 () {\n var len = this.length\n if (len % 2 !== 0) {\n
throw new RangeError('Buffer size must be a multiple of 16-bits')\n }\n for (var i = 0; i < len; i += 2) {\n swap(this, i, i + 1)\n }\n return this\n}\n\nBuffer.prototype.swap32 = function swap32 () {\n var len = this.length\n

if (len % 4 !== 0) {\n throw new RangeError('Buffer size must be a multiple of 32-bits')\n }\n for (var i = 0; i < len; i += 4) {\n swap(this, i, i + 3)\n swap(this, i + 1, i + 2)\n }\n return this\n}\n\nBuffer.prototype.swap64 = function swap64 () {\n var len = this.length\n if (len % 8 !== 0) {\n throw new RangeError('Buffer size must be a multiple of 64-bits')\n }\n for (var i = 0; i < len; i += 8) {\n swap(this, i, i + 7)\n swap(this, i + 1, i + 6)\n swap(this, i + 2, i + 5)\n swap(this, i + 3, i + 4)\n }\n return this\n}\n\nBuffer.prototype.toString = function toString () {\n var length = this.length | 0\n if (length === 0) return ''\n if (arguments.length === 0) return utf8Slice(this, 0, length)\n return slowToString.apply(this, arguments)\n}\n\nBuffer.prototype.equals = function equals (b) {\n if (!Buffer.isBuffer(b)) throw new TypeError('Argument must be a Buffer')\n if (this === b) return true\n return Buffer.compare(this, b) === 0\n}\n\nBuffer.prototype.inspect = function inspect () {\n var str = ''\n var max = exports.INSPECT_MAX_BYTES\n if (this.length > 0) {\n str = this.toString('hex', 0, max).match(/.{2}/g).join(' ')\n if (this.length > max) str += ' ... '\n }\n return '<Buffer ' + str + '>'\n}\n\nBuffer.prototype.compare = function compare (target, start, end, thisStart, thisEnd) {\n if (!Buffer.isBuffer(target)) {\n throw new TypeError('Argument must be a Buffer')\n }\n\n if (start === undefined) {\n start = 0\n }\n if (end === undefined) {\n end = target ? target.length : 0\n }\n if (thisStart === undefined) {\n thisStart = 0\n }\n if (thisEnd === undefined) {\n thisEnd = this.length\n }\n\n if (start < 0 || end > target.length || thisStart < 0 || thisEnd > this.length) {\n throw new RangeError('out of range index')\n }\n\n if (thisStart >= thisEnd && start >= end) {\n return 0\n }\n if (thisStart >= thisEnd) {\n return -1\n }\n if (start >= end) {\n return 1\n }\n\n start >>>= 0\n end >>>= 0\n thisStart >>>= 0\n thisEnd >>>= 0\n\n if (this === target) return 0\n\n var x = thisEnd - thisStart\n var y = end - start\n var len = Math.min(x, y)\n\n var thisCopy = this.slice(thisStart, thisEnd)\n var targetCopy = target.slice(start, end)\n\n for (var i = 0; i < len; ++i) {\n if (thisCopy[i] !== targetCopy[i]) {\n   x = thisCopy[i]\n   y = targetCopy[i]\n   break\n }\n }\n\n if (x < y) return -1\n if (y < x) return 1\n return 0\n}\n\n// Finds either the first index of `val` in `buffer` at offset >= `byteOffset`,\n// OR the last index of `val` in `buffer` at offset <= `byteOffset`.\n//\n// Arguments:\n// - buffer - a Buffer to search\n// - val - a string, Buffer, or number\n// - byteOffset - an index into `buffer`; will be clamped to an int32\n// - encoding - an optional encoding, relevant is val is a string\n// - dir - true for indexOf, false for lastIndexOf\nfunction bidirectionalIndexOf (buffer, val, byteOffset, encoding, dir) {\n // Empty buffer means no match\n if (buffer.length === 0) return -1\n\n // Normalize byteOffset\n if (typeof byteOffset === 'string') {\n encoding = byteOffset\n byteOffset = 0\n } else if (byteOffset > 0x7fffffff) {\n byteOffset = 0x7fffffff\n } else if (byteOffset < -0x80000000) {\n byteOffset = -0x80000000\n }\n byteOffset = +byteOffset // Coerce to Number.\n if (isNaN(byteOffset)) {\n // byteOffset: it it's undefined, null, NaN, \"foo\", etc, search whole buffer\n byteOffset = dir ? 0 : (buffer.length - 1)\n }\n\n // Normalize byteOffset: negative offsets start from the end of the buffer\n if (byteOffset < 0) byteOffset = buffer.length + byteOffset\n if (byteOffset >= buffer.length) {\n if (dir) return -1\n else byteOffset = buffer.length - 1\n } else if (byteOffset < 0) {\n if (dir) byteOffset = 0\n else return -1\n }\n\n // Normalize val\n if (typeof val === 'string') {\n val = Buffer.from(val, encoding)\n }\n\n // Finally, search either indexOf (if dir is true) or lastIndexOf\n if (Buffer.isBuffer(val)) {\n // Special case: looking for empty string/buffer always fails\n if (val.length === 0) {\n   return -1\n }\n return arrayIndexOf(buffer, val, byteOffset, encoding, dir)\n } else if (typeof val === 'number') {\n val = val & 0xFF // Search for a byte value [0-255]\n if (Buffer.TYPED_ARRAY_SUPPORT &&\n   typeof Uint8Array.prototype.indexOf === 'function') {\n   if (dir) {\n   return Uint8Array.prototype.indexOf.call(buffer, val, byteOffset)\n   } else {\n   return Uint8Array.prototype.lastIndexOf.call(buffer, val, byteOffset)\n   }\n }\n return arrayIndexOf(buffer, [val], byteOffset, encoding, dir)\n }\n\n throw new TypeError('val must be string, number or Buffer')\n}\n\nfunction arrayIndexOf (arr, val, byteOffset, encoding, dir) {\n var indexSize = 1\n var arrLength = arr.length\n var valLength = val.length\n\n if (encoding !== undefined) {\n encoding = String(encoding).toLowerCase()\n if (encoding === 'ucs2' || encoding === 'ucs-2' ||\n   encoding === 'utf16le' || encoding === 'utf-16le') {\n   if (arr.length < 2 || val.length < 2) {\n   return -1\n   }\n   indexSize = 2\n   arrLength /= 2\n   valLength /= 2\n   byteOffset /= 2\n }\n }\n

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function read (buf, i) {\n  if (indexSize === 1) {\n    return buf[i]\n  } else {\n    return buf.readUInt16BE(i * indexSize)\n  }\n }\n\n var i\n if (dir) {\n  var foundIndex = -1\n  for (i = byteOffset; i < arrLength; i++) {\n if (read(arr, i) === read(val, foundIndex === -1 ? 0 : i - foundIndex)) {\n    if (foundIndex === -1) foundIndex = i\n    if (i - foundIndex +
 1 === valLength) return foundIndex * indexSize\n  } else {\n    if (foundIndex !== -1) i -= i - foundIndex\n foundIndex = -1\n  }\n  }\n } else {\n  if (byteOffset + valLength > arrLength) byteOffset = arrLength - valLength\n  for (i = byteOffset; i >= 0; i--) {\n    var found = true\n    for (var j = 0; j < valLength; j++) {\n if (read(arr, i + j) !== read(val, j)) {\n      found = false\n      break\n    }\n  }\n    if (found) return i\n  }\n }\n\n  return -1\n}\n\nBuffer.prototype.includes = function includes (val, byteOffset, encoding) {\n  return this.indexOf(val, byteOffset, encoding) !== -1\n}\n\nBuffer.prototype.indexOf = function indexOf (val, byteOffset, encoding) {\n  return bidirectionalIndexOf(this, val, byteOffset, encoding, true)\n}\n\nBuffer.prototype.lastIndexOf = function lastIndexOf (val, byteOffset, encoding) {\n  return bidirectionalIndexOf(this, val, byteOffset, encoding, false)\n}\n\nfunction hexWrite (buf,
 string, offset, length) {\n  offset = Number(offset) || 0\n  var remaining = buf.length - offset\n  if (!length) {\n length = remaining\n  } else {\n  length = Number(length)\n  if (length > remaining) {\n    length = remaining\n }\n }\n\n  // must be an even number of digits\n  var strLen = string.length\n  if (strLen % 2 !== 0) throw new TypeError('Invalid hex string')\n\n  if (length > strLen / 2) {\n  length = strLen / 2\n  }\n  for (var i = 0; i < length; ++i) {\n  var parsed = parseInt(string.substr(i * 2, 2), 16)\n  if (isNaN(parsed)) return i\n  buf[offset + i] = parsed\n  }\n  return i\n}\n\nfunction utf8Write (buf, string, offset, length) {\n  return blitBuffer(utf8ToBytes(string, buf.length - offset), buf, offset, length)\n}\n\nfunction asciiWrite (buf, string, offset, length) {\n  return blitBuffer(asciiToBytes(string), buf, offset, length)\n}\n\nfunction latin1Write (buf, string, offset, length) {\n  return asciiWrite(buf, string, offset, length)\n}\n\nfunction
 base64Write (buf, string, offset, length) {\n  return blitBuffer(base64ToBytes(string), buf, offset, length)\n}\n\nfunction ucs2Write (buf, string, offset, length) {\n  return blitBuffer(utf16leToBytes(string, buf.length - offset), buf, offset, length)\n}\n\nBuffer.prototype.write = function write (string, offset, length, encoding) {\n  // Buffer#write(string)\n  if (offset === undefined) {\n  encoding = 'utf8'\n  length = this.length\n  offset = 0\n  // Buffer#write(string, encoding)\n  } else if (length === undefined && typeof offset === 'string') {\n  encoding = offset\n  length = this.length\n  offset = 0\n  // Buffer#write(string, offset[, length][, encoding])\n  } else if (isFinite(offset)) {\n  offset = offset | 0\n  if (isFinite(length)) {\n    length = length | 0\n    if (encoding === undefined) encoding = 'utf8'\n  } else {\n    encoding = length\n    length = undefined\n  }\n  // legacy write(string, encoding, offset, length) - remove
 in v0.13\n  } else {\n  throw new Error(\n    'Buffer.write(string, encoding, offset[, length]) is no longer supported'\n  )\n  }\n\n  var remaining = this.length - offset\n  if (length === undefined || length > remaining) length = remaining\n\n  if ((string.length > 0 && (length < 0 || offset < 0)) || offset > this.length) {\n  throw new RangeError('Attempt to write outside buffer bounds')\n  }\n\n  if (!encoding) encoding = 'utf8'\n\n  var loweredCase = false\n  for (;;) {\n  switch (encoding) {\n    case 'hex':\n    return hexWrite(this, string, offset, length)\n\n    case 'utf8':\n    case 'utf-8':\n    return utf8Write(this, string, offset, length)\n\n    case 'ascii':\n    return asciiWrite(this, string, offset, length)\n\n    case 'latin1':\n    case 'binary':\n    return latin1Write(this, string, offset, length)\n\n    case 'base64':\n    // Warning: maxLength not taken into account in base64Write\n    return base64Write(this, string,
 offset, length)\n\n    case 'ucs2':\n    case 'ucs-2':\n    case 'utf16le':\n    case 'utf-16le':\n    return ucs2Write(this, string, offset, length)\n\n    default:\n    if (loweredCase) throw new TypeError('Unknown encoding: ' + encoding)\n    encoding = ('' + encoding).toLowerCase()\n    loweredCase = true\n  }\n }\n}\n\nBuffer.prototype.toJSON = function toJSON () {\n  return {\n  type: 'Buffer',\n  data: Array.prototype.slice.call(this._arr || this, 0)\n  }\n}\n\nfunction base64Slice (buf, start, end) {\n  if (start === 0 && end === buf.length) {\n  return base64.fromByteArray(buf)\n  } else {\n  return base64.fromByteArray(buf.slice(start, end))\n  }\n}\n\nfunction utf8Slice (buf, start, end) {\n  end = Math.min(buf.length, end)\n  var res = []\n\n  var i = start\n  while (i < end) {\n  var firstByte = buf[i]\n  var
```

codePoint = null\n var bytesPerSequence = (firstByte > 0xEF) ? 4\n   : (firstByte > 0xDF) ? 3\n   : (firstByte > 0xBF) ? 2\n   : 1\n\n if (i + bytesPerSequence <= end) {\n   var secondByte, thirdByte, fourthByte, tempCodePoint\n\n   switch (bytesPerSequence) {\n   case 1:\n   if (firstByte < 0x80) {\n   codePoint = firstByte\n   }\n   break\n   case 2:\n   secondByte = buf[i + 1]\n   if ((secondByte & 0xC0) === 0x80) {\n   tempCodePoint = (firstByte & 0x1F) << 0x6 | (secondByte & 0x3F)\n   if (tempCodePoint > 0x7F) {\n   codePoint = tempCodePoint\n   }\n   }\n   break\n   case 3:\n   secondByte = buf[i + 1]\n   thirdByte = buf[i + 2]\n   if ((secondByte & 0xC0) === 0x80 && (thirdByte & 0xC0) === 0x80) {\n   tempCodePoint = (firstByte & 0xF) << 0xC | (secondByte & 0x3F) << 0x6 | (thirdByte & 0x3F)\n   if (tempCodePoint > 0x7FF && (tempCodePoint < 0xD800 || tempCodePoint > 0xDFFF)) {\n   codePoint = tempCodePoint\n   }\n   }\n   break\n   case 4:\n   secondByte = buf[i + 1]\n   thirdByte = buf[i + 2]\n   fourthByte = buf[i + 3]\n   if ((secondByte & 0xC0) === 0x80 && (thirdByte & 0xC0) === 0x80 && (fourthByte & 0xC0) === 0x80) {\n   tempCodePoint = (firstByte & 0xF) << 0x12 | (secondByte & 0x3F) << 0xC | (thirdByte & 0x3F) << 0x6 | (fourthByte & 0x3F)\n   if (tempCodePoint > 0xFFFF && tempCodePoint < 0x110000) {\n   codePoint = tempCodePoint\n   }\n   }\n   }\n\n if (codePoint === null) {\n   // we did not generate a valid codePoint so insert a\n   // replacement char (U+FFFD) and advance only 1 byte\n   codePoint = 0xFFFD\n   bytesPerSequence = 1\n } else if (codePoint > 0xFFFF) {\n   // encode to utf16 (surrogate pair dance)\n   codePoint -= 0x10000\n   res.push(codePoint >>> 10 & 0x3FF | 0xD800)\n   codePoint = 0xDC00 | codePoint & 0x3FF\n }\n\n res.push(codePoint)\n i += bytesPerSequence\n}\n\nreturn decodeCodePointsArray(res)\n}\n\n// Based on http://stackoverflow.com/a/22747272/680742, the browser with\n// the lowest limit is Chrome, with 0x10000 args.\n// We go 1 magnitude less, for safety\nvar MAX_ARGUMENTS_LENGTH = 0x1000\n\nfunction decodeCodePointsArray (codePoints) {\n var len = codePoints.length\n if (len <= MAX_ARGUMENTS_LENGTH) {\n   return String.fromCharCode.apply(String, codePoints) // avoid extra slice()\n }\n\n // Decode in chunks to avoid \"call stack size exceeded\".\n var res = ''\n var i = 0\n while (i < len) {\n   res += String.fromCharCode.apply(\n   String,\n   codePoints.slice(i, i += MAX_ARGUMENTS_LENGTH)\n   )\n }\n return res\n}\n\nfunction asciiSlice (buf, start, end) {\n var ret = ''\n end = Math.min(buf.length, end)\n\n for (var i = start; i < end; ++i) {\n   ret += String.fromCharCode(buf[i] & 0x7F)\n }\n return ret\n}\n\nfunction latin1Slice (buf, start, end) {\n var ret = ''\n end = Math.min(buf.length, end)\n\n for (var i = start; i < end; ++i) {\n   ret += String.fromCharCode(buf[i])\n }\n return ret\n}\n\nfunction hexSlice (buf, start, end) {\n var len = buf.length\n\n if (!start || start < 0) start = 0\n if (!end || end < 0 || end > len) end = len\n\n var out = ''\n for (var i = start; i < end; ++i) {\n   out += toHex(buf[i])\n }\n return out\n}\n\nfunction utf16leSlice (buf, start, end) {\n var bytes = buf.slice(start, end)\n var res = ''\n for (var i = 0; i < bytes.length; i += 2) {\n   res += String.fromCharCode(bytes[i] + bytes[i + 1] * 256)\n }\n return res\n}\n\nBuffer.prototype.slice = function slice (start, end) {\n var len = this.length\n start = ~~start\n end = end === undefined ? len : ~~end\n\n if (start < 0) {\n   start += len\n   if (start < 0) start = 0\n } else if (start > len) {\n   start = len\n }\n\n if (end < 0) {\n   end += len\n   if (end < 0) end = 0\n } else if (end > len) {\n   end = len\n }\n\n if (end < start) end = start\n\n var newBuf\n if (Buffer.TYPED_ARRAY_SUPPORT) {\n   newBuf = this.subarray(start, end)\n   newBuf.__proto__ = Buffer.prototype\n } else {\n   var sliceLen = end - start\n   newBuf = new Buffer(sliceLen, undefined)\n   for (var i = 0; i < sliceLen; ++i) {\n   newBuf[i] = this[i + start]\n   }\n }\n\n return newBuf\n}\n\n/*\n * Need to make sure that buffer isn't trying to write out of bounds.\n */\nfunction checkOffset (offset, ext, length) {\n if ((offset % 1) !== 0 || offset < 0) throw new RangeError('offset is not uint')\n if (offset + ext > length) throw new RangeError('Trying to access beyond buffer length')\n}\n\nBuffer.prototype.readUIntLE = function readUIntLE (offset, byteLength, noAssert) {\n offset = offset | 0\n byteLength = byteLength | 0\n if (!noAssert) checkOffset(offset, byteLength, this.length)\n\n var val = this[offset]\n var mul = 1\n var i = 0\n while (++i < byteLength && (mul *= 0x100)) {\n   val += this[offset

+ i] * mul\n }\n\n return val\n}\n\nBuffer.prototype.readUIntBE = function readUIntBE (offset, byteLength, noAssert) {\n offset = offset | 0\n byteLength = byteLength | 0\n if (!noAssert) {\n   checkOffset(offset, byteLength, this.length)\n }\n\n var val = this[offset + --byteLength]\n var mul = 1\n while (byteLength > 0 && (mul *= 0x100)) {\n   val += this[offset + --byteLength] * mul\n }\n\n return val\n}\n\nBuffer.prototype.readUInt8 = function readUInt8 (offset, noAssert) {\n if (!noAssert) checkOffset(offset, 1, this.length)\n return this[offset]\n}\n\nBuffer.prototype.readUInt16LE = function readUInt16LE (offset, noAssert) {\n if (!noAssert) checkOffset(offset, 2, this.length)\n return this[offset] | (this[offset + 1] << 8)\n}\n\nBuffer.prototype.readUInt16BE = function readUInt16BE (offset, noAssert) {\n if (!noAssert) checkOffset(offset, 2, this.length)\n return (this[offset] << 8) | this[offset + 1]\n}\n\nBuffer.prototype.readUInt32LE = function readUInt32LE (offset, noAssert) {\n if (!noAssert) checkOffset(offset, 4, this.length)\n\n return ((this[offset]) |\n   (this[offset + 1] << 8) |\n   (this[offset + 2] << 16)) +\n   (this[offset + 3] * 0x1000000)\n}\n\nBuffer.prototype.readUInt32BE = function readUInt32BE (offset, noAssert) {\n if (!noAssert) checkOffset(offset, 4, this.length)\n\n return (this[offset] * 0x1000000) +\n   ((this[offset + 1] << 16) |\n   (this[offset + 2] << 8) |\n   this[offset + 3])\n}\n\nBuffer.prototype.readIntLE = function readIntLE (offset, byteLength, noAssert) {\n offset = offset | 0\n byteLength = byteLength | 0\n if (!noAssert) checkOffset(offset, byteLength, this.length)\n\n var val = this[offset]\n var mul = 1\n var i = 0\n while (++i < byteLength && (mul *= 0x100)) {\n   val += this[offset + i] * mul\n }\n mul *= 0x80\n\n if (val >= mul) val -= Math.pow(2, 8 * byteLength)\n\n return val\n}\n\nBuffer.prototype.readIntBE = function readIntBE (offset, byteLength, noAssert) {\n offset = offset | 0\n byteLength = byteLength | 0\n if (!noAssert) checkOffset(offset, byteLength, this.length)\n\n var i = byteLength\n var mul = 1\n var val = this[offset + --i]\n while (i > 0 && (mul *= 0x100)) {\n   val += this[offset + --i] * mul\n }\n mul *= 0x80\n\n if (val >= mul) val -= Math.pow(2, 8 * byteLength)\n\n return val\n}\n\nBuffer.prototype.readInt8 = function readInt8 (offset, noAssert) {\n if (!noAssert) checkOffset(offset, 1, this.length)\n if (!(this[offset] & 0x80)) return (this[offset])\n return ((0xff - this[offset] + 1) * -1)\n}\n\nBuffer.prototype.readInt16LE = function readInt16LE (offset, noAssert) {\n if (!noAssert) checkOffset(offset, 2, this.length)\n var val = this[offset] | (this[offset + 1] << 8)\n return (val & 0x8000) ? val | 0xFFFF0000 : val\n}\n\nBuffer.prototype.readInt16BE = function readInt16BE (offset, noAssert) {\n if (!noAssert) checkOffset(offset, 2, this.length)\n var val = this[offset + 1] | (this[offset] << 8)\n return (val & 0x8000) ? val | 0xFFFF0000 : val\n}\n\nBuffer.prototype.readInt32LE = function readInt32LE (offset, noAssert) {\n if (!noAssert) checkOffset(offset, 4, this.length)\n\n return (this[offset]) |\n   (this[offset + 1] << 8) |\n   (this[offset + 2] << 16) |\n   (this[offset + 3] << 24)\n}\n\nBuffer.prototype.readInt32BE = function readInt32BE (offset, noAssert) {\n if (!noAssert) checkOffset(offset, 4, this.length)\n\n return (this[offset] << 24) |\n   (this[offset + 1] << 16) |\n   (this[offset + 2] << 8) |\n   (this[offset + 3])\n}\n\nBuffer.prototype.readFloatLE = function readFloatLE (offset, noAssert) {\n if (!noAssert) checkOffset(offset, 4, this.length)\n return ieee754.read(this, offset, true, 23, 4)\n}\n\nBuffer.prototype.readFloatBE = function readFloatBE (offset, noAssert) {\n if (!noAssert) checkOffset(offset, 4, this.length)\n return ieee754.read(this, offset, false, 23, 4)\n}\n\nBuffer.prototype.readDoubleLE = function readDoubleLE (offset, noAssert) {\n if (!noAssert) checkOffset(offset, 8, this.length)\n return ieee754.read(this, offset, true, 52, 8)\n}\n\nBuffer.prototype.readDoubleBE = function readDoubleBE (offset, noAssert) {\n if (!noAssert) checkOffset(offset, 8, this.length)\n return ieee754.read(this, offset, false, 52, 8)\n}\n\nfunction checkInt (buf, value, offset, ext, max, min) {\n if (!Buffer.isBuffer(buf)) throw new TypeError('\"buffer\" argument must be a Buffer instance')\n if (value > max || value < min) throw new RangeError('\"value\" argument is out of bounds')\n if (offset + ext > buf.length) throw new RangeError('Index out of range')\n}\n\nBuffer.prototype.writeUIntLE = function writeUIntLE (value, offset, byteLength, noAssert) {\n value = +value\n offset = offset | 0\n byteLength = byteLength | 0\n if (!noAssert) {\n   var maxBytes = Math.pow(2, 8 * byteLength) - 1\n   checkInt(this, value, offset, byteLength, maxBytes, 0)\n }\n\n var mul = 1\n var i = 0\n this[offset] = value & 0xFF\n while (++i < byteLength && (mul *= 0x100)) {\n   this[offset + i] = (value / mul) & 0xFF\n }\n\n return offset + byteLength\n}\n\nBuffer.prototype.writeUIntBE = function writeUIntBE (value, offset, byteLength, noAssert) {\n

value = +value\n offset = offset | 0\n byteLength = byteLength | 0\n if (!noAssert) {\n   var maxBytes = Math.pow(2, 8 * byteLength) - 1\n   checkInt(this, value, offset, byteLength, maxBytes, 0)\n }\n\n var i = byteLength - 1\n var mul = 1\n this[offset + i] = value & 0xFF\n while (--i >= 0 && (mul *= 0x100)) {\n this[offset + i] = (value / mul) & 0xFF\n }\n\n return offset + byteLength\n}\n\nBuffer.prototype.writeUInt8 = function writeUInt8 (value, offset, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) checkInt(this, value, offset, 1, 0xff, 0)\n if (!Buffer.TYPED_ARRAY_SUPPORT) value = Math.floor(value)\n this[offset] = (value & 0xff)\n return offset + 1\n}\n\nfunction objectWriteUInt16 (buf, value, offset, littleEndian) {\n if (value < 0) value = 0xffff + value + 1\n for (var i = 0, j = Math.min(buf.length - offset, 2); i < j; ++i) {\n buf[offset + i] = (value & (0xff << (8 * (littleEndian ? i : 1 - i)))) >>>\n   (littleEndian ? i : 1 - i) * 8\n }\n}\n\nBuffer.prototype.writeUInt16LE = function writeUInt16LE (value, offset, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) checkInt(this, value, offset, 2, 0xffff, 0)\n if (Buffer.TYPED_ARRAY_SUPPORT) {\n   this[offset] = (value & 0xff)\n   this[offset + 1] = (value >>> 8)\n } else {\n   objectWriteUInt16(this, value, offset, true)\n }\n return offset + 2\n}\n\nBuffer.prototype.writeUInt16BE = function writeUInt16BE (value, offset, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) checkInt(this, value, offset, 2, 0xffff, 0)\n if (Buffer.TYPED_ARRAY_SUPPORT) {\n   this[offset] = (value >>> 8)\n   this[offset + 1] = (value & 0xff)\n } else {\n   objectWriteUInt16(this, value, offset, false)\n }\n return offset + 2\n}\n\nfunction objectWriteUInt32 (buf, value, offset, littleEndian) {\n if (value < 0) value = 0xffffffff + value + 1\n for (var i = 0, j = Math.min(buf.length - offset, 4); i < j; ++i) {\n   buf[offset + i] = (value >>> (littleEndian ? i : 3 - i) * 8) & 0xff\n }\n}\n\nBuffer.prototype.writeUInt32LE = function writeUInt32LE (value, offset, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) checkInt(this, value, offset, 4, 0xffffffff, 0)\n if (Buffer.TYPED_ARRAY_SUPPORT) {\n   this[offset + 3] = (value >>> 24)\n   this[offset + 2] = (value >>> 16)\n   this[offset + 1] = (value >>> 8)\n   this[offset] = (value & 0xff)\n } else {\n   objectWriteUInt32(this, value, offset, true)\n }\n return offset + 4\n}\n\nBuffer.prototype.writeUInt32BE = function writeUInt32BE (value, offset, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) checkInt(this, value, offset, 4, 0xffffffff, 0)\n if (Buffer.TYPED_ARRAY_SUPPORT)
  {\n   this[offset] = (value >>> 24)\n   this[offset + 1] = (value >>> 16)\n   this[offset + 2] = (value >>> 8)\n   this[offset + 3] = (value & 0xff)\n } else {\n   objectWriteUInt32(this, value, offset, false)\n }\n return offset + 4\n}\n\nBuffer.prototype.writeIntLE = function writeIntLE (value, offset, byteLength, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) {\n   var limit = Math.pow(2, 8 * byteLength - 1)\n\n   checkInt(this, value, offset, byteLength, limit - 1, -limit)\n }\n\n var i = 0\n var mul = 1\n var sub = 0\n this[offset] = value & 0xFF\n while (++i < byteLength && (mul *= 0x100)) {\n   if (value < 0 && sub === 0 && this[offset + i - 1] !== 0) {\n   sub = 1\n   }\n   this[offset + i] = ((value / mul) >> 0) - sub & 0xFF\n }\n\n return offset + byteLength\n}\n\nBuffer.prototype.writeIntBE = function writeIntBE (value, offset, byteLength, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) {\n   var limit
  = Math.pow(2, 8 * byteLength - 1)\n\n   checkInt(this, value, offset, byteLength, limit - 1, -limit)\n }\n\n var i = byteLength - 1\n var mul = 1\n var sub = 0\n this[offset + i] = value & 0xFF\n while (--i >= 0 && (mul *= 0x100)) {\n   if (value < 0 && sub === 0 && this[offset + i + 1] !== 0) {\n   sub = 1\n   }\n   this[offset + i] = ((value / mul) >> 0) - sub & 0xFF\n }\n\n return offset + byteLength\n}\n\nBuffer.prototype.writeInt8 = function writeInt8 (value, offset, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) checkInt(this, value, offset, 1, 0x7f, -0x80)\n if (!Buffer.TYPED_ARRAY_SUPPORT) value = Math.floor(value)\n if (value < 0) value = 0xff + value + 1\n this[offset] = (value & 0xff)\n return offset + 1\n}\n\nBuffer.prototype.writeInt16LE = function writeInt16LE (value, offset, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) checkInt(this, value, offset, 2, 0x7fff, -0x8000)\n if (Buffer.TYPED_ARRAY_SUPPORT)
  {\n   this[offset] = (value & 0xff)\n   this[offset + 1] = (value >>> 8)\n } else {\n   objectWriteUInt16(this, value, offset, true)\n }\n return offset + 2\n}\n\nBuffer.prototype.writeInt16BE = function writeInt16BE (value, offset, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) checkInt(this, value, offset, 2, 0x7fff, -0x8000)\n if (Buffer.TYPED_ARRAY_SUPPORT) {\n   this[offset] = (value >>> 8)\n   this[offset + 1] = (value & 0xff)\n } else {\n   objectWriteUInt16(this, value, offset, false)\n }\n return offset + 2\n}\n\nBuffer.prototype.writeInt32LE

= function writeInt32LE (value, offset, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) checkInt(this, value, offset, 4, 0x7fffffff, -0x80000000)\n if (Buffer.TYPED_ARRAY_SUPPORT) {\n this[offset] = (value & 0xff)\n   this[offset + 1] = (value >>> 8)\n   this[offset + 2] = (value >>> 16)\n   this[offset + 3] = (value >>> 24)\n } else {\n   objectWriteUInt32(this, value,
 offset, true)\n }\n return offset + 4\n}\n\nBuffer.prototype.writeInt32BE = function writeInt32BE (value, offset, noAssert) {\n value = +value\n offset = offset | 0\n if (!noAssert) checkInt(this, value, offset, 4, 0x7fffffff, -0x80000000)\n if (value < 0) value = 0xffffffff + value + 1\n if (Buffer.TYPED_ARRAY_SUPPORT) {\n this[offset] = (value >>> 24)\n   this[offset + 1] = (value >>> 16)\n   this[offset + 2] = (value >>> 8)\n   this[offset + 3] = (value & 0xff)\n } else {\n   objectWriteUInt32(this, value, offset, false)\n }\n return offset + 4\n}\n\nfunction checkIEEE754 (buf, value, offset, ext, max, min) {\n if (offset + ext > buf.length) throw new RangeError('Index out of range')\n if (offset < 0) throw new RangeError('Index out of range')\n}\n\nfunction writeFloat (buf, value, offset, littleEndian, noAssert) {\n if (!noAssert) {\n   checkIEEE754(buf, value, offset, 4, 3.4028234663852886e+38, -3.4028234663852886e+38)\n }\n ieee754.write(buf, value, offset,
 littleEndian, 23, 4)\n return offset + 4\n}\n\nBuffer.prototype.writeFloatLE = function writeFloatLE (value, offset, noAssert) {\n return writeFloat(this, value, offset, true, noAssert)\n}\n\nBuffer.prototype.writeFloatBE = function writeFloatBE (value, offset, noAssert) {\n return writeFloat(this, value, offset, false, noAssert)\n}\n\nfunction writeDouble (buf, value, offset, littleEndian, noAssert) {\n if (!noAssert) {\n   checkIEEE754(buf, value, offset, 8, 1.7976931348623157E+308, -1.7976931348623157E+308)\n }\n ieee754.write(buf, value, offset, littleEndian, 52, 8)\n return offset + 8\n}\n\nBuffer.prototype.writeDoubleLE = function writeDoubleLE (value, offset, noAssert) {\n return writeDouble(this, value, offset, true, noAssert)\n}\n\nBuffer.prototype.writeDoubleBE = function writeDoubleBE (value, offset, noAssert) {\n return writeDouble(this, value, offset, false, noAssert)\n}\n\n// copy(targetBuffer, targetStart=0, sourceStart=0, sourceEnd=buffer.length)\nBuffer.prototype.copy
 = function copy (target, targetStart, start, end) {\n if (!start) start = 0\n if (!end && end !== 0) end = this.length\n if (targetStart >= target.length) targetStart = target.length\n if (!targetStart) targetStart = 0\n if (end > 0 && end < start) end = start\n\n // Copy 0 bytes; we're done\n if (end === start) return 0\n if (target.length === 0 || this.length === 0) return 0\n\n // Fatal error conditions\n if (targetStart < 0) {\n   throw new RangeError('targetStart out of bounds')\n }\n if (start < 0 || start >= this.length) throw new RangeError('sourceStart out of bounds')\n if (end < 0) throw new RangeError('sourceEnd out of bounds')\n\n // Are we oob?\n if (end > this.length) end = this.length\n if (target.length - targetStart < end - start) {\n   end = target.length - targetStart + start\n }\n\n var len = end - start\n var i\n\n if (this === target && start < targetStart && targetStart < end) {\n   // descending copy from end\n   for (i = len
 - 1; i >= 0; --i) {\n   target[i + targetStart] = this[i + start]\n   }\n } else if (len < 1000 || !Buffer.TYPED_ARRAY_SUPPORT) {\n   // ascending copy from start\n   for (i = 0; i < len; ++i) {\n   target[i + targetStart] = this[i + start]\n   }\n } else {\n   Uint8Array.prototype.set.call(\n   target,\n   this.subarray(start, start + len),\n   targetStart\n   )\n }\n\n return len\n}\n\n// Usage:\n//   buffer.fill(number[, offset[, end]])\n//   buffer.fill(buffer[, offset[, end]])\n//   buffer.fill(string[, offset[, end]][, encoding])\nBuffer.prototype.fill = function fill (val, start, end, encoding) {\n // Handle string cases:\n if (typeof val === 'string') {\n   if (typeof start === 'string') {\n   encoding = start\n   start = 0\n   end = this.length\n   } else if (typeof end === 'string') {\n   encoding = end\n   end = this.length\n   }\n   if (val.length === 1) {\n   var code = val.charCodeAt(0)\n   if (code < 256) {\n
 val = code\n   }\n   }\n   if (encoding !== undefined && typeof encoding !== 'string') {\n   throw new TypeError('encoding must be a string')\n   }\n   if (typeof encoding === 'string' && !Buffer.isEncoding(encoding)) {\n   throw new TypeError('Unknown encoding: ' + encoding)\n   }\n } else if (typeof val === 'number') {\n   val = val & 255\n }\n\n // Invalid ranges are not set to a default, so can range check early.\n if (start < 0 || this.length < start || this.length < end) {\n   throw new RangeError('Out of range index')\n }\n\n if (end <= start) {\n   return this\n }\n\n start = start >>> 0\n end = end === undefined ? this.length : end >>> 0\n\n if (!val) val = 0\n\n var i\n if (typeof val === 'number') {\n   for (i = start; i < end; ++i) {\n   this[i] = val\n   }\n } else {\n   var bytes = Buffer.isBuffer(val)\n   ? val\n   : utf8ToBytes(new Buffer(val, encoding).toString())\n   var len = bytes.length\n

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  for (i = 0; i < end - start; ++i)
 {\n      this[i + start] = bytes[i % len]\n    }\n  }\n\n  return this\n}\n\n// HELPER FUNCTIONS\n//
================\n\nvar INVALID_BASE64_RE = /[^+\\/0-9A-Za-z-_]/g\n\nfunction base64clean (str) {\n  //
Node strips out invalid characters like \\n and \\t from the string, base64-js does not\n  str =
stringtrim(str).replace(INVALID_BASE64_RE, '')\n  // Node converts strings with length < 2 to ''\n  if (str.length <
2) return ''\n  // Node allows for non-padded base64 strings (missing trailing ===), base64-js does not\n  while
(str.length % 4 !== 0) {\n    str = str + '='\n  }\n  return str\n}\n\nfunction stringtrim (str) {\n  if (str.trim) return
str.trim()\n  return str.replace(/^\\s+|\\s+$/g, '')\n}\n\nfunction toHex (n) {\n  if (n < 16) return '0' + n.toString(16)\n
return n.toString(16)\n}\n\nfunction utf8ToBytes (string, units) {\n  units = units || Infinity\n  var codePoint\n  var
length = string.length\n  var leadSurrogate = null\n  var bytes = []\n\n  for (var i = 0; i < length;
 ++i) {\n    codePoint = string.charCodeAt(i)\n\n    // is surrogate component\n    if (codePoint > 0xD7FF &&
codePoint < 0xE000) {\n      // last char was a lead\n      if (!leadSurrogate) {\n        // no lead yet\n        if (codePoint
> 0xDBFF) {\n          // unexpected trail\n          if ((units -= 3) > -1) bytes.push(0xEF, 0xBF, 0xBD)\n
continue\n        } else if (i + 1 === length) {\n          // unpaired lead\n          if ((units -= 3) > -1) bytes.push(0xEF,
0xBF, 0xBD)\n          continue\n        }\n\n        // valid lead\n        leadSurrogate = codePoint\n\n        continue\n
}\n\n      // 2 leads in a row\n      if (codePoint < 0xDC00) {\n        if ((units -= 3) > -1) bytes.push(0xEF, 0xBF,
0xBD)\n        leadSurrogate = codePoint\n        continue\n      }\n\n      // valid surrogate pair\n      codePoint =
(leadSurrogate - 0xD800 << 10 | codePoint - 0xDC00) + 0x10000\n    } else if (leadSurrogate) {\n      // valid bmp
char, but last char was a lead\n
    if ((units -= 3) > -1) bytes.push(0xEF, 0xBF, 0xBD)\n    }\n\n    leadSurrogate = null\n\n    // encode utf8\n    if
(codePoint < 0x80) {\n      if ((units -= 1) < 0) break\n      bytes.push(codePoint)\n    } else if (codePoint < 0x800)
{\n      if ((units -= 2) < 0) break\n      bytes.push(\n        codePoint >> 0x6 | 0xC0,\n        codePoint & 0x3F | 0x80\n
  )\n    } else if (codePoint < 0x10000) {\n      if ((units -= 3) < 0) break\n      bytes.push(\n        codePoint >> 0xC |
0xE0,\n        codePoint >> 0x6 & 0x3F | 0x80,\n        codePoint & 0x3F | 0x80\n      )\n    } else if (codePoint <
0x110000) {\n      if ((units -= 4) < 0) break\n      bytes.push(\n        codePoint >> 0x12 | 0xF0,\n        codePoint >>
0xC & 0x3F | 0x80,\n        codePoint >> 0x6 & 0x3F | 0x80,\n        codePoint & 0x3F | 0x80\n      )\n    } else {\n
throw new Error('Invalid code point')\n    }\n  }\n\n  return bytes\n}\n\nfunction asciiToBytes (str) {\n  var
byteArray = []\n  for (var
 i = 0; i < str.length; ++i) {\n    // Node's code seems to be doing this and not & 0x7F..\n
byteArray.push(str.charCodeAt(i) & 0xFF)\n  }\n  return byteArray\n}\n\nfunction utf16leToBytes (str, units) {\n
var c, hi, lo\n  var byteArray = []\n  for (var i = 0; i < str.length; ++i) {\n    if ((units -= 2) < 0) break\n\n    c =
str.charCodeAt(i)\n    hi = c >> 8\n    lo = c % 256\n    byteArray.push(lo)\n    byteArray.push(hi)\n  }\n\n  return
byteArray\n}\n\nfunction base64ToBytes (str) {\n  return base64.toByteArray(base64clean(str))\n}\n\nfunction
blitBuffer (src, dst, offset, length) {\n  for (var i = 0; i < length; ++i) {\n    if ((i + offset >= dst.length) || (i >=
src.length)) break\n    dst[i + offset] = src[i]\n  }\n  return i\n}\n\nfunction isnan (val) {\n  return val !== val // eslint-
disable-line no-self-compare\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n *
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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==========================================================================\n
*/\n\nimport {complex} from '../ops/complex';\n\nimport {tensor} from '../ops/tensor';\nimport {NamedTensor,
NamedTensorMap} from '../tensor_types';\nimport {TypedArray} from '../types';\nimport {sizeFromShape} from
'../util';\n\nimport {DTYPE_VALUE_SIZE_MAP, ModelArtifacts, ModelArtifactsInfo, WeightGroup,
WeightsManifestEntry} from './types';\n\n/** Number of bytes reserved for the length of the string. (32bit integer).
*/\nconst
```

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NUM_BYTES_STRING_LENGTH = 4;\n\n/**\n * Encode a map from names to weight values as an ArrayBuffer, along with an\n * `Array` of `WeightsManifestEntry` as specification of the encoded weights.\n *\n * This function does not perform sharding.\n *\n * This function is the reverse of `decodeWeights`.\n *\n * @param tensors A map (\"dict\") from names to tensors.\n * @param group Group to which the weights belong (optional).\n * @returns A `Promise` of\n *   - A flat `ArrayBuffer` with all the binary values of the `Tensor`s\n *     concatenated.\n *   - An `Array` of `WeightManifestEntry`s, carrying information including\n *     tensor names, `dtype`s and shapes.\n * @throws Error: on unsupported tensor `dtype`.\n */\nexport async function encodeWeights(\n    tensors: NamedTensorMap|NamedTensor[], group?: WeightGroup):\n    Promise<{data: ArrayBuffer, specs: WeightsManifestEntry[]}> {\n  // TODO(adarob, cais): Support quantization.\n  const specs: WeightsManifestEntry[] = [];\n  const dataPromises:
 Array<Promise<TypedArray>> = [];\n\n  const names: string[] = Array.isArray(tensors) ?\n      tensors.map(tensor => tensor.name) :\n      Object.keys(tensors);\n\n  for (let i = 0; i < names.length; ++i) {\n    const name = names[i];\n    const t = Array.isArray(tensors) ? tensors[i].tensor : tensors[name];\n    if (t.dtype !== 'float32' && t.dtype !== 'int32' && t.dtype !== 'bool' &&\n        t.dtype !== 'string' && t.dtype !== 'complex64') {\n      throw new Error(`Unsupported dtype in weight '${name}': ${t.dtype}`);\n    }\n    const spec: WeightsManifestEntry = {name, shape: t.shape, dtype: t.dtype};\n    if (t.dtype === 'string') {\n      const utf8bytes = new Promise<TypedArray>(async resolve => {\n        const vals = await t.bytes() as Uint8Array[];\n        const totalNumBytes = vals.reduce((p, c) => p + c.length, 0) +\n            NUM_BYTES_STRING_LENGTH * vals.length;\n        const bytes = new Uint8Array(totalNumBytes);\n        let offset = 0;\n        for (let i = 0; i < vals.length; i++) {\n          const val = vals[i];\n          const bytesOfLength =\n              new Uint8Array(new Uint32Array([val.length]).buffer);\n          bytes.set(bytesOfLength, offset);\n          offset += NUM_BYTES_STRING_LENGTH;\n          bytes.set(val, offset);\n          offset += val.length;\n        }\n        resolve(bytes);\n      });\n      dataPromises.push(utf8bytes);\n    } else {\n      dataPromises.push(t.data());\n    }\n    if (group != null) {\n      spec.group = group;\n    }\n    specs.push(spec);\n  }\n\n  const tensorValues = await Promise.all(dataPromises);\n  return {data: concatenateTypedArrays(tensorValues), specs};\n}\n\n/**\n * Decode flat ArrayBuffer as weights.\n *\n * This function does not handle sharding.\n *\n * This function is the reverse of `encodeWeights`.\n *\n * @param buffer A flat ArrayBuffer carrying the binary values of the tensors\n *     concatenated in the order specified in `specs`.\n * @param specs Specifications of
 the names, dtypes and shapes of the tensors\n *     whose value are encoded by `buffer`.\n * @return A map from tensor name to tensor value, with the names corresponding\n *     to names in `specs`.\n * @throws Error, if any of the tensors has unsupported dtype.\n */\nexport function decodeWeights(\n    buffer: ArrayBuffer, specs: WeightsManifestEntry[]): NamedTensorMap {\n  // TODO(adarob, cais): Support quantization.\n  const out: NamedTensorMap = {};\n  let float16Decode: (buffer: Uint16Array) => Float32Array | undefined;\n  let offset = 0;\n  for (const spec of specs) {\n    const name = spec.name;\n    const dtype = spec.dtype;\n    const shape = spec.shape;\n    const size = sizeFromShape(shape);\n    let values: TypedArray|string[]|Uint8Array[];\n\n    if ('quantization' in spec) {\n      const quantization = spec.quantization;\n      if (quantization.dtype === 'uint8' || quantization.dtype === 'uint16') {\n        if (!('min' in quantization && 'scale' in quantization)) {\n          throw new Error(\n              `Weight ${spec.name} with quantization ${quantization.dtype} ` +\n              `doesn't have corresponding metadata min and scale.`);\n        }\n      } else if (quantization.dtype === 'float16') {\n        if (dtype !== 'float32') {\n          throw new Error(\n              `Weight ${spec.name} is quantized with ${quantization.dtype} ` +\n              `which only supports weights of type float32 not ${dtype}.`);\n        }\n      } else {\n        throw new Error(\n            `Weight ${spec.name} has unknown ` +\n            `quantization dtype ${quantization.dtype}. ` +\n            `Supported quantization dtypes are: ` +\n            `'uint8', 'uint16', and 'float16'.`);\n      }\n      const quantizationSizeFactor = DTYPE_VALUE_SIZE_MAP[quantization.dtype];\n      const byteBuffer =\n          buffer.slice(offset, offset + size * quantizationSizeFactor);\n      const quantizedArray = (quantization.dtype === 'uint8') ?\n          new Uint8Array(byteBuffer) :\n          new Uint16Array(byteBuffer);\n      if (dtype === 'float32') {\n        if (quantization.dtype === 'uint8' || quantization.dtype === 'uint16') {\n          values = new Float32Array(quantizedArray.length);\n          for (let i = 0; i
```

< quantizedArray.length; i++) {\n const v = quantizedArray[i];\n values[i] = v * quantization.scale + quantization.min;\n }\n } else if (quantization.dtype === 'float16') {\n if (float16Decode === undefined) {\n float16Decode = getFloat16Decoder();\n }\n values = float16Decode(quantizedArray as Uint16Array);\n } else {\n throw new Error(\n `Unsupported quantization type ${quantization.dtype} ` +\n `for weight type float32.`);\n }\n } else if (dtype === 'int32') {\n if (quantization.dtype !== 'uint8' && quantization.dtype !== 'uint16') {\n throw new Error(\n `Unsupported quantization
type ${quantization.dtype} ` +\n `for weight type int32.`);\n }\n values = new Int32Array(quantizedArray.length);\n for (let i = 0; i < quantizedArray.length; i++) {\n const v = quantizedArray[i];\n values[i] = Math.round(v * quantization.scale + quantization.min);\n }\n } else {\n throw new Error(`Unsupported dtype in weight '${name}': ${dtype}`);\n }\n offset += size * quantizationSizeFactor;\n } else if (dtype === 'string') {\n const size = sizeFromShape(spec.shape);\n values = [];\n for (let i = 0; i < size; i++) {\n const byteLength = new Uint32Array(\n buffer.slice(offset, offset + NUM_BYTES_STRING_LENGTH))[0];\n offset += NUM_BYTES_STRING_LENGTH;\n const bytes = new Uint8Array(buffer.slice(offset, offset + byteLength));\n (values as Uint8Array[]).push(bytes);\n offset += byteLength;\n }\n } else {\n const dtypeFactor
= DTYPE_VALUE_SIZE_MAP[dtype];\n const byteBuffer = buffer.slice(offset, offset + size * dtypeFactor);\n\n if (dtype === 'float32') {\n values = new Float32Array(byteBuffer);\n } else if (dtype === 'int32') {\n values = new Int32Array(byteBuffer);\n } else if (dtype === 'bool') {\n values = new Uint8Array(byteBuffer);\n } else if (dtype === 'complex64') {\n values = new Float32Array(byteBuffer);\n const real = new Float32Array(values.length / 2);\n const image = new Float32Array(values.length / 2);\n for (let i = 0; i < real.length; i++) {\n real[i] = values[i * 2];\n image[i] = values[i * 2 + 1];\n }\n const realTensor = tensor(real, shape, 'float32');\n const imageTensor = tensor(image, shape, 'float32');\n out[name] = complex(realTensor, imageTensor);\n realTensor.dispose();\n imageTensor.dispose();\n } else {\n throw new Error(`Unsupported
dtype in weight '${name}': ${dtype}`);\n }\n offset += size * dtypeFactor;\n }\n if (dtype !== 'complex64') {\n out[name] = tensor(values, shape, dtype);\n }\n }\n return out;\n}\n\n/**\n * Concatenate TypedArrays into an ArrayBuffer.\n */\nexport function concatenateTypedArrays(xs: TypedArray[]): ArrayBuffer {\n // TODO(adarob, cais): Support quantization.\n if (xs === null) {\n throw new Error(`Invalid input value: ${JSON.stringify(xs)}`);\n }\n\n let totalByteLength = 0;\n\n // `normalizedXs` is here for this reason: a `TypedArray`'s `buffer'\n // can have a different byte length from that of the `TypedArray` itself,\n // for example, when the `TypedArray` is created from an offset in an\n // `ArrayBuffer`. `normliazedXs` holds `TypedArray`s whose `buffer`s match\n // the `TypedArray` in byte length. If an element of `xs` does not show\n // this property, a new `TypedArray` that satisfy this property will be\n // constructed and pushed
into `normalizedXs`.\n const normalizedXs: TypedArray[] = [];\n xs.forEach((x: TypedArray) => {\n totalByteLength += x.byteLength;\n // tslint:disable:no-any\n normalizedXs.push(\n x.byteLength === x.buffer.byteLength ? x :\n new (x.constructor as any)(x));\n if (!(x as any instanceof Float32Array || x as any instanceof Int32Array ||\n x as any instanceof Uint8Array)) {\n throw new Error(`Unsupported TypedArray subtype: ${x.constructor.name}`);\n }\n // tslint:enable:no-any\n });\n\n const y = new Uint8Array(totalByteLength);\n let offset = 0;\n normalizedXs.forEach((x: TypedArray) => {\n y.set(new Uint8Array(x.buffer), offset);\n offset += x.byteLength;\n });\n\n return y.buffer;\n}\n\n// Use Buffer on Node.js instead of Blob/atob/btoa\nconst useNodeBuffer = typeof Buffer !== 'undefined' &&\n (typeof Blob === 'undefined' || typeof atob === 'undefined' ||\n typeof btoa === 'undefined');\n\n/**\n
 * Calculate the byte length of a JavaScript string.\n *\n * Note that a JavaScript string can contain wide characters, therefore the\n * length of the string is not necessarily equal to the byte length.\n *\n * @param str Input string.\n * @returns Byte length.\n */\nexport function stringByteLength(str: string): number {\n if (useNodeBuffer) {\n return Buffer.byteLength(str);\n }\n return new Blob([str]).size;\n}\n\n/**\n * Encode an ArrayBuffer as a base64 encoded string.\n *\n * @param buffer `ArrayBuffer` to be converted.\n * @returns A string that base64-encodes

`buffer`.\n */\nexport function arrayBufferToBase64String(buffer: ArrayBuffer): string {\n if (useNodeBuffer) {\n return Buffer.from(buffer).toString('base64');\n }\n const buf = new Uint8Array(buffer);\n let s = '';\n for (let i = 0, l = buf.length; i < l; i++) {\n s += String.fromCharCode(buf[i]);\n }\n return btoa(s);\n}\n\n/**\n * Decode a base64 string as an ArrayBuffer.\n *\n * @param str Base64 string.\n * @returns Decoded `ArrayBuffer`.\n */\nexport function base64StringToArrayBuffer(str: string): ArrayBuffer {\n if (useNodeBuffer) {\n const buf = Buffer.from(str, 'base64');\n return buf.buffer.slice(buf.byteOffset, buf.byteOffset + buf.byteLength);\n }\n const s = atob(str);\n const buffer = new Uint8Array(s.length);\n for (let i = 0; i < s.length; ++i) {\n buffer.set([s.charCodeAt(i)], i);\n }\n return buffer.buffer;\n}\n\n/**\n * Concatenate a number of ArrayBuffers into one.\n *\n * @param buffers A number of array buffers to concatenate.\n * @returns Result of concatenating `buffers` in order.\n */\nexport function concatenateArrayBuffers(buffers: ArrayBuffer[]): ArrayBuffer {\n if (buffers.length === 1) {\n return buffers[0];\n }\n\n let totalByteLength = 0;\n buffers.forEach((buffer: ArrayBuffer) => {\n totalByteLength += buffer.byteLength;\n });\n\n const temp = new Uint8Array(totalByteLength);\n let offset = 0;\n buffers.forEach((buffer: ArrayBuffer) => {\n temp.set(new Uint8Array(buffer), offset);\n offset += buffer.byteLength;\n });\n return temp.buffer;\n}\n\n/**\n * Get the basename of a path.\n *\n * Behaves in a way analogous to Linux's basename command.\n *\n * @param path\n */\nexport function basename(path: string): string {\n const SEPARATOR = '/';\n path = path.trim();\n while (path.endsWith(SEPARATOR)) {\n path = path.slice(0, path.length - 1);\n }\n const items = path.split(SEPARATOR);\n return items[items.length - 1];\n}\n\n/**\n * Populate ModelArtifactsInfo fields for a model with JSON topology.\n * @param modelArtifacts\n * @returns A ModelArtifactsInfo object.\n */\nexport function getModelArtifactsInfoForJSON(modelArtifacts: ModelArtifacts):\n ModelArtifactsInfo {\n if (modelArtifacts.modelTopology instanceof ArrayBuffer) {\n throw new Error('Expected JSON model topology, received ArrayBuffer.');\n }\n\n return {\n dateSaved: new Date(),\n modelTopologyType: 'JSON',\n modelTopologyBytes: modelArtifacts.modelTopology == null ?\n 0 :\n stringByteLength(JSON.stringify(modelArtifacts.modelTopology)),\n weightSpecsBytes: modelArtifacts.weightSpecs == null ?\n 0 :\n stringByteLength(JSON.stringify(modelArtifacts.weightSpecs)),\n weightDataBytes: modelArtifacts.weightData == null ?\n 0 :\n modelArtifacts.weightData.byteLength,\n };\n}\n\n/**\n * Computes mantisa table for casting Float16 to Float32\n * See http://www.fox-toolkit.org/ftp/fasthalffloatconversion.pdf\n *\n * @returns Uint32Array, 2048 mantissa lookup values.\n */\nfunction computeFloat16MantisaTable(): Uint32Array {\n const convertMantissa = (i: number): number => {\n let m = i << 13;\n let e = 0;\n\n while ((m & 0x00800000) === 0) {\n e -= 0x00800000;\n m <<= 1;\n }\n m &= ~0x00800000;\n e += 0x38800000;\n\n return m | e;\n };\n\n const mantisaTable = new Uint32Array(2048);\n\n mantisaTable[0] = 0;\n for (let i = 1; i < 1024; i++) {\n mantisaTable[i] = convertMantissa(i);\n }\n for (let i = 1024; i < 2048; i++) {\n mantisaTable[i] = 0x38000000 + ((i - 1024) << 13);\n }\n\n return mantisaTable;\n}\n\n/**\n * Computes exponent table for casting Float16 to Float32\n * See http://www.fox-toolkit.org/ftp/fasthalffloatconversion.pdf\n *\n * @returns Uint32Array, 64 exponent lookup values.\n */\nfunction computeFloat16ExponentTable(): Uint32Array {\n const exponentTable = new Uint32Array(64);\n\n exponentTable[0] = 0;\n exponentTable[31] = 0x47800000;\n exponentTable[32] = 0x80000000;\n exponentTable[63] = 0xc7800000;\n for (let i = 1; i < 31; i++) {\n exponentTable[i] = i << 23;\n }\n for (let i = 33; i < 63; i++) {\n exponentTable[i] = 0x80000000 + ((i - 32) << 23);\n }\n\n return exponentTable;\n}\n\n/**\n * Computes offset table for casting Float16 to Float32\n * See http://www.fox-toolkit.org/ftp/fasthalffloatconversion.pdf\n *\n * @returns Uint32Array, 6d offset values.\n */\nfunction computeFloat16OffsetTable(): Uint32Array {\n const offsetTable = new Uint32Array(64);\n\n for (let i = 0; i < 64; i++) {\n offsetTable[i] = 1024;\n }\n offsetTable[0] = offsetTable[32] = 0;\n\n return offsetTable;\n}\n\n/**\n * Retrieve a Float16 decoder which will decode a ByteArray of Float16 values\n * to a Float32Array.\n *\n * @returns Function (buffer: Uint16Array) => Float32Array which decodes\n * the Uint16Array of Float16 bytes to a Float32Array.\n */\nexport function getFloat16Decoder(): (buffer:

Uint16Array) => Float32Array {\n // Algorithm is based off of\n // http://www.fox-toolkit.org/ftp/fasthalffloatconversion.pdf\n\n // Cache lookup tables\n const mantisaTable = computeFloat16MantisaTable();\n const exponentTable = computeFloat16ExponentTable();\n const offsetTable = computeFloat16OffsetTable();\n\n return (quantizedArray: Uint16Array) => {\n   const buffer = new ArrayBuffer(4 * quantizedArray.length);\n
    const bufferUint32View = new Uint32Array(buffer);\n   for (let index = 0; index < quantizedArray.length; index++) {\n   const float16Bits = quantizedArray[index];\n   const float32Bits =\n mantisaTable[offsetTable[float16Bits >> 10] + (float16Bits & 0x3ff)] +\n   exponentTable[float16Bits >> 10];\n
    bufferUint32View[index] = float32Bits;\n   }\n   return new Float32Array(buffer);\n };\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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==\n
*/\n\nimport {IOHandler, LoadOptions} from './types';\n\nexport type IORouter = (url: string|string[], loadOptions?: LoadOptions) =>\n   IOHandler;\n\nexport class IORouterRegistry {\n // Singleton instance.\n private static instance: IORouterRegistry;\n\n private saveRouters: IORouter[];\n private loadRouters: IORouter[];\n\n private constructor() {\n   this.saveRouters = [];\n   this.loadRouters = [];\n }\n\n private static getInstance(): IORouterRegistry {\n   if (IORouterRegistry.instance == null) {\n   IORouterRegistry.instance = new IORouterRegistry();\n   }\n   return IORouterRegistry.instance;\n }\n\n /**\n   * Register a save-handler router.\n   *\n   * @param saveRouter A function that maps a URL-like string onto an instance\n   * of `IOHandler` with the `save` method defined or `null`.\n   */\n static registerSaveRouter(saveRouter:
 IORouter) {\n   IORouterRegistry.getInstance().saveRouters.push(saveRouter);\n }\n\n /**\n   * Register a load-handler router.\n   *\n   * @param loadRouter A function that maps a URL-like string onto an instance\n   * of `IOHandler` with the `load` method defined or `null`.\n   */\n static registerLoadRouter(loadRouter: IORouter) {\n IORouterRegistry.getInstance().loadRouters.push(loadRouter);\n }\n\n /**\n   * Look up IOHandler for saving, given a URL-like string.\n   *\n   * @param url\n   * @returns If only one match is found, an instance of IOHandler with the\n   * `save` method defined. If no match is found, `null`.\n   * @throws Error, if more than one match is found.\n   */\n static getSaveHandlers(url: string|string[]): IOHandler[] {\n   return IORouterRegistry.getHandlers(url, 'save');\n }\n\n /**\n   * Look up IOHandler for loading, given a URL-like string.\n   *\n   * @param url\n   * @param loadOptions Optional, custom load options.\n   *
 @returns All valid handlers for `url`, given the currently registered\n   *   handler routers.\n   */\n static getLoadHandlers(url: string|string[], loadOptions?: LoadOptions):\n   IOHandler[] {\n   return IORouterRegistry.getHandlers(url, 'load', loadOptions);\n }\n\n private static getHandlers(\n   url: string|string[], handlerType: 'save'|'load',\n   loadOptions?: LoadOptions): IOHandler[] {\n   const validHandlers: IOHandler[] = [];\n   const routers = handlerType === 'load' ?\n   IORouterRegistry.getInstance().loadRouters :\n IORouterRegistry.getInstance().saveRouters;\n   routers.forEach(router => {\n   const handler = router(url, loadOptions);\n   if (handler !== null) {\n   validHandlers.push(handler);\n   }\n   });\n   return validHandlers;\n }\n}\n\nexport const registerSaveRouter = (loudRouter: IORouter) =>\n IORouterRegistry.registerSaveRouter(loudRouter);\nexport const registerLoadRouter = (loudRouter: IORouter) =>\n   IORouterRegistry.registerLoadRouter(loudRouter);\nexport
 const getSaveHandlers = (url: string|string[]) =>\n   IORouterRegistry.getSaveHandlers(url);\nexport const getLoadHandlers =\n   (url: string|string[], loadOptions?: LoadOptions) =>\n IORouterRegistry.getLoadHandlers(url, loadOptions);\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this

file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport '../flags';\n\nimport {env} from '../environment';\n\nimport {getModelArtifactsInfoForJSON} from './io_utils';\nimport {IORouter, IORouterRegistry} from './router_registry';\nimport {IOHandler, ModelArtifacts, ModelArtifactsInfo, ModelStoreManager, SaveResult} from './types';\n\nconst DATABASE_NAME = 'tensorflowjs';\nconst DATABASE_VERSION = 1;\n\n// Model data and ModelArtifactsInfo (metadata) are stored in two separate\n// stores for efficient access of the list of stored models and their metadata.\n// 1. The object store for model data: topology, weights and weight manifests.\nconst MODEL_STORE_NAME = 'models_store';\n// 2. The object store for ModelArtifactsInfo, including meta-information such\n// as the type of topology (JSON vs binary), byte size of the topology, byte\n// size of the weights, etc.\nconst INFO_STORE_NAME = 'model_info_store';\n\n/**\n * Delete the entire database for tensorflow.js, including the models store.\n */\nexport async function deleteDatabase(): Promise<void> {\n const idbFactory = getIndexedDBFactory();\n\n return new Promise<void>((resolve, reject) => {\n const deleteRequest = idbFactory.deleteDatabase(DATABASE_NAME);\n deleteRequest.onsuccess = () => resolve();\n deleteRequest.onerror = error => reject(error);\n });\n}\n\nfunction getIndexedDBFactory(): IDBFactory {\n if (!env().getBool('IS_BROWSER')) {\n // TODO(cais): Add more info about what IOHandler subtypes are available.\n // Maybe point to a doc page on the web and/or automatically determine\n // the available IOHandlers and print them in the error message.\n throw new Error(\n 'Failed to obtain IndexedDB factory because the current environment' +\n 'is not a web browser.');\n }\n // tslint:disable-next-line:no-any\n const theWindow: any = typeof window === 'undefined' ? self : window;\n const factory = theWindow.indexedDB || theWindow.mozIndexedDB ||\n theWindow.webkitIndexedDB || theWindow.msIndexedDB ||\n theWindow.shimIndexedDB;\n if (factory == null) {\n throw new Error(\n 'The current browser does not appear to support IndexedDB.');\n }\n return factory;\n}\n\nfunction setUpDatabase(openRequest: IDBRequest) {\n const db = openRequest.result as IDBDatabase;\n db.createObjectStore(MODEL_STORE_NAME, {keyPath: 'modelPath'});\n db.createObjectStore(INFO_STORE_NAME, {keyPath: 'modelPath'});\n}\n\n/**\n * IOHandler subclass: Browser IndexedDB.\n *\n * See the doc string of `browserIndexedDB` for more details.\n */\nexport class BrowserIndexedDB implements IOHandler {\n protected readonly indexedDB: IDBFactory;\n protected readonly modelPath: string;\n\n static readonly URL_SCHEME = 'indexeddb://';\n\n constructor(modelPath: string) {\n this.indexedDB = getIndexedDBFactory();\n\n if (modelPath == null || !modelPath) {\n throw new Error(\n 'For IndexedDB, modelPath must not be null, undefined or empty.');\n }\n this.modelPath = modelPath;\n }\n\n async save(modelArtifacts: ModelArtifacts): Promise<SaveResult> {\n // TODO(cais): Support saving GraphDef models.\n if (modelArtifacts.modelTopology instanceof ArrayBuffer) {\n throw new Error(\n 'BrowserLocalStorage.save() does not support saving model topology ' +\n 'in binary formats yet.');\n }\n\n return this.databaseAction(this.modelPath, modelArtifacts) as\n Promise<SaveResult>;\n }\n\n async load(): Promise<ModelArtifacts> {\n return this.databaseAction(this.modelPath) as\n Promise<ModelArtifacts>;\n }\n\n /**\n * Perform database action to put model artifacts into or read model artifacts\n * from IndexedDB object store.\n *\n * Whether the action is put or get depends on whether `modelArtifacts` is\n * specified. If it is specified, the action will be put; otherwise the action\n * will be get.\n *\n * @param modelPath A unique string path for the model.\n * @param modelArtifacts If specified, it will be the model artifacts to be\n * stored in IndexedDB.\n * @returns A `Promise` of `SaveResult`, if the action is put, or a `Promise`\n * of `ModelArtifacts`, if the action is get.\n */\n private databaseAction(modelPath: string, modelArtifacts?: ModelArtifacts):\n Promise<ModelArtifacts|SaveResult> {\n

```
 return new Promise<ModelArtifacts|SaveResult>((resolve, reject) => {\n      const openRequest =
this.indexedDB.open(DATABASE_NAME, DATABASE_VERSION);\n      openRequest.onupgradeneeded = () =>
setUpDatabase(openRequest);\n\n      openRequest.onsuccess = () => {\n        const db = openRequest.result;\n\n
if (modelArtifacts == null) {\n          // Read model out from object store.\n          const modelTx =
db.transaction(MODEL_STORE_NAME, 'readonly');\n          const modelStore =
modelTx.objectStore(MODEL_STORE_NAME);\n          const getRequest = modelStore.get(this.modelPath);\n
 getRequest.onsuccess = () => {\n            if
 (getRequest.result == null) {\n              db.close();\n              return reject(new Error(\n                  `Cannot find
model with path '${this.modelPath}' ` +\n                  `in IndexedDB.`));\n            } else {\n
resolve(getRequest.result.modelArtifacts);\n            }\n          };\n          getRequest.onerror = error => {\n
db.close();\n            return reject(getRequest.error);\n          };\n          modelTx.oncomplete = () => db.close();\n
} else {\n          // Put model into object store.\n          const modelArtifactsInfo: ModelArtifactsInfo =\n
getModelArtifactsInfoForJSON(modelArtifacts);\n          // First, put ModelArtifactsInfo into info store.\n
const infoTx = db.transaction(INFO_STORE_NAME, 'readwrite');\n          let infoStore =
infoTx.objectStore(INFO_STORE_NAME);\n          const putInfoRequest =\n              infoStore.put({modelPath:
this.modelPath, modelArtifactsInfo});\n          let modelTx:
 IDBTransaction;\n          putInfoRequest.onsuccess = () => {\n            // Second, put model data into model store.\n
        modelTx = db.transaction(MODEL_STORE_NAME, 'readwrite');\n            const modelStore =
modelTx.objectStore(MODEL_STORE_NAME);\n            const putModelRequest = modelStore.put({\n
modelPath: this.modelPath,\n              modelArtifacts,\n              modelArtifactsInfo\n            });\n
putModelRequest.onsuccess = () => resolve({modelArtifactsInfo});\n            putModelRequest.onerror = error =>
{\n              // If the put-model request fails, roll back the info entry as\n              // well.\n              infoStore =
infoTx.objectStore(INFO_STORE_NAME);\n              const deleteInfoRequest =
infoStore.delete(this.modelPath);\n              deleteInfoRequest.onsuccess = () => {\n                db.close();\n
return reject(putModelRequest.error);\n              };\n              deleteInfoRequest.onerror
 = error => {\n                db.close();\n                return reject(putModelRequest.error);\n              };\n            };\n
};\n          putInfoRequest.onerror = error => {\n            db.close();\n            return reject(putInfoRequest.error);\n
  };\n          infoTx.oncomplete = () => {\n            if (modelTx == null) {\n              db.close();\n            } else {\n
    modelTx.oncomplete = () => db.close();\n            }\n          };\n        }\n      };\n      openRequest.onerror = error
=> reject(openRequest.error);\n    });\n  }\n}\n\nexport const indexedDBRouter: IORouter = (url: string|string[]) =>
{\n  if (!env().getBool('IS_BROWSER')) {\n    return null;\n  } else {\n    if (!Array.isArray(url) &&
url.startsWith(BrowserIndexedDB.URL_SCHEME)) {\n      return
browserIndexedDB(url.slice(BrowserIndexedDB.URL_SCHEME.length));\n    } else {\n      return null;\n    }\n
}\n};\nIORouterRegistry.registerSaveRouter(indexedDBRouter);\nIORouterRegistry.registerLoadRouter(indexedD
BRouter);\n\n/**\n
 * Creates a browser IndexedDB IOHandler for saving and loading models.\n *\n * ```js\n * const model =
tf.sequential();\n * model.add(\n *     tf.layers.dense({units: 1, inputShape: [100], activation: 'sigmoid'}));\n *\n *
const saveResult = await model.save('indexeddb://MyModel'));\n * console.log(saveResult);\n * ```\n *\n * @param
modelPath A unique identifier for the model to be saved. Must be a\n *    non-empty string.\n * @returns An
instance of `BrowserIndexedDB` (sublcass of `IOHandler`),\n *    which can be used with, e.g., `tf.Model.save`.\n
*/\nexport function browserIndexedDB(modelPath: string): IOHandler {\n  return new
BrowserIndexedDB(modelPath);\n}\n\nfunction maybeStripScheme(key: string) {\n  return
key.startsWith(BrowserIndexedDB.URL_SCHEME) ?\n      key.slice(BrowserIndexedDB.URL_SCHEME.length)
:\n      key;\n}\n\nexport class BrowserIndexedDBManager implements ModelStoreManager {\n  private
indexedDB:
 IDBFactory;\n\n  constructor() {\n    this.indexedDB = getIndexedDBFactory();\n  }\n\n  async listModels():
Promise<{[path: string]: ModelArtifactsInfo}> {\n    return new Promise<{[path: string]: ModelArtifactsInfo}>(\n
  (resolve, reject) => {\n          const openRequest =\n              this.indexedDB.open(DATABASE_NAME,
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DATABASE_VERSION);\n          openRequest.onupgradeneeded = () => setUpDatabase(openRequest);\n\n
openRequest.onsuccess = () => {\n            const db = openRequest.result;\n            const tx =
db.transaction(INFO_STORE_NAME, 'readonly');\n            const store = tx.objectStore(INFO_STORE_NAME);\n
        // tslint:disable:max-line-length\n            // Need to cast `store` as `any` here because TypeScript's DOM\n
 // library does not have the `getAll()` method even though the\n            // method is supported in the latest version of
most mainstream\n            // browsers:\n            // https://developer.mozilla.org/en-
US/docs/Web/API/IDBObjectStore/getAll\n
            // tslint:enable:max-line-length\n            // tslint:disable-next-line:no-any\n            const getAllInfoRequest =
(store as any).getAll() as IDBRequest;\n            getAllInfoRequest.onsuccess = () => {\n              const out: {[path:
string]: ModelArtifactsInfo} = {};\n              for (const item of getAllInfoRequest.result) {\n
out[item.modelPath] = item.modelArtifactsInfo;\n              }\n              resolve(out);\n            };\n
getAllInfoRequest.onerror = error => {\n              db.close();\n              return reject(getAllInfoRequest.error);\n
  };\n            tx.oncomplete = () => db.close();\n          };\n          openRequest.onerror = error =>
reject(openRequest.error);\n        });\n  }\n\n  async removeModel(path: string): Promise<ModelArtifactsInfo> {\n
path = maybeStripScheme(path);\n    return new Promise<ModelArtifactsInfo>((resolve, reject) => {\n      const
openRequest
 = this.indexedDB.open(DATABASE_NAME, DATABASE_VERSION);\n      openRequest.onupgradeneeded = ()
=> setUpDatabase(openRequest);\n\n      openRequest.onsuccess = () => {\n        const db = openRequest.result;\n
  const infoTx = db.transaction(INFO_STORE_NAME, 'readwrite');\n        const infoStore =
infoTx.objectStore(INFO_STORE_NAME);\n\n        const getInfoRequest = infoStore.get(path);\n        let modelTx:
IDBTransaction;\n        getInfoRequest.onsuccess = () => {\n          if (getInfoRequest.result == null) {\n
db.close();\n            return reject(new Error(\n                `Cannot find model with path '${path}' ` +\n                `in
IndexedDB.`));\n          } else {\n            // First, delete the entry in the info store.\n            const deleteInfoRequest =
infoStore.delete(path);\n            const deleteModelData = () => {\n              // Second, delete the entry in the model
store.\n              modelTx = db.transaction(MODEL_STORE_NAME,
 'readwrite');\n              const modelStore = modelTx.objectStore(MODEL_STORE_NAME);\n              const
deleteModelRequest = modelStore.delete(path);\n              deleteModelRequest.onsuccess = () =>\n
resolve(getInfoRequest.result.modelArtifactsInfo);\n              deleteModelRequest.onerror = error =>\n
reject(getInfoRequest.error);\n            };\n            // Proceed with deleting model data regardless of whether
deletion\n            // of info data succeeds or not.\n            deleteInfoRequest.onsuccess = deleteModelData;\n
deleteInfoRequest.onerror = error => {\n              deleteModelData();\n              db.close();\n              return
reject(getInfoRequest.error);\n            };\n          }\n        };\n        getInfoRequest.onerror = error => {\n
db.close();\n          return reject(getInfoRequest.error);\n        };\n\n        infoTx.oncomplete = () => {\n          if
(modelTx == null) {\n
      db.close();\n          } else {\n            modelTx.oncomplete = () => db.close();\n          }\n        };\n      };\n
openRequest.onerror = error => reject(openRequest.error);\n    });\n  }\n}\n","/**\n * @license\n * Copyright 2018
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport '../flags';\nimport {env} from '../environment';\n\nimport
 {assert} from '../util';\nimport {arrayBufferToBase64String, base64StringToArrayBuffer,
getModelArtifactsInfoForJSON} from './io_utils';\nimport {IORouter, IORouterRegistry} from
'./router_registry';\nimport {IOHandler, ModelArtifacts, ModelArtifactsInfo, ModelStoreManager, SaveResult}
from './types';\n\nconst PATH_SEPARATOR = '/';\nconst PATH_PREFIX = 'tensorflowjs_models';\nconst
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INFO_SUFFIX = 'info';\nconst MODEL_TOPOLOGY_SUFFIX = 'model_topology';\nconst
WEIGHT_SPECS_SUFFIX = 'weight_specs';\nconst WEIGHT_DATA_SUFFIX = 'weight_data';\nconst
MODEL_METADATA_SUFFIX = 'model_metadata';\n\n/**\n * Purge all tensorflow.js-saved model artifacts from
local storage.\n *\n * @returns Paths of the models purged.\n */\nexport function purgeLocalStorageArtifacts():
string[] {\n  if (!env().getBool('IS_BROWSER') || typeof window === 'undefined' ||\n      typeof
window.localStorage === 'undefined') {\n    throw new Error(\n        'purgeLocalStorageModels() cannot proceed
because local storage is
 ' +\n        'unavailable in the current environment.');\n  }\n  const LS = window.localStorage;\n  const
purgedModelPaths: string[] = [];\n  for (let i = 0; i < LS.length; ++i) {\n    const key = LS.key(i);\n    const prefix =
PATH_PREFIX + PATH_SEPARATOR;\n    if (key.startsWith(prefix) && key.length > prefix.length) {\n
LS.removeItem(key);\n      const modelName = getModelPathFromKey(key);\n      if
(purgedModelPaths.indexOf(modelName) === -1) {\n        purgedModelPaths.push(modelName);\n      }\n    }\n
}\n  return purgedModelPaths;\n}\n\nfunction getModelKeys(path: string): {\n  info: string,\n  topology: string,\n
weightSpecs: string,\n  weightData: string,\n  modelMetadata: string\n} {\n  return {\n    info: [PATH_PREFIX,
path, INFO_SUFFIX].join(PATH_SEPARATOR),\n    topology: [PATH_PREFIX, path,
MODEL_TOPOLOGY_SUFFIX].join(PATH_SEPARATOR),\n    weightSpecs: [PATH_PREFIX, path,
WEIGHT_SPECS_SUFFIX].join(PATH_SEPARATOR),\n    weightData: [PATH_PREFIX, path,
WEIGHT_DATA_SUFFIX].join(PATH_SEPARATOR),\n
   modelMetadata:\n        [PATH_PREFIX, path, MODEL_METADATA_SUFFIX].join(PATH_SEPARATOR)\n
};\n}\n\n/**\n * Get model path from a local-storage key.\n *\n * E.g., 'tensorflowjs_models/my/model/1/info' -->
'my/model/1'\n *\n * @param key\n */\nfunction getModelPathFromKey(key: string) {\n  const items =
key.split(PATH_SEPARATOR);\n  if (items.length < 3) {\n    throw new Error(`Invalid key format: ${key}`);\n  }\n
return items.slice(1, items.length - 1).join(PATH_SEPARATOR);\n}\n\nfunction maybeStripScheme(key: string)
{\n  return key.startsWith(BrowserLocalStorage.URL_SCHEME) ?\n
key.slice(BrowserLocalStorage.URL_SCHEME.length) :\n      key;\n}\n\ndeclare type LocalStorageKeys = {\n
info: string,\n  topology: string,\n  weightSpecs: string,\n  weightData: string,\n  modelMetadata: string\n};\n\n/**\n
* IOHandler subclass: Browser Local Storage.\n *\n * See the doc string to `browserLocalStorage` for more
details.\n */\nexport class BrowserLocalStorage
 implements IOHandler {\n  protected readonly LS: Storage;\n  protected readonly modelPath: string;\n  protected
readonly keys: LocalStorageKeys;\n\n  static readonly URL_SCHEME = 'localstorage://';\n\n
constructor(modelPath: string) {\n    if (!env().getBool('IS_BROWSER') || typeof window === 'undefined' ||\n
typeof window.localStorage === 'undefined') {\n      // TODO(cais): Add more info about what IOHandler subtypes
are\n      // available.\n      //   Maybe point to a doc page on the web and/or automatically determine\n      //   the
available IOHandlers and print them in the error message.\n      throw new Error(\n          'The current environment
does not support local storage.');\n    }\n    this.LS = window.localStorage;\n\n    if (modelPath == null || !modelPath)
{\n      throw new Error(\n          'For local storage, modelPath must not be null, undefined or empty.');\n    }\n
this.modelPath = modelPath;\n    this.keys = getModelKeys(this.modelPath);\n  }\n\n
  /**\n   * Save model artifacts to browser local storage.\n   *\n   * See the documentation to `browserLocalStorage`
for details on the saved\n   * artifacts.\n   *\n   * @param modelArtifacts The model artifacts to be stored.\n   *
@returns An instance of SaveResult.\n   */\n  async save(modelArtifacts: ModelArtifacts): Promise<SaveResult>
{\n    if (modelArtifacts.modelTopology instanceof ArrayBuffer) {\n      throw new Error(\n
'BrowserLocalStorage.save() does not support saving model topology ' +\n          'in binary formats yet.');\n    } else
{\n      const topology = JSON.stringify(modelArtifacts.modelTopology);\n      const weightSpecs =
JSON.stringify(modelArtifacts.weightSpecs);\n\n      const modelArtifactsInfo: ModelArtifactsInfo =\n
getModelArtifactsInfoForJSON(modelArtifacts);\n\n      try {\n        this.LS.setItem(this.keys.info,
JSON.stringify(modelArtifactsInfo));\n        this.LS.setItem(this.keys.topology, topology);\n
this.LS.setItem(this.keys.weightSpecs,
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 weightSpecs);\n        this.LS.setItem(\n            this.keys.weightData,\n
arrayBufferToBase64String(modelArtifacts.weightData));\n        const result: ModelArtifacts = {\n
format: modelArtifacts.format,\n            generatedBy: modelArtifacts.generatedBy,\n
convertedBy: modelArtifacts.convertedBy\n        };\n        if (modelArtifacts.signature != null) {\n
result.signature = modelArtifacts.signature;\n        }\n        if (modelArtifacts.userDefinedMetadata != null) {\n
result.userDefinedMetadata = modelArtifacts.userDefinedMetadata;\n        }\n        if
(modelArtifacts.modelInitializer != null) {\n            result.modelInitializer = modelArtifacts.modelInitializer;\n
}\n        this.LS.setItem(this.keys.modelMetadata, JSON.stringify(result));\n\n        return {modelArtifactsInfo};\n
} catch (err) {\n        // If saving failed, clean up all items saved so far.\n        this.LS.removeItem(this.keys.info);\n
        this.LS.removeItem(this.keys.topology);\n        this.LS.removeItem(this.keys.weightSpecs);\n
this.LS.removeItem(this.keys.weightData);\n        this.LS.removeItem(this.keys.modelMetadata);\n\n        throw new
Error(\n            `Failed to save model '${this.modelPath}' to local storage: ` +\n            `size quota being exceeded is
a possible cause of this failure: ` +\n            `modelTopologyBytes=${modelArtifactsInfo.modelTopologyBytes}, ` +\n
+\n            `weightSpecsBytes=${modelArtifactsInfo.weightSpecsBytes}, ` +\n
`weightDataBytes=${modelArtifactsInfo.weightDataBytes}.`);\n      }\n    }\n  }\n\n  /**\n   * Load a model from
local storage.\n   *\n   * See the documentation to `browserLocalStorage` for details on the saved\n   * artifacts.\n
*\n   * @returns The loaded model (if loading succeeds).\n   */\n  async load(): Promise<ModelArtifacts> {\n
const info =\n        JSON.parse(this.LS.getItem(this.keys.info)) as ModelArtifactsInfo;\n
    if (info == null) {\n      throw new Error(\n          `In local storage, there is no model with name
'${this.modelPath}'`);\n    }\n\n    if (info.modelTopologyType !== 'JSON') {\n      throw new Error(\n
'BrowserLocalStorage does not support loading non-JSON model ' +\n          'topology yet.');\n    }\n\n    const out:
ModelArtifacts = {};\n\n    // Load topology.\n    const topology =
JSON.parse(this.LS.getItem(this.keys.topology));\n    if (topology == null) {\n      throw new Error(\n          `In local
storage, the topology of model '${this.modelPath}' ` +\n          `is missing.`);\n    }\n    out.modelTopology =
topology;\n\n    // Load weight specs.\n    const weightSpecs =
JSON.parse(this.LS.getItem(this.keys.weightSpecs));\n    if (weightSpecs == null) {\n      throw new Error(\n
`In local storage, the weight specs of model '${this.modelPath}' ` +\n          `are missing.`);\n    }\n
out.weightSpecs = weightSpecs;\n\n    // Load meta-data fields.\n
    const metadataString = this.LS.getItem(this.keys.modelMetadata);\n    if (metadataString != null) {\n      const
metadata = JSON.parse(metadataString) as ModelArtifacts;\n      out.format = metadata['format'];\n
out.generatedBy = metadata['generatedBy'];\n      out.convertedBy = metadata['convertedBy'];\n      if
(metadata['signature'] != null) {\n        out.signature = metadata['signature'];\n      }\n      if
(metadata['userDefinedMetadata'] != null) {\n        out.userDefinedMetadata = metadata['userDefinedMetadata'];\n
  }\n      if (metadata['modelInitializer'] != null) {\n        out.modelInitializer = metadata['modelInitializer'];\n      }\n
}\n\n    // Load weight data.\n    const weightDataBase64 = this.LS.getItem(this.keys.weightData);\n    if
(weightDataBase64 == null) {\n      throw new Error(\n          `In local storage, the binary weight values of model ` +\n
`'${this.modelPath}' are missing.`);\n    }\n    out.weightData =
base64StringToArrayBuffer(weightDataBase64);\n\n
    return out;\n  }\n}\n\nexport const localStorageRouter: IORouter = (url: string|string[]) => {\n  if
(!env().getBool('IS_BROWSER')) {\n    return null;\n  } else {\n    if (!Array.isArray(url) &&
url.startsWith(BrowserLocalStorage.URL_SCHEME)) {\n      return browserLocalStorage(\n
url.slice(BrowserLocalStorage.URL_SCHEME.length));\n    } else {\n      return null;\n    }\n
}\n};\nIORouterRegistry.registerSaveRouter(localStorageRouter);\nIORouterRegistry.registerLoadRouter(localStor
ageRouter);\n\n/**\n * Factory function for local storage IOHandler.\n *\n * This `IOHandler` supports both `save`
and `load`.\n *\n * For each model's saved artifacts, four items are saved to local storage.\n *   -
`${PATH_SEPARATOR}/${modelPath}/info`: Contains meta-info about the\n *     model, such as date saved, type
of the topology, size in bytes, etc.\n *   - `${PATH_SEPARATOR}/${modelPath}/topology`: Model topology. For
Keras-\n *     style models, this is a
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stringized JSON.\n *   - `${PATH_SEPARATOR}/${modelPath}/weight_specs`: Weight specs of the\n *     model, can be used to decode the saved binary weight values (see\n *     item below).\n *   - `${PATH_SEPARATOR}/${modelPath}/weight_data`: Concatenated binary\n *     weight values, stored as a base64-encoded string.\n *\n * Saving may throw an `Error` if the total size of the artifacts exceed the\n * browser-specific quota.\n *\n * @param modelPath A unique identifier for the model to be saved. Must be a\n *   non-empty string.\n * @returns An instance of `IOHandler`, which can be used with, e.g.,\n *   `tf.Model.save`.\n */\nexport function browserLocalStorage(modelPath: string): IOHandler {\n  return new BrowserLocalStorage(modelPath);\n}\n\nexport class BrowserLocalStorageManager implements ModelStoreManager {\n  private readonly LS: Storage;\n\n  constructor() {\n    assert(\n        env().getBool('IS_BROWSER'),\n        () => 'Current environment is not a web browser');\n    assert(\n        typeof window === 'undefined' ||\n            typeof window.localStorage !== 'undefined',\n        () => 'Current browser does not appear to support localStorage');\n    this.LS = window.localStorage;\n  }\n\n  async listModels(): Promise<{[path: string]: ModelArtifactsInfo}> {\n    const out: {[path: string]: ModelArtifactsInfo} = {};\n    const prefix = PATH_PREFIX + PATH_SEPARATOR;\n    const suffix = PATH_SEPARATOR + INFO_SUFFIX;\n    for (let i = 0; i < this.LS.length; ++i) {\n      const key = this.LS.key(i);\n      if (key.startsWith(prefix) && key.endsWith(suffix)) {\n        const modelPath = getModelPathFromKey(key);\n        out[modelPath] = JSON.parse(this.LS.getItem(key)) as ModelArtifactsInfo;\n      }\n    }\n    return out;\n  }\n\n  async removeModel(path: string): Promise<ModelArtifactsInfo> {\n    path = maybeStripScheme(path);\n    const keys = getModelKeys(path);\n    if (this.LS.getItem(keys.info) == null) {\n      throw new Error(`Cannot find model at path '${path}'`);\n    }\n    const info = JSON.parse(this.LS.getItem(keys.info)) as ModelArtifactsInfo;\n\n    this.LS.removeItem(keys.info);\n    this.LS.removeItem(keys.topology);\n    this.LS.removeItem(keys.weightSpecs);\n    this.LS.removeItem(keys.weightData);\n    return info;\n  }\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ============================================================================\n */\n\n/**\n * Classes and functions for model management across multiple storage mediums.\n *\n * Supported client actions:\n * - Listing models on all registered storage mediums.\n * - Remove model by URL from any registered storage mediums, by using URL\n *   string.\n * - Moving or copying model from one path to another in the same medium or from\n *   one medium to another, by using URL strings.\n */\n\nimport {assert} from '../util';\n\nimport {IORouterRegistry} from './router_registry';\nimport {ModelArtifactsInfo, ModelStoreManager} from './types';\n\nconst URL_SCHEME_SUFFIX = '://';\n\nexport class ModelStoreManagerRegistry {\n  // Singleton instance.\n  private static instance: ModelStoreManagerRegistry;\n\n  private managers: {[scheme: string]: ModelStoreManager};\n\n  private constructor() {\n    this.managers = {};\n  }\n\n  private static getInstance(): ModelStoreManagerRegistry {\n    if (ModelStoreManagerRegistry.instance == null) {\n      ModelStoreManagerRegistry.instance\n          = new ModelStoreManagerRegistry();\n    }\n    return ModelStoreManagerRegistry.instance;\n  }\n\n  /**\n   * Register a save-handler router.\n   *\n   * @param saveRouter A function that maps a URL-like string onto an instance\n   * of `IOHandler` with the `save` method defined or `null`.\n   */\n  static registerManager(scheme: string, manager: ModelStoreManager) {\n    assert(scheme != null, () => 'scheme must not be undefined or null.');\n    if (scheme.endsWith(URL_SCHEME_SUFFIX)) {\n      scheme = scheme.slice(0, scheme.indexOf(URL_SCHEME_SUFFIX));\n    }\n    assert(scheme.length > 0, () => 'scheme must not be an empty string.');\n    const registry = ModelStoreManagerRegistry.getInstance();\n    assert(\n        registry.managers[scheme] == null,\n        () => `A model store manager is already registered for scheme '${\n            scheme}'.`);\n    registry.managers[scheme] = manager;\n  }\n\n  static getManager(scheme: string):
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ModelStoreManager {\n
  const manager = this.getInstance().managers[scheme];\n    if (manager == null) {\n      throw new Error(`Cannot
find model manager for scheme '${scheme}'`);\n    }\n    return manager;\n  }\n\n  static getSchemes(): string[] {\n
return Object.keys(this.getInstance().managers);\n  }\n}\n\n/**\n * Helper method for parsing a URL string into a
scheme and a path.\n *\n * @param url E.g., 'localstorage://my-model'\n * @returns A dictionary with two fields:
scheme and path.\n *   Scheme: e.g., 'localstorage' in the example above.\n *   Path: e.g., 'my-model' in the example
above.\n */\nfunction parseURL(url: string): {scheme: string, path: string} {\n  if
(url.indexOf(URL_SCHEME_SUFFIX) === -1) {\n    throw new Error(\n        `The url string provided does not
contain a scheme. ` +\n        `Supported schemes are: ` +\n
`${ModelStoreManagerRegistry.getSchemes().join(',')}`);\n  }\n  return {\n    scheme:
url.split(URL_SCHEME_SUFFIX)[0],\n    path: url.split(URL_SCHEME_SUFFIX)[1],\n
  };\n}\n\nasync function cloneModelInternal(\n    sourceURL: string, destURL: string,\n    deleteSource = false):
Promise<ModelArtifactsInfo> {\n  assert(\n      sourceURL !== destURL,\n      () => `Old path and new path are the
same: '${sourceURL}'`);\n\n  const loadHandlers = IORouterRegistry.getLoadHandlers(sourceURL);\n  assert(\n
loadHandlers.length > 0,\n      () => `Copying failed because no load handler is found for source URL ${\n
sourceURL}.`);\n  assert(\n      loadHandlers.length < 2,\n      () => `Copying failed because more than one
(${loadHandlers.length}) ` +\n          `load handlers for source URL ${sourceURL}.`);\n  const loadHandler =
loadHandlers[0];\n\n  const saveHandlers = IORouterRegistry.getSaveHandlers(destURL);\n  assert(\n
saveHandlers.length > 0,\n      () => `Copying failed because no save handler is found for destination ` +\n
`URL ${destURL}.`);\n  assert(\n      saveHandlers.length < 2,\n      () => `Copying failed because
  more than one (${loadHandlers.length}) ` +\n          `save handlers for destination URL ${destURL}.`);\n  const
saveHandler = saveHandlers[0];\n\n  const sourceScheme = parseURL(sourceURL).scheme;\n  const sourcePath =
parseURL(sourceURL).path;\n  const sameMedium = sourceScheme === parseURL(sourceURL).scheme;\n\n
const modelArtifacts = await loadHandler.load();\n\n  // If moving within the same storage medium, remove the old
model as soon as\n  // the loading is done. Without doing this, it is possible that the combined\n  // size of the two
models will cause the cloning to fail.\n  if (deleteSource && sameMedium) {\n    await
ModelStoreManagerRegistry.getManager(sourceScheme)\n        .removeModel(sourcePath);\n  }\n\n  const
saveResult = await saveHandler.save(modelArtifacts);\n\n  // If moving between mediums, the deletion is done after
the save succeeds.\n  // This guards against the case in which saving to the destination medium\n  // fails.\n  if
(deleteSource && !sameMedium)
  {\n    await ModelStoreManagerRegistry.getManager(sourceScheme)\n        .removeModel(sourcePath);\n  }\n\n
return saveResult.modelArtifactsInfo;\n}\n\n/**\n * List all models stored in registered storage mediums.\n *\n *
For a web browser environment, the registered mediums are Local Storage and\n * IndexedDB.\n *\n * ```js\n * //
First create and save a model.\n * const model = tf.sequential();\n * model.add(tf.layers.dense(\n *     {units: 1,
inputShape: [10], activation: 'sigmoid'}));\n * await model.save('localstorage://demo/management/model1');\n *\n *
// Then list existing models.\n * console.log(JSON.stringify(await tf.io.listModels()));\n *\n * // Delete the model.\n
* await tf.io.removeModel('localstorage://demo/management/model1');\n *\n * // List models again.\n *
console.log(JSON.stringify(await tf.io.listModels()));\n * ```\n *\n * @returns A `Promise` of a dictionary mapping
URLs of existing models to\n * their model artifacts info. URLs include medium-specific schemes,
  e.g.,\n *   'indexeddb://my/model/1'. Model artifacts info include type of the\n * model's topology, byte sizes of the
topology, weights, etc.\n *\n * @doc {\n *   heading: 'Models',\n *   subheading: 'Management',\n *   namespace:
'io',\n *   ignoreCI: true\n * }\n */\nasync function listModels(): Promise<{[url: string]: ModelArtifactsInfo}> {\n
const schemes = ModelStoreManagerRegistry.getSchemes();\n  const out: {[url: string]: ModelArtifactsInfo} =
{};\n  for (const scheme of schemes) {\n    const schemeOut =\n        await
ModelStoreManagerRegistry.getManager(scheme).listModels();\n    for (const path in schemeOut) {\n      const url =
scheme + URL_SCHEME_SUFFIX + path;\n      out[url] = schemeOut[path];\n    }\n  }\n  return out;\n}\n\n/**\n *
Remove a model specified by URL from a reigstered storage medium.\n *\n * ```js\n * // First create and save a
model.\n * const model = tf.sequential();\n * model.add(tf.layers.dense(\n *     {units: 1, inputShape: [10],
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activation: 'sigmoid'}));\n
 * await model.save('localstorage://demo/management/model1');\n *\n * // Then list existing models.\n * console.log(JSON.stringify(await tf.io.listModels()));\n *\n * // Delete the model.\n * await tf.io.removeModel('localstorage://demo/management/model1');\n *\n * // List models again.\n * console.log(JSON.stringify(await tf.io.listModels()));\n * ```\n *\n * @param url A URL to a stored model, with a scheme prefix, e.g.,\n *   'localstorage://my-model-1', 'indexeddb://my/model/2'.\n * @returns ModelArtifactsInfo of the deleted model (if and only if deletion\n *   is successful).\n * @throws Error if deletion fails, e.g., if no model exists at `path`.\n *\n * @doc {\n *   heading: 'Models',\n *   subheading: 'Management',\n *   namespace: 'io',\n *   ignoreCI: true\n * }\n */\nasync function removeModel(url: string): Promise<ModelArtifactsInfo> {\n const schemeAndPath = parseURL(url);\n const manager = ModelStoreManagerRegistry.getManager(schemeAndPath.scheme);\n return manager.removeModel(schemeAndPath.path);\n}\n\n/**\n * Copy a model from one URL to another.\n *\n * This function supports:\n *\n * 1. Copying within a storage medium, e.g.,\n *   `tf.io.copyModel('localstorage://model-1', 'localstorage://model-2')`\n * 2. Copying between two storage mediums, e.g.,\n *   `tf.io.copyModel('localstorage://model-1', 'indexeddb://model-1')`\n *\n * ```js\n * // First create and save a model.\n * const model = tf.sequential();\n * model.add(tf.layers.dense(\n *   {units: 1, inputShape: [10], activation: 'sigmoid'}));\n * await model.save('localstorage://demo/management/model1');\n *\n * // Then list existing models.\n * console.log(JSON.stringify(await tf.io.listModels()));\n *\n * // Copy the model, from Local Storage to IndexedDB.\n * await tf.io.copyModel(\n *   'localstorage://demo/management/model1',\n *   'indexeddb://demo/management/model1');\n *\n * // List models again.\n * console.log(JSON.stringify(await tf.io.listModels()));\n *\n * // Remove both models.\n * await tf.io.removeModel('localstorage://demo/management/model1');\n * await tf.io.removeModel('indexeddb://demo/management/model1');\n * ```\n *\n * @param sourceURL Source URL of copying.\n * @param destURL Destination URL of copying.\n * @returns ModelArtifactsInfo of the copied model (if and only if copying\n *   is successful).\n * @throws Error if copying fails, e.g., if no model exists at `sourceURL`, or\n *   if `oldPath` and `newPath` are identical.\n *\n * @doc {\n *   heading: 'Models',\n *   subheading: 'Management',\n *   namespace: 'io',\n *   ignoreCI: true\n * }\n */\nasync function copyModel(\n   sourceURL: string, destURL: string): Promise<ModelArtifactsInfo> {\n const deleteSource = false;\n return cloneModelInternal(sourceURL, destURL, deleteSource);\n}\n\n/**\n * Move a model from one URL to another.\n *\n * This function supports:\n *\n * 1. Moving within a storage medium, e.g.,\n *   `tf.io.moveModel('localstorage://model-1', 'localstorage://model-2')`\n
 * 2. Moving between two storage mediums, e.g.,\n *   `tf.io.moveModel('localstorage://model-1', 'indexeddb://model-1')`\n *\n * ```js\n * // First create and save a model.\n * const model = tf.sequential();\n * model.add(tf.layers.dense(\n *   {units: 1, inputShape: [10], activation: 'sigmoid'}));\n * await model.save('localstorage://demo/management/model1');\n *\n * // Then list existing models.\n * console.log(JSON.stringify(await tf.io.listModels()));\n *\n * // Move the model, from Local Storage to IndexedDB.\n * await tf.io.moveModel(\n *   'localstorage://demo/management/model1',\n *   'indexeddb://demo/management/model1');\n *\n * // List models again.\n * console.log(JSON.stringify(await tf.io.listModels()));\n *\n * // Remove the moved model.\n * await tf.io.removeModel('indexeddb://demo/management/model1');\n * ```\n *\n * @param sourceURL Source URL of moving.\n * @param destURL Destination URL of moving.\n * @returns ModelArtifactsInfo of the copied model (if and only if copying\n *   is successful).\n * @throws Error if moving fails, e.g., if no model exists at `sourceURL`, or\n *   if `oldPath` and `newPath` are identical.\n *\n * @doc {\n *   heading: 'Models',\n *   subheading: 'Management',\n *   namespace: 'io',\n *   ignoreCI: true\n * }\n */\nasync function moveModel(\n   sourceURL: string, destURL: string): Promise<ModelArtifactsInfo> {\n const deleteSource = true;\n return cloneModelInternal(sourceURL, destURL, deleteSource);\n}\n\nexport {moveModel, copyModel, removeModel, listModels};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the

License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an
\"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport '../flags';\n\nimport {env} from '../environment';\nimport {BrowserIndexedDB, BrowserIndexedDBManager} from '../io/indexed_db';\nimport {BrowserLocalStorage, BrowserLocalStorageManager} from '../io/local_storage';\nimport {ModelStoreManagerRegistry} from '../io/model_management';\n\nimport {Platform} from './platform';\n\nexport class PlatformBrowser implements Platform {\n // According to the spec, the built-in encoder can do only UTF-8 encoding.\n // https://developer.mozilla.org/en-US/docs/Web/API/TextEncoder/TextEncoder\n private textEncoder: TextEncoder;\n\n fetch(path: string, init?: RequestInit): Promise<Response> {\n return fetch(path, init);\n }\n\n now(): number {\n return
performance.now();\n }\n\n encode(text: string, encoding: string): Uint8Array {\n if (encoding !== 'utf-8' && encoding !== 'utf8') {\n throw new Error(\n `Browser's encoder only supports utf-8, but got ${encoding}`);\n }\n if (this.textEncoder == null) {\n this.textEncoder = new TextEncoder();\n }\n return this.textEncoder.encode(text);\n }\n decode(bytes: Uint8Array, encoding: string): string {\n return new TextDecoder(encoding).decode(bytes);\n }\n}\n\nif (env().get('IS_BROWSER')) {\n env().setPlatform('browser', new PlatformBrowser());\n\n // Register LocalStorage IOHandler\n try {\n ModelStoreManagerRegistry.registerManager(\n BrowserLocalStorage.URL_SCHEME, new BrowserLocalStorageManager());\n } catch (err) {\n }\n\n // Register IndexedDB IOHandler\n try {\n ModelStoreManagerRegistry.registerManager(\n BrowserIndexedDB.URL_SCHEME, new BrowserIndexedDBManager());\n } catch (err) {\n }\n}\n","/**\n * @license\n
* Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\nimport {env} from '../environment';\n\nimport {Platform} from './platform';\n\n// We are wrapping this within an object so it can be stubbed by Jasmine.\nexport const getNodeFetch = {\n // tslint:disable-next-line:no-require-imports\n importFetch: () => require('node-fetch')\n};\n\ntype FetchFn
= (url: string, init?: RequestInit) => Promise<Response>;\nlet systemFetch: FetchFn;\n// These getters and setters are for testing so we don't export a mutable\n// variable.\nexport function resetSystemFetch() {\n systemFetch = null;\n}\nexport function setSystemFetch(fetchFn: FetchFn) {\n systemFetch = fetchFn;\n}\nexport function getSystemFetch(): FetchFn {\n return systemFetch;\n}\n\nexport class PlatformNode implements Platform {\n private textEncoder: TextEncoder;\n // tslint:disable-next-line:no-any\n util: any;\n\n constructor() {\n // tslint:disable-next-line:no-require-imports\n this.util = require('util');\n // According to the spec, the built-in encoder can do only UTF-8 encoding.\n // https://developer.mozilla.org/en-US/docs/Web/API/TextEncoder/TextEncoder\n this.textEncoder = new this.util.TextEncoder();\n }\n\n fetch(path: string, requestInits?: RequestInit): Promise<Response> {\n if (env().global.fetch != null) {\n return env().global.fetch(path,
requestInits);\n }\n\n if (systemFetch == null) {\n systemFetch = getNodeFetch.importFetch();\n }\n return systemFetch(path, requestInits);\n }\n\n now(): number {\n const time = process.hrtime();\n return time[0] * 1000 + time[1] / 1000000;\n }\n\n encode(text: string, encoding: string): Uint8Array {\n if (encoding !== 'utf-8' && encoding !== 'utf8') {\n throw new Error(\n `Node built-in encoder only supports utf-8, but

got ${encoding}`);\n }\n return this.textEncoder.encode(text);\n }\n decode(bytes: Uint8Array, encoding: string): string {\n if (bytes.length === 0) {\n return '';\n }\n return new this.util.TextDecoder(encoding).decode(bytes);\n }\n}\n\nif (env().get('IS_NODE')) {\n env().setPlatform('node', new PlatformNode());\n}\n","/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {TensorBuffer} from '../tensor';\nimport {DataType, DataTypeMap, Rank, ShapeMap} from '../types';\nimport * as util from '../util';\n\n/**\n * Creates an empty `tf.TensorBuffer` with the specified `shape` and `dtype`.\n *\n * The values are stored in CPU as `TypedArray`. Fill the buffer using\n * `buffer.set()`, or by modifying directly `buffer.values`.\n *\n * When done, call `buffer.toTensor()` to get an immutable `tf.Tensor` with\n *
those values.\n *\n * ```js\n * // Create a buffer and set values at particular indices.\n * const buffer = tf.buffer([2, 2]);\n * buffer.set(3, 0, 0);\n * buffer.set(5, 1, 0);\n *\n * // Convert the buffer back to a tensor.\n * buffer.toTensor().print();\n * ```\n *\n * @param shape An array of integers defining the output tensor shape.\n * @param dtype The dtype of the buffer. Defaults to 'float32'.\n * @param values The values of the buffer as `TypedArray`. Defaults to\n * zeros.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function buffer<R extends Rank, D extends DataType = 'float32'>(\n shape: ShapeMap[R], dtype: D = 'float32' as D,\n values?: DataTypeMap[D]): TensorBuffer<R, D> {\n dtype = dtype || 'float32' as D;\n util.assertNonNegativeIntegerDimensions(shape);\n return new TensorBuffer<R, D>(shape, dtype, values);\n}\n","/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
\"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\nimport {ENGINE} from '../engine';\nimport {Cast, CastAttrs, CastInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {DataType, TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {op} from './operation';\n\n/**\n
* Casts a `tf.Tensor` to a new dtype.\n *\n * ```js\n * const x = tf.tensor1d([1.5, 2.5, 3]);\n * tf.cast(x, 'int32').print();\n * ```\n * @param x The input tensor to be casted.\n * @param dtype The dtype to cast the input tensor to.\n *\n * @doc {heading: 'Tensors', subheading: 'Transformations'}\n */\nfunction cast_<T extends Tensor>(x: T|TensorLike, dtype: DataType): T {\n const $x = convertToTensor(x, 'x', 'cast');\n\n // Sanity checks.\n if (!util.isValidDtype(dtype)) {\n throw new Error(`Failed to cast to unknown dtype ${dtype}`);\n }\n if (dtype === 'string' && $x.dtype !== 'string' ||\n dtype !== 'string' && $x.dtype === 'string') {\n throw new Error('Only strings can be casted to strings');\n }\n\n const inputs: CastInputs = {x: $x};\n const attrs: CastAttrs = {dtype};\n\n return ENGINE.runKernel(\n Cast, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const cast = op({cast_});\n","/**\n * @license\n * Copyright 2020
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software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Identity, IdentityInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Creates a new tensor with the same values and shape as the specified\n * tensor.\n *\n * ```js\n * const x = tf.tensor([1, 2]);\n *\n * x.clone().print();\n * ```\n *\n * @param x The tensor to clone.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nfunction clone_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'clone', 'string_or_numeric');\n const inputs: IdentityInputs = {x: $x};\n\n // Note this op is called tf.identity in python. Hence the kernel name used\n // here.\n return ENGINE.runKernel(Identity, inputs as {} as NamedTensorMap);\n}\n\nexport const clone = op({clone_});\n","/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {Tensor} from '../tensor';\n\n/**\n * Prints information about the `tf.Tensor` including its data.\n *\n * ```js\n * const verbose = true;\n * tf.tensor2d([1, 2, 3, 4], [2, 2]).print(verbose);\n * ```\n * @param x The tensor to be printed.\n * @param verbose Whether to print verbose information about the ` Tensor`,\n * including dtype and size.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function print<T extends Tensor>(x: T, verbose = false): void {\n console.log(x.toString(verbose));\n}\n","/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\n// Required side effectful code for tfjs-core\n\n// Set up Engine and ENV\nimport {getOrMakeEngine} from './engine';\ngetOrMakeEngine();\n\n// Register backend-agnostic flags.\nimport './flags';\n// Register platforms\nimport './platforms/platform_browser';\nimport './platforms/platform_node';\n\n// Set up OpHandler\nimport {buffer} from './ops/buffer';\nimport {cast} from './ops/cast';\nimport {clone} from './ops/clone';\nimport {print} from './ops/print';\nimport {OpHandler, setOpHandler} from './tensor';\nconst opHandler: OpHandler = {\n buffer,\n cast,\n clone,\n print\n};\nsetOpHandler(opHandler);\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\n/**\n * IOHandlers related

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 to files, such as browser-triggered file downloads,\n * user-selected files in browser.\n */\n\nimport
'../flags';\nimport {env} from '../environment';\n\nimport {basename, concatenateArrayBuffers,
getModelArtifactsInfoForJSON} from './io_utils';\nimport {IORouter, IORouterRegistry} from
'./router_registry';\nimport {IOHandler, ModelArtifacts, ModelJSON, SaveResult, WeightsManifestConfig,
WeightsManifestEntry} from './types';\n\nconst DEFAULT_FILE_NAME_PREFIX = 'model';\nconst
DEFAULT_JSON_EXTENSION_NAME = '.json';\nconst DEFAULT_WEIGHT_DATA_EXTENSION_NAME =
'.weights.bin';\n\nfunction defer<T>(f: () => T): Promise<T> {\n  return new Promise(resolve =>
setTimeout(resolve)).then(f);\n}\n\nexport class BrowserDownloads implements IOHandler {\n  private readonly
modelTopologyFileName: string;\n  private readonly weightDataFileName: string;\n  private readonly jsonAnchor:
HTMLAnchorElement;\n  private readonly weightDataAnchor: HTMLAnchorElement;\n\n  static readonly
URL_SCHEME = 'downloads://';\n\n
  constructor(fileNamePrefix?: string) {\n    if (!env().getBool('IS_BROWSER')) {\n      // TODO(cais): Provide info
on what IOHandlers are available under the\n      //   current environment.\n      throw new Error(\n
'browserDownloads() cannot proceed because the current environment ' +\n          'is not a browser.');\n    }\n\n    if
(fileNamePrefix.startsWith(BrowserDownloads.URL_SCHEME)) {\n      fileNamePrefix =
fileNamePrefix.slice(BrowserDownloads.URL_SCHEME.length);\n    }\n    if (fileNamePrefix == null ||
fileNamePrefix.length === 0) {\n      fileNamePrefix = DEFAULT_FILE_NAME_PREFIX;\n    }\n\n
this.modelTopologyFileName = fileNamePrefix + DEFAULT_JSON_EXTENSION_NAME;\n
this.weightDataFileName =\n        fileNamePrefix + DEFAULT_WEIGHT_DATA_EXTENSION_NAME;\n  }\n\n
async save(modelArtifacts: ModelArtifacts): Promise<SaveResult> {\n    if (typeof (document) === 'undefined') {\n
    throw new Error(\n          'Browser downloads are not supported in
' +\n          'this environment since `document` is not present');\n    }\n    const weightsURL =
window.URL.createObjectURL(new Blob(\n        [modelArtifacts.weightData], {type: 'application/octet-
stream'}));\n\n    if (modelArtifacts.modelTopology instanceof ArrayBuffer) {\n      throw new Error(\n
'BrowserDownloads.save() does not support saving model topology ' +\n          'in binary formats yet.');\n    } else {\n
    const weightsManifest: WeightsManifestConfig = [{\n        paths: ['./' + this.weightDataFileName],\n        weights:
modelArtifacts.weightSpecs\n      }];\n      const modelTopologyAndWeightManifest: ModelJSON = {\n
modelTopology: modelArtifacts.modelTopology,\n        format: modelArtifacts.format,\n        generatedBy:
modelArtifacts.generatedBy,\n        convertedBy: modelArtifacts.convertedBy,\n        weightsManifest\n      };\n
if (modelArtifacts.signature != null) {\n        modelTopologyAndWeightManifest.signature =
modelArtifacts.signature;\n
      }\n      if (modelArtifacts.userDefinedMetadata != null) {\n
modelTopologyAndWeightManifest.userDefinedMetadata =\n            modelArtifacts.userDefinedMetadata;\n      }\n
    if (modelArtifacts.modelInitializer != null) {\n        modelTopologyAndWeightManifest.modelInitializer =\n
 modelArtifacts.modelInitializer;\n      }\n      const modelTopologyAndWeightManifestURL =\n
window.URL.createObjectURL(new Blob(\n              [JSON.stringify(modelTopologyAndWeightManifest)],\n
    {type: 'application/json'}));\n\n      // If anchor elements are not provided, create them without attaching them\n
// to parents, so that the downloaded file names can be controlled.\n      const jsonAnchor = this.jsonAnchor == null
? document.createElement('a') :\n                                          this.jsonAnchor;\n      jsonAnchor.download =
this.modelTopologyFileName;\n      jsonAnchor.href = modelTopologyAndWeightManifestURL;\n
      // Trigger downloads by evoking a click event on the download anchors.\n      // When multiple downloads are
started synchronously, Firefox will only\n      // save the last one.\n      await defer(() =>
jsonAnchor.dispatchEvent(new MouseEvent('click')));\n\n      if (modelArtifacts.weightData != null) {\n        const
weightDataAnchor = this.weightDataAnchor == null ?\n            document.createElement('a') :\n
this.weightDataAnchor;\n        weightDataAnchor.download = this.weightDataFileName;\n
weightDataAnchor.href = weightsURL;\n        await defer(\n            () => weightDataAnchor.dispatchEvent(new
MouseEvent('click')));\n      }\n\n      return {modelArtifactsInfo:
getModelArtifactsInfoForJSON(modelArtifacts)};\n    }\n  }\n}\n\nclass BrowserFiles implements IOHandler {\n
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private readonly files: File[];\n\n  constructor(files: File[]) {\n    if (files == null || files.length < 1) {\n      throw new Error(\n          `When calling browserFiles, at least
 1 file is required, ` +\n          `but received ${files}`);\n    }\n    this.files = files;\n  }\n\n  async load(): Promise<ModelArtifacts> {\n    const jsonFile = this.files[0];\n    const weightFiles = this.files.slice(1);\n\n    return new Promise<ModelArtifacts>((resolve, reject) => {\n      const jsonReader = new FileReader();\n jsonReader.onload = (event: Event) => {\n        // tslint:disable-next-line:no-any\n        const modelJSON = JSON.parse((event.target as any).result) as ModelJSON;\n        const modelTopology = modelJSON.modelTopology;\n        if (modelTopology == null) {\n          reject(new Error(\n `modelTopology field is missing from file ${jsonFile.name}`));\n          return;\n        }\n\n        if (weightFiles.length === 0) {\n          resolve({modelTopology});\n        }\n\n        const weightsManifest = modelJSON.weightsManifest;\n        if (weightsManifest == null) {\n          reject(new Error(\n `weightManifest field
 is missing from file ${jsonFile.name}`));\n          return;\n        }\n\n        let pathToFile: {[path: string]: File};\n try {\n          pathToFile =\n              this.checkManifestAndWeightFiles(weightsManifest, weightFiles);\n        } catch (err) {\n          reject(err);\n          return;\n        }\n\n        const weightSpecs: WeightsManifestEntry[] = [];\n  const paths: string[] = [];\n        const perFileBuffers: ArrayBuffer[] = [];\n weightsManifest.forEach(weightsGroup => {\n          weightsGroup.paths.forEach(path => {\n paths.push(path);\n            perFileBuffers.push(null);\n          });\n weightSpecs.push(...weightsGroup.weights);\n        });\n\n        weightsManifest.forEach(weightsGroup => {\n weightsGroup.paths.forEach(path => {\n            const weightFileReader = new FileReader();\n weightFileReader.onload = (event: Event) => {\n              // tslint:disable-next-line:no-any\n  const weightData = (event.target as any).result as ArrayBuffer;\n              const index = paths.indexOf(path);\n    perFileBuffers[index] = weightData;\n              if (perFileBuffers.indexOf(null) === -1) {\n                const result: ModelArtifacts = {\n                  modelTopology,\n                  weightSpecs,\n                  weightData: concatenateArrayBuffers(perFileBuffers),\n                  format: modelJSON.format,\n                  generatedBy: modelJSON.generatedBy,\n                  convertedBy: modelJSON.convertedBy\n                };\n                if (modelJSON.signature != null) {\n                  result.signature = modelJSON.signature;\n                }\n                if (modelJSON.userDefinedMetadata != null) {\n                  result.userDefinedMetadata = modelJSON.userDefinedMetadata;\n                }\n                if (modelJSON.modelInitializer != null) {\n result.modelInitializer = modelJSON.modelInitializer;\n                }\n                resolve(result);\n              }\n            };\n            weightFileReader.onerror = error =>\n  reject(`Failed to weights data from file of path '${path}'.`);\n weightFileReader.readAsArrayBuffer(pathToFile[path]);\n          });\n        });\n      };\n      jsonReader.onerror = error => reject(\n          `Failed to read model topology and weights manifest JSON ` +\n          `from file '${jsonFile.name}'. BrowserFiles supports loading ` +\n          `Keras-style tf.Model artifacts only.`);\n jsonReader.readAsText(jsonFile);\n    });\n  }\n\n  /**\n   * Check the compatibility between weights manifest and weight files.\n   */\n  private checkManifestAndWeightFiles(\n      manifest: WeightsManifestConfig, files: File[]): {[path: string]: File} {\n    const basenames: string[] = [];\n    const fileNames = files.map(file => basename(file.name));\n    const pathToFile: {[path: string]: File} = {};\n    for (const group of manifest) {\n      group.paths.forEach(path => {\n        const pathBasename = basename(path);\n        if (basenames.indexOf(pathBasename) !== -1) {\n          throw new Error(\n              `Duplicate file basename found in weights manifest: ` +\n              `'${pathBasename}'`);\n        }\n        basenames.push(pathBasename);\n        if (fileNames.indexOf(pathBasename) === -1) {\n          throw new Error(\n              `Weight file with basename '${pathBasename}' is not provided.`);\n        } else {\n          pathToFile[path] = files[fileNames.indexOf(pathBasename)];\n        }\n      });\n    }\n\n    if (basenames.length !== files.length) {\n throw new Error(\n          `Mismatch in the number of files in weights manifest ` +\n          `(${basenames.length}) and the number of weight files provided ` +\n          `(${files.length}).`);\n    }\n    return pathToFile;\n  }\n}\n\nexport const browserDownloadsRouter: IORouter = (url: string|string[]) => {\n
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if (!env().getBool('IS_BROWSER')) {\n return null;\n } else {\n if (!Array.isArray(url) && url.startsWith(BrowserDownloads.URL_SCHEME)) {\n return browserDownloads(url.slice(BrowserDownloads.URL_SCHEME.length));\n } else {\n return null;\n }\n }\n};\nIORouterRegistry.registerSaveRouter(browserDownloadsRouter);\n\n/**\n * Creates an IOHandler that triggers file downloads from the browser.\n *\n * The returned `IOHandler` instance can be used as model exporting methods such\n * as `tf.Model.save` and supports only saving.\n *\n * ```js\n * const model = tf.sequential();\n * model.add(tf.layers.dense(\n * {units: 1, inputShape: [10], activation: 'sigmoid'}));\n * const saveResult = await model.save('downloads://mymodel');\n * // This will trigger downloading of two files:\n * // 'mymodel.json' and 'mymodel.weights.bin'.\n * console.log(saveResult);\n * ```\n *\n * @param fileNamePrefix Prefix name of the files to be downloaded. For use with\n * `tf.Model`,
`fileNamePrefix` should follow either of the following two\n * formats:\n * 1. `null` or `undefined`, in which case the default file\n * names will be used:\n * - 'model.json' for the JSON file containing the model topology and\n * weights manifest.\n * - 'model.weights.bin' for the binary file containing the binary weight\n * values.\n * 2. A single string or an Array of a single string, as the file name prefix.\n * For example, if `'foo'` is provided, the downloaded JSON\n * file and binary weights file will be named 'foo.json' and\n * 'foo.weights.bin', respectively.\n * @param config Additional configuration for triggering downloads.\n * @returns An instance of `BrowserDownloads` `IOHandler`.\n *\n * @doc {\n * heading: 'Models',\n * subheading: 'Loading',\n * namespace: 'io',\n * ignoreCI: true\n * }\n */\nexport function browserDownloads(fileNamePrefix = 'model'): IOHandler {\n return new BrowserDownloads(fileNamePrefix);\n}\n\n/**\n
* Creates an IOHandler that loads model artifacts from user-selected files.\n *\n * This method can be used for loading from files such as user-selected files\n * in the browser.\n * When used in conjunction with `tf.loadLayersModel`, an instance of\n * `tf.LayersModel` (Keras-style) can be constructed from the loaded artifacts.\n *\n * ```js\n * // Note: This code snippet won't run properly without the actual file input\n * // elements in the HTML DOM.\n *\n * // Suppose there are two HTML file input (`<input type=\"file\" ...>`)\n * // elements.\n * const uploadJSONInput = document.getElementById('upload-json');\n * const uploadWeightsInput = document.getElementById('upload-weights');\n * const model = await tf.loadLayersModel(tf.io.browserFiles(\n * [uploadJSONInput.files[0], uploadWeightsInput.files[0]]));\n * ```\n *\n * @param files `File`s to load from. Currently, this function supports only\n * loading from files that contain Keras-style models (i.e., `tf.Model`s),
for\n * which an `Array` of `File`s is expected (in that order):\n * - A JSON file containing the model topology and weight manifest.\n * - Optionally, One or more binary files containing the binary weights.\n * These files must have names that match the paths in the `weightsManifest`\n * contained by the aforementioned JSON file, or errors will be thrown\n * during loading. These weights files have the same format as the ones\n * generated by `tensorflowjs_converter` that comes with the `tensorflowjs`\n * Python PIP package. If no weights files are provided, only the model\n * topology will be loaded from the JSON file above.\n * @returns An instance of `Files` `IOHandler`.\n *\n * @doc {\n * heading: 'Models',\n * subheading: 'Loading',\n * namespace: 'io',\n * ignoreCI: true\n * }\n */\nexport function browserFiles(files: File[]): IOHandler {\n return new BrowserFiles(files);\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {assert} from '../util';\n\nimport {OnProgressCallback} from './types';\n\n/**\n * Monitor Promise.all progress, fire onProgress callback function.\n *\n * @param promises Promise list going to be monitored\n * @param onProgress Callback function. Fired when a promise resolved.\n * @param startFraction Optional fraction

start. Default to 0.\n * @param endFraction Optional fraction end. Default to 1.\n */\nexport function monitorPromisesProgress(\n promises: Array<Promise<{}|void>>, onProgress: OnProgressCallback,\n startFraction?: number, endFraction?: number) {\n checkPromises(promises);\n startFraction = startFraction == null ? 0 : startFraction;\n endFraction = endFraction == null ? 1 : endFraction;\n checkFraction(startFraction, endFraction);\n let resolvedPromise = 0;\n\n const registerMonitor = (promise: Promise<{}>) => {\n promise.then(value => {\n const fraction = startFraction +\n ++resolvedPromise / promises.length * (endFraction - startFraction);\n // pass fraction as parameter to callback function.\n onProgress(fraction);\n return value;\n });\n return promise;\n };\n\n function checkPromises(promises: Array<Promise<{}|void>>): void {\n assert(\n promises != null && Array.isArray(promises) && promises.length > 0,\n () => 'promises must be a none empty array');\n }\n\n function checkFraction(startFraction: number, endFraction: number): void {\n assert(\n startFraction >= 0 && startFraction <= 1,\n () => `Progress fraction must be in range [0, 1], but ` +\n `got startFraction ${startFraction}`);\n assert(\n endFraction >= 0 && endFraction <= 1,\n () => `Progress fraction must be in range [0, 1], but ` +\n `got endFraction ${endFraction}`);\n assert(\n endFraction >= startFraction,\n () => `startFraction must be no more than endFraction, but ` +\n `got startFraction ${startFraction} and endFraction ` +\n `${endFraction}`);\n }\n\n return Promise.all(promises.map(registerMonitor));\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {env} from '../environment';\n\nimport {NamedTensorMap} from '../tensor_types';\nimport * as util from '../util';\nimport {decodeWeights} from './io_utils';\nimport {monitorPromisesProgress} from './progress';\nimport {DTYPE_VALUE_SIZE_MAP, LoadOptions, WeightsManifestConfig, WeightsManifestEntry} from './types';\n\n/**\n * Reads binary weights data from a number of URLs.\n *\n * @param fetchURLs URLs to send the HTTP requests at, using `fetch` calls.\n * @param requestOptions RequestInit (options) for the HTTP requests.\n * @param fetchFunc Optional overriding value for the `window.fetch` function.\n * @param onProgress Optional, progress callback function, fired periodically\n * before the load is completed.\n * @returns A `Promise` of an Array of `ArrayBuffer`. The Array has the same\n * length as `fetchURLs`.\n */\nexport async function loadWeightsAsArrayBuffer(\n fetchURLs: string[], loadOptions?: LoadOptions): Promise<ArrayBuffer[]> {\n if (loadOptions == null) {\n loadOptions = {};\n }\n\n const fetchFunc = loadOptions.fetchFunc == null ? env().platform.fetch :\n loadOptions.fetchFunc;\n\n // Create the requests for all of the weights in parallel.\n const requests = fetchURLs.map(\n fetchURL =>\n fetchFunc(fetchURL, loadOptions.requestInit, {isBinary: true}));\n\n const fetchStartFraction = 0;\n const fetchEndFraction = 0.5;\n\n const responses = loadOptions.onProgress == null ?\n await Promise.all(requests) :\n await monitorPromisesProgress(\n requests, loadOptions.onProgress, fetchStartFraction,\n fetchEndFraction);\n\n const bufferPromises = responses.map(response => response.arrayBuffer());\n\n const bufferStartFraction = 0.5;\n const bufferEndFraction = 1;\n\n const buffers = loadOptions.onProgress == null ?\n await Promise.all(bufferPromises) :\n await monitorPromisesProgress(\n bufferPromises, loadOptions.onProgress, bufferStartFraction,\n bufferEndFraction);\n return buffers;\n}\n\n/**\n * Reads a weights manifest JSON configuration, fetches the weights and\n * returns them as `Tensor`s.\n *\n * @param manifest The weights manifest JSON.\n * @param filePathPrefix The path prefix for filenames given in the manifest.\n * Defaults to the empty string.\n * @param weightNames The names of the weights to be fetched.\n */\nexport async function loadWeights(\n manifest: WeightsManifestConfig,

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filePathPrefix = '',\n    weightNames?: string[],\n    requestInit?: RequestInit): Promise<NamedTensorMap> {\n  // TODO(nsthorat): Groups are currently fetched atomically. If you need a\n  // single weight from a group, the whole group will be fetched. At a future\n  // date, we should support fetching only the individual shards within a\n  // group that are needed to reconstruct the requested weight.\n  // TODO(cais): Use `decodeWeights` for implementation.\n\n  const fetchWeights = (fetchUrls: string[]) =>\n      loadWeightsAsArrayBuffer(fetchUrls, {requestInit});\n  const loadWeights = weightsLoaderFactory(fetchWeights);\n\n  return loadWeights(manifest, filePathPrefix, weightNames);\n}\n\n/**\n * Creates a function, which reads a weights manifest JSON configuration,\n * fetches the weight files using the specified function and returns them as\n * `Tensor`s.\n *\n * ```js\n * // example for creating a nodejs weight loader, which reads the weight files\n * // from disk using fs.readFileSync\n *\n * import * as fs from 'fs'\n *\n * const fetchWeightsFromDisk = (filePaths: string[]) =>\n * filePaths.map(filePath => fs.readFileSync(filePath).buffer)\n *\n * const loadWeights = tf.io.weightsLoaderFactory(fetchWeightsFromDisk)\n *\n * const manifest = JSON.parse(\n * fs.readFileSync('./my_model-weights_manifest').toString()\n * )\n * const weightMap = await loadWeights(manifest, './')\n * ```\n * @param fetchWeightsFunction The function used for fetching the weight files.\n * @returns Weight loading function.\n */\nexport function weightsLoaderFactory(\n    fetchWeightsFunction: (fetchUrls: string[]) => Promise<ArrayBuffer[]>):\n    (manifest: WeightsManifestConfig, filePathPrefix?: string,\n     weightNames?: string[]) => Promise<NamedTensorMap> {\n  return async(\n      manifest: WeightsManifestConfig, filePathPrefix = '',\n      weightNames?: string[]): Promise<NamedTensorMap> => {\n    // Collect all the groups, weights, and their relative offsets to be\n    // fetched.\n    const groupIndicesToFetchMap = manifest.map(() => false);\n    const groupWeightsToFetch: {\n      [group: number]: Array<{\n        manifestEntry: WeightsManifestEntry; groupOffset: number;\n        sizeBytes: number;\n      }>\n    } = {};\n    const weightsFound =\n        weightNames != null ? weightNames.map(() => false) : [];\n    const allManifestWeightNames: string[] = [];\n    manifest.forEach((manifestGroupConfig, groupIndex) => {\n      let groupOffset = 0;\n      manifestGroupConfig.weights.forEach(weightsEntry => {\n        const rawDtype = ('quantization' in weightsEntry)\n            ?\n            weightsEntry.quantization.dtype :\n            weightsEntry.dtype;\n\n        const weightsBytes = DTYPE_VALUE_SIZE_MAP[rawDtype] *\n            util.sizeFromShape(weightsEntry.shape);\n\n        const enqueueWeightsForFetchingFn = () => {\n          groupIndicesToFetchMap[groupIndex] = true;\n          if (groupWeightsToFetch[groupIndex] == null) {\n            groupWeightsToFetch[groupIndex] = [];\n          }\n\n          groupWeightsToFetch[groupIndex].push({\n            manifestEntry: weightsEntry,\n            groupOffset,\n            sizeBytes: weightsBytes\n          });\n        };\n\n        if (weightNames != null) {\n          weightNames.forEach((weightName, weightIndex) => {\n            if (weightName === weightsEntry.name) {\n              enqueueWeightsForFetchingFn();\n              weightsFound[weightIndex] = true;\n            }\n          });\n        } else {\n          enqueueWeightsForFetchingFn();\n        }\n\n        allManifestWeightNames.push(weightsEntry.name);\n        groupOffset += weightsBytes;\n      });\n    });\n\n    if (!weightsFound.every(found => found)) {\n      const weightsNotFound = weightNames.filter((_, i) => !weightsFound[i]);\n      throw new Error(\n          `Could not find weights in manifest with names: ` +\n          `${weightsNotFound.join(', ')}. \\n` +\n          `Manifest JSON has weights with names: ` +\n          `${allManifestWeightNames.join(', ')}.`);\n    }\n\n    // Convert the one-hot boolean groupId => shouldFetch map to a list of group\n    // IDs.\n    const groupIndicesToFetch =\n        groupIndicesToFetchMap.reduce((accumulator, shouldFetch, i) => {\n          if (shouldFetch) {\n            accumulator.push(i);\n          }\n          return accumulator;\n        }, []);\n\n    const fetchUrls: string[] = [];\n    groupIndicesToFetch.forEach(i => {\n      manifest[i].paths.forEach(filepath => {\n        const fetchUrl = filePathPrefix +\n            (!filePathPrefix.endsWith('/') ? '/' : '') + filepath;\n        fetchUrls.push(fetchUrl);\n      });\n    });\n    const buffers = await fetchWeightsFunction(fetchUrls);\n\n    const weightsTensorMap: NamedTensorMap = {};\n    let bufferIndexOffset = 0;\n    groupIndicesToFetch.forEach(i => {\n      const numBuffers = manifest[i].paths.length;\n\n      let groupBytes = 0;\n      for (let i = 0; i <
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numBuffers; i++) {\n groupBytes += buffers[bufferIndexOffset + i].byteLength;\n }\n\n // Create a buffer for the whole group.\n const groupBuffer = new ArrayBuffer(groupBytes);\n const groupByteBuffer = new Uint8Array(groupBuffer);\n let groupBufferOffset = 0;\n for (let i = 0; i < numBuffers; i++) {\n const buffer = new Uint8Array(buffers[bufferIndexOffset + i]);\n groupByteBuffer.set(buffer, groupBufferOffset);\n groupBufferOffset += buffer.byteLength;\n }\n\n const weightsEntries = groupWeightsToFetch[i];\n weightsEntries.forEach(weightsEntry => {\n const byteBuffer = groupBuffer.slice(\n weightsEntry.groupOffset,\n weightsEntry.groupOffset + weightsEntry.sizeBytes);\n const nameToTensorMap =\n decodeWeights(byteBuffer, [weightsEntry.manifestEntry]);\n for (const name in nameToTensorMap) {\n weightsTensorMap[name] = nameToTensorMap[name];\n }\n });\n\n bufferIndexOffset += numBuffers;\n });\n\n return weightsTensorMap;\n };\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\n/**\n * IOHandler implementations based on HTTP requests in the web browser.\n *\n * Uses [`fetch`](https://developer.mozilla.org/en-US/docs/Web/API/Fetch_API).\n */\n\nimport
 {env} from '../environment';\n\nimport {assert} from '../util';\nimport {concatenateArrayBuffers, getModelArtifactsInfoForJSON} from './io_utils';\nimport {IORouter, IORouterRegistry} from './router_registry';\nimport {IOHandler, LoadOptions, ModelArtifacts, ModelJSON, OnProgressCallback, SaveResult, WeightsManifestConfig, WeightsManifestEntry} from './types';\nimport {loadWeightsAsArrayBuffer} from './weights_loader';\n\nconst OCTET_STREAM_MIME_TYPE = 'application/octet-stream';\nconst JSON_TYPE = 'application/json';\nexport class HTTPRequest implements IOHandler {\n protected readonly path: string;\n protected readonly requestInit: RequestInit;\n\n private readonly fetch: Function;\n private readonly weightUrlConverter: (weightName: string) => Promise<string>;\n\n readonly DEFAULT_METHOD = 'POST';\n\n static readonly URL_SCHEME_REGEX = /^https?:\\/\\//;\n\n private readonly weightPathPrefix: string;\n private readonly onProgress: OnProgressCallback;\n\n constructor(path:
 string, loadOptions?: LoadOptions) {\n if (loadOptions == null) {\n loadOptions = {};\n }\n this.weightPathPrefix = loadOptions.weightPathPrefix;\n this.onProgress = loadOptions.onProgress;\n this.weightUrlConverter = loadOptions.weightUrlConverter;\n\n if (loadOptions.fetchFunc != null) {\n assert(\n typeof loadOptions.fetchFunc === 'function',\n () => 'Must pass a function that matches the signature of ' +\n '`fetch` (see ' +\n 'https://developer.mozilla.org/en-US/docs/Web/API/Fetch_API)');\n this.fetch = loadOptions.fetchFunc;\n } else {\n this.fetch = env().platform.fetch;\n }\n\n assert(\n path != null && path.length > 0,\n () => 'URL path for http must not be null, undefined or ' +\n 'empty.');\n\n if (Array.isArray(path)) {\n assert(\n path.length === 2,\n () => 'URL paths for http must have a length of 2, ' +\n `(actual
 length is ${path.length}).`);\n }\n this.path = path;\n\n if (loadOptions.requestInit != null &&\n loadOptions.requestInit.body != null) {\n throw new Error(\n 'requestInit is expected to have no pre-existing body, but has one.');\n }\n this.requestInit = loadOptions.requestInit || {};\n }\n\n async save(modelArtifacts: ModelArtifacts): Promise<SaveResult> {\n if (modelArtifacts.modelTopology instanceof ArrayBuffer) {\n throw new Error(\n 'BrowserHTTPRequest.save() does not support saving model topology ' +\n 'in binary formats yet.');\n }\n\n const init = Object.assign({method: this.DEFAULT_METHOD}, this.requestInit);\n init.body = new FormData();\n\n const weightsManifest: WeightsManifestConfig = [{\n paths: ['./model.weights.bin'],\n weights: modelArtifacts.weightSpecs,\n }];\n const modelTopologyAndWeightManifest: ModelJSON = {\n modelTopology: modelArtifacts.modelTopology,\n format:
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 modelArtifacts.format,\n      generatedBy: modelArtifacts.generatedBy,\n      convertedBy:
modelArtifacts.convertedBy,\n      weightsManifest\n    };\n    if (modelArtifacts.signature != null) {\n
modelTopologyAndWeightManifest.signature = modelArtifacts.signature;\n    }\n    if
(modelArtifacts.userDefinedMetadata != null) {\n      modelTopologyAndWeightManifest.userDefinedMetadata =\n
      modelArtifacts.userDefinedMetadata;\n    }\n    if (modelArtifacts.modelInitializer != null) {\n
modelTopologyAndWeightManifest.modelInitializer =\n          modelArtifacts.modelInitializer;\n    }\n\n
init.body.append(\n          'model.json',\n          new Blob(\n
[JSON.stringify(modelTopologyAndWeightManifest)],\n            {type: JSON_TYPE}),\n          'model.json');\n\n    if
(modelArtifacts.weightData != null) {\n      init.body.append(\n          'model.weights.bin',\n          new
Blob([modelArtifacts.weightData], {type: OCTET_STREAM_MIME_TYPE}),\n          'model.weights.bin');\n
    }\n\n    const response = await this.fetch(this.path, init);\n\n    if (response.ok) {\n      return {\n
modelArtifactsInfo: getModelArtifactsInfoForJSON(modelArtifacts),\n        responses: [response],\n      };\n    } else
{\n      throw new Error(\n          `BrowserHTTPRequest.save() failed due to HTTP response status ` +\n
`${response.status}.`);\n    }\n  }\n\n  /**\n   * Load model artifacts via HTTP request(s).\n   *\n   * See the
documentation to `tf.io.http` for details on the saved\n   * artifacts.\n   *\n   * @returns The loaded model artifacts (if
loading succeeds).\n   */\n  async load(): Promise<ModelArtifacts> {\n    const modelConfigRequest = await
this.fetch(this.path, this.requestInit);\n\n    if (!modelConfigRequest.ok) {\n      throw new Error(\n          `Request to
${this.path} failed with status code ` +\n          `${modelConfigRequest.status}. Please verify this URL points to ` +\n
          `the model JSON of the model to
 load.`);\n    }\n    let modelConfig: ModelJSON;\n    try {\n      modelConfig = await modelConfigRequest.json();\n
 } catch (e) {\n      let message = `Failed to parse model JSON of response from ${this.path}.`;\n      //
TODO(nsthorat): Remove this after some time when we're comfortable that\n      // .pb files are mostly gone.\n      if
(this.path.endsWith('.pb')) {\n        message += ' Your path contains a .pb file extension. ' +\n            'Support for .pb
models have been removed in TensorFlow.js 1.0 ' +\n            'in favor of .json models. You can re-convert your
Python ' +\n            'TensorFlow model using the TensorFlow.js 1.0 conversion scripts ' +\n            'or you can
convert your.pb models with the \\'pb2json\\'' +\n            'NPM script in the tensorflow/tfjs-converter repository.';\n
 } else {\n        message += ' Please make sure the server is serving valid ' +\n            'JSON for this request.';\n
}\n      throw new Error(message);\n    }\n
    const modelTopology = modelConfig.modelTopology;\n    const weightsManifest =
modelConfig.weightsManifest;\n    const generatedBy = modelConfig.generatedBy;\n    const convertedBy =
modelConfig.convertedBy;\n    const format = modelConfig.format;\n    const signature = modelConfig.signature;\n
 const userDefinedMetadata = modelConfig.userDefinedMetadata;\n\n    // We do not allow both modelTopology
and weightsManifest to be missing.\n    if (modelTopology == null && weightsManifest == null) {\n      throw new
Error(\n          `The JSON from HTTP path ${this.path} contains neither model ` +\n          `topology or manifest for
weights.`);\n    }\n\n    let weightSpecs: WeightsManifestEntry[];\n    let weightData: ArrayBuffer;\n    if
(weightsManifest != null) {\n      const results = await this.loadWeights(weightsManifest);\n      [weightSpecs,
weightData] = results;\n    }\n\n    const artifacts: ModelArtifacts = {\n      modelTopology,\n      weightSpecs,\n
weightData,\n
      generatedBy,\n      convertedBy,\n      format\n    };\n\n    if (signature != null) {\n      artifacts.signature =
signature;\n    }\n    if (userDefinedMetadata != null) {\n      artifacts.userDefinedMetadata =
userDefinedMetadata;\n    }\n\n    const initializer = modelConfig.modelInitializer;\n    if (initializer) {\n
artifacts.modelInitializer = initializer;\n    }\n\n    return artifacts;\n  }\n\n  private async
loadWeights(weightsManifest: WeightsManifestConfig):\n      Promise<[WeightsManifestEntry[], ArrayBuffer]>
{\n    const weightPath = Array.isArray(this.path) ? this.path[1] : this.path;\n    const [prefix, suffix] =
parseUrl(weightPath);\n    const pathPrefix = this.weightPathPrefix || prefix;\n\n    const weightSpecs = [];\n    for
(const entry of weightsManifest) {\n      weightSpecs.push(...entry.weights);\n    }\n\n    const fetchURLs: string[] =
[];\n    const urlPromises: Array<Promise<string>> = [];\n    for (const weightsGroup of weightsManifest) {\n
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  for (const path of weightsGroup.paths) {\n        if (this.weightUrlConverter != null) {\n
urlPromises.push(this.weightUrlConverter(path));\n        } else {\n          fetchURLs.push(pathPrefix + path +
suffix);\n        }\n      }\n    }\n\n    if (this.weightUrlConverter) {\n      fetchURLs.push(...await
Promise.all(urlPromises));\n    }\n\n    const buffers = await loadWeightsAsArrayBuffer(fetchURLs, {\n
requestInit: this.requestInit,\n      fetchFunc: this.fetch,\n      onProgress: this.onProgress\n    });\n    return
[weightSpecs, concatenateArrayBuffers(buffers)];\n  }\n}\n\n/**\n * Extract the prefix and suffix of the url, where
the prefix is the path before\n * the last file, and suffix is the search params after the last file.\n * ```\n * const url =
'http://tfhub.dev/model/1/tensorflowjs_model.pb?tfjs-format=file'\n * [prefix, suffix] = parseUrl(url)\n * // prefix =
'http://tfhub.dev/model/1/'\n * // suffix = '?tfjs-format=file'\n * ```\n * @param url the model
 url to be parsed.\n */\nexport function parseUrl(url: string): [string, string] {\n  const lastSlash =
url.lastIndexOf('/');\n  const lastSearchParam = url.lastIndexOf('?');\n  const prefix = url.substring(0, lastSlash);\n
const suffix =\n      lastSearchParam > lastSlash ? url.substring(lastSearchParam) : '';\n  return [prefix + '/',
suffix];\n}\n\nexport function isHTTPScheme(url: string): boolean {\n  return
url.match(HTTPRequest.URL_SCHEME_REGEX) != null;\n}\n\nexport const httpRouter: IORouter =\n    (url:
string, loadOptions?: LoadOptions) => {\n      if (typeof fetch === 'undefined' &&\n          (loadOptions == null ||
loadOptions.fetchFunc == null)) {\n        // `http` uses `fetch` or `node-fetch`, if one wants to use it in\n        // an
environment that is not the browser or node they have to setup a\n        // global fetch polyfill.\n        return null;\n
} else {\n        let isHTTP = true;\n        if (Array.isArray(url)) {\n          isHTTP = url.every(urlItem
 => isHTTPScheme(urlItem));\n        } else {\n          isHTTP = isHTTPScheme(url);\n        }\n        if (isHTTP) {\n
      return http(url, loadOptions);\n        }\n      }\n      return null;\n
};\nIORouterRegistry.registerSaveRouter(httpRouter);\nIORouterRegistry.registerLoadRouter(httpRouter);\n\n/**\n
* Creates an IOHandler subtype that sends model artifacts to HTTP server.\n *\n * An HTTP request of the
`multipart/form-data` mime type will be sent to the\n * `path` URL. The form data includes artifacts that represent
the topology\n * and/or weights of the model. In the case of Keras-style `tf.Model`, two\n * blobs (files) exist in
form-data:\n *   - A JSON file consisting of `modelTopology` and `weightsManifest`.\n *   - A binary weights file
consisting of the concatenated weight values.\n * These files are in the same format as the one generated by\n *
[tfjs_converter](https://js.tensorflow.org/tutorials/import-keras.html).\n *\n * The following code snippet
exemplifies
 the client-side code that uses this\n * function:\n *\n * ```js\n * const model = tf.sequential();\n * model.add(\n *
tf.layers.dense({units: 1, inputShape: [100], activation: 'sigmoid'}));\n *\n * const saveResult = await
model.save(tf.io.http(\n *     'http://model-server:5000/upload', {requestInit: {method: 'PUT'}}));\n *
console.log(saveResult);\n * ```\n *\n * If the default `POST` method is to be used, without any custom parameters\n
* such as headers, you can simply pass an HTTP or HTTPS URL to `model.save`:\n *\n * ```js\n * const saveResult
= await model.save('http://model-server:5000/upload');\n * ```\n *\n * The following GitHub Gist\n *
https://gist.github.com/dsmilkov/1b6046fd6132d7408d5257b0976f7864\n * implements a server based on
[flask](https://github.com/pallets/flask) that\n * can receive the request. Upon receiving the model artifacts via the
requst,\n * this particular server reconsistutes instances of [Keras\n * Models](https://keras.io/models/model/) in
memory.\n
 *\n *\n * @param path A URL path to the model.\n *   Can be an absolute HTTP path (e.g.,\n *
'http://localhost:8000/model-upload)') or a relative path (e.g.,\n *   './model-upload').\n * @param requestInit
Request configurations to be used when sending\n *     HTTP request to server using `fetch`. It can contain fields
such as\n *     `method`, `credentials`, `headers`, `mode`, etc. See\n *     https://developer.mozilla.org/en-
US/docs/Web/API/Request/Request\n *     for more information. `requestInit` must not have a body, because the\n *
body will be set by TensorFlow.js. File blobs representing the model\n * topology (filename: 'model.json') and the
weights of the model (filename:\n * 'model.weights.bin') will be appended to the body. If `requestInit` has a\n *
`body`, an Error will be thrown.\n * @param loadOptions Optional configuration for the loading. It includes the\n *
following fields:\n *   - weightPathPrefix Optional, this specifies the path prefix for weight\n *
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files, by default this is calculated from the path param.\n * - fetchFunc Optional, custom `fetch` function. E.g., in Node.js,\n * the `fetch` from node-fetch can be used here.\n * - onProgress Optional, progress callback function, fired periodically\n * before the load is completed.\n * @returns An instance of `IOHandler`.\n *\n * @doc {\n * heading: 'Models',\n * subheading: 'Loading',\n * namespace: 'io',\n * ignoreCI: true\n * }\n */\nexport function http(path: string, loadOptions?: LoadOptions): IOHandler {\n return new HTTPRequest(path, loadOptions);\n}\n\n/**\n * Deprecated. Use `tf.io.http`.\n * @param path\n * @param loadOptions\n */\nexport function browserHTTPRequest(\n path: string, loadOptions?: LoadOptions): IOHandler {\n return http(path, loadOptions);\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\n/**\n * IOHandlers that pass through the in-memory ModelArtifacts format.\n */\n\nimport {IOHandler, ModelArtifacts, SaveResult, TrainingConfig, WeightsManifestEntry} from './types';\n\nclass PassthroughLoader implements IOHandler {\n constructor(private readonly modelArtifacts?: ModelArtifacts) {}\n\n async load(): Promise<ModelArtifacts> {\n   return this.modelArtifacts;\n }\n}\n\nclass PassthroughSaver implements IOHandler {\n constructor(\n   private readonly saveHandler:\n   (artifacts: ModelArtifacts) => Promise<SaveResult>) {}\n\n async save(modelArtifacts: ModelArtifacts) {\n   return this.saveHandler(modelArtifacts);\n }\n}\n\n/**\n * Creates an IOHandler that loads model artifacts from memory.\n *\n * When used in conjunction with `tf.loadLayersModel`, an instance of\n * `tf.LayersModel` (Keras-style) can be constructed from the loaded artifacts.\n *\n * ```js\n * const model = await tf.loadLayersModel(tf.io.fromMemory(\n *   modelTopology, weightSpecs, weightData));\n * ```\n *\n * @param modelArtifacts a object containing model topology (i.e., parsed from\n * the JSON format).\n * @param weightSpecs An array of `WeightsManifestEntry` objects describing the\n * names, shapes, types, and quantization of the weight data.\n * @param weightData A single `ArrayBuffer` containing the weight data,\n * concatenated in the order described by the weightSpecs.\n * @param trainingConfig Model training configuration. Optional.\n *\n * @returns A passthrough `IOHandler` that simply loads the provided data.\n */\nexport function fromMemory(\n   modelArtifacts: {}|ModelArtifacts, weightSpecs?: WeightsManifestEntry[],\n   weightData?: ArrayBuffer, trainingConfig?: TrainingConfig): IOHandler {\n if (arguments.length === 1) {\n   const isModelArtifacts =\n   (modelArtifacts as ModelArtifacts).modelTopology != null ||\n   (modelArtifacts as ModelArtifacts).weightSpecs != null;\n   if (isModelArtifacts) {\n   return new PassthroughLoader(modelArtifacts as ModelArtifacts);\n   } else {\n   // Legacy support: with only modelTopology.\n   // TODO(cais): Remove this deprecated API.\n   console.warn(\n   'Please call tf.io.fromMemory() with only one argument. ' +\n   'The argument should be of type ModelArtifacts. ' +\n   'The multi-argument signature of tf.io.fromMemory() has been ' +\n   'deprecated and will be removed in a future release.');\n   return new PassthroughLoader({modelTopology: modelArtifacts as {}});\n   }\n } else {\n   // Legacy support.\n   // TODO(cais): Remove this deprecated API.\n   console.warn(\n   'Please call tf.io.fromMemory() with only one argument. ' +\n   'The argument should be of type ModelArtifacts. ' +\n   'The multi-argument signature of tf.io.fromMemory() has been ' +\n   'deprecated and will be removed in a future release.');\n   return new PassthroughLoader({\n   modelTopology: modelArtifacts as {},\n   weightSpecs,\n   weightData,\n   trainingConfig\n   });\n }\n}\n\n/**\n * Creates an IOHandler that passes saved model artifacts to a callback.\n *\n * ```js\n * function handleSave(artifacts) {\n *   // ... do something with the artifacts ...\n *   return {modelArtifactsInfo: {...}, ...};\n * }\n *\n * const saveResult = model.save(tf.io.withSaveHandler(handleSave));\n * ```\n *\n * @param saveHandler A function that accepts a `ModelArtifacts` and returns

a\n *   `SaveResult`.\n */\nexport function withSaveHandler(\n   saveHandler: (artifacts: ModelArtifacts) =>\n Promise<SaveResult>): IOHandler {\n return new PassthroughSaver(saveHandler);\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\n// Importing local_storage and indexed_db is necessary for the routers
 to be\n// registered.\nimport './indexed_db';\nimport './local_storage';\n\nimport {browserFiles} from './browser_files';\nimport {browserHTTPRequest, http, isHTTPScheme} from './http';\nimport {concatenateArrayBuffers, decodeWeights, encodeWeights, getModelArtifactsInfoForJSON} from './io_utils';\nimport {fromMemory, withSaveHandler} from './passthrough';\nimport {getLoadHandlers, getSaveHandlers, registerLoadRouter, registerSaveRouter} from './router_registry';\nimport {IOHandler, LoadHandler, LoadOptions, ModelArtifacts, ModelArtifactsInfo, ModelJSON, ModelStoreManager, OnProgressCallback, RequestDetails, SaveConfig, SaveHandler, SaveResult, WeightGroup, WeightsManifestConfig, WeightsManifestEntry} from './types';\nimport {loadWeights, weightsLoaderFactory} from './weights_loader';\n\nexport {copyModel, listModels, moveModel, removeModel} from './model_management';\nexport {\n browserFiles,\n browserHTTPRequest,\n concatenateArrayBuffers,\n decodeWeights,\n encodeWeights,\n
 fromMemory,\n getLoadHandlers,\n getModelArtifactsInfoForJSON,\n getSaveHandlers,\n http,\n IOHandler,\n isHTTPScheme,\n LoadHandler,\n LoadOptions,\n loadWeights,\n ModelArtifacts,\n ModelArtifactsInfo,\n ModelJSON,\n ModelStoreManager,\n OnProgressCallback,\n registerLoadRouter,\n registerSaveRouter,\n RequestDetails,\n SaveConfig,\n SaveHandler,\n SaveResult,\n WeightGroup,\n weightsLoaderFactory,\n WeightsManifestConfig,\n WeightsManifestEntry,\n withSaveHandler\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY
 KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {ENGINE} from '../engine';\nimport {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {makeTypesMatch} from '../tensor_util';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes the dot product of two matrices, A * B. These must be matrices.\n *\n * ```js\n * const a = tf.tensor2d([1, 2], [1, 2]);\n * const b = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n *\n * a.matMul(b).print(); // or tf.matMul(a, b)\n * ```\n * @param a First matrix in dot product operation.\n * @param b Second matrix in dot product operation.\n
 * @param transposeA If true, `a` is transposed before multiplication.\n * @param transposeB If true, `b` is transposed before multiplication.\n *\n * @doc {heading: 'Operations', subheading: 'Matrices'}\n */\nfunction matMul_<T extends Tensor>(\n   a: Tensor|TensorLike, b: Tensor|TensorLike, transposeA = false,\n   transposeB = false): T {\n let $a = convertToTensor(a, 'a', 'matMul');\n let $b = convertToTensor(b, 'b', 'matMul');\n [$a, $b] = makeTypesMatch($a, $b);\n\n const inputs: BatchMatMulInputs = {a: $a, b: $b};\n const attrs: BatchMatMulAttrs = {transposeA, transposeB};\n\n return ENGINE.runKernel(\n   BatchMatMul, inputs as {} as NamedTensorMap,

attrs as {} as NamedAttrMap);\n}\n\nexport const matMul = op({matMul_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ENGINE} from '../engine';\nimport {OneHot, OneHotAttrs, OneHotInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Creates a one-hot `tf.Tensor`. The locations represented by `indices` take\n * value `onValue` (defaults to 1), while all other locations take value\n * `offValue` (defaults to 0). If `indices` is rank `R`, the output has rank\n * `R+1` with the last axis of size `depth`.\n *\n * ```js\n * tf.oneHot(tf.tensor1d([0, 1], 'int32'), 3).print();\n * ```\n *\n * @param indices `tf.Tensor` of indices with dtype `int32`.\n * @param depth The depth of the one hot dimension.\n * @param onValue A number used to fill in the output when the index matches\n * the location.\n * @param offValue A number used to fill in the output when the index does\n *   not match the location.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nfunction oneHot_(\n   indices: Tensor|TensorLike, depth: number, onValue = 1,\n   offValue = 0): Tensor {\n if (depth < 2) {\n   throw new Error(`Error in oneHot: depth must be >=2, but it is ${depth}`);\n }\n const $indices = convertToTensor(indices, 'indices', 'oneHot', 'int32');\n\n const inputs: OneHotInputs = {indices: $indices};\n const attrs: OneHotAttrs = {depth, onValue, offValue};\n\n\n return ENGINE.runKernel(\n   OneHot, inputs as unknown as NamedTensorMap,\n   attrs as unknown as NamedAttrMap);\n}\n\nexport const oneHot = op({oneHot_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Transpose, TransposeAttrs, TransposeInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {op} from './operation';\n\n/**\n * Transposes the `tf.Tensor`. Permutes the dimensions according to `perm`.\n *\n * The returned `tf.Tensor`'s dimension `i` will correspond to the input\n * dimension `perm[i]`. If `perm` is not given, it is set to `[n-1...0]`,\n * where `n` is the rank of the input `tf.Tensor`. Hence by default, this\n * operation performs a regular matrix transpose on 2-D input `tf.Tensor`s.\n *\n * ```js\n * const a = tf.tensor2d([1, 2, 3, 4, 5, 6], [2, 3]);\n *\n * a.transpose().print(); // or tf.transpose(a)\n * ```\n *\n * @param x The tensor to transpose.\n * @param perm The permutation of the dimensions of a.\n *\n * @doc {heading: 'Operations', subheading: 'Matrices'}\n */\nfunction transpose_<T extends Tensor>(x: T|TensorLike, perm?: number[]): T {\n const $x = convertToTensor(x, 'x', 'transpose');\n\n if (perm == null) {\n   perm = $x.shape.map((s, i) => i).reverse();\n }\n util.assert(\n $x.rank === perm.length,\n   () => `Error in transpose: rank of input ${$x.rank} ` +\n   `must match length of perm ${perm}.`);\n perm.forEach(axis => {\n   util.assert(\n   axis >= 0 && axis < $x.rank,\n   () => `All entries in 'perm' must be between 0 and ${$x.rank - 1}` +\n   ` but got ${perm}`);\n });\n\n if ($x.rank <= 1) {\n   return $x.clone();\n }\n\n const inputs: TransposeInputs = {x: $x};\n const attrs: TransposeAttrs = {perm};\n\n return

ENGINE.runKernel(\n Transpose, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const transpose = op({transpose_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {Tensor1D, Tensor2D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {cast} from './cast';\nimport {matMul} from './mat_mul';\nimport {oneHot} from './one_hot';\nimport {op} from './operation';\nimport {transpose} from './transpose';\n\n/**\n * Computes the confusion matrix from true labels and predicted labels.\n *\n * ```js\n * const labels = tf.tensor1d([0, 1, 2, 1, 0], 'int32');\n * const predictions = tf.tensor1d([0, 2, 2, 1, 0], 'int32');\n * const numClasses = 3;\n * const out = tf.math.confusionMatrix(labels, predictions, numClasses);\n * out.print();\n * // Expected output matrix:\n * // [[2, 0, 0],\n * // [0, 1, 1],\n * // [0, 0, 1]]\n * ```\n *\n * @param labels The target labels, assumed to be 0-based integers\n * for the classes. The shape is `[numExamples]`, where\n * `numExamples` is the number of examples included.\n * @param predictions The predicted classes, assumed to be\n * 0-based integers for the classes. Must have the same shape as `labels`.\n * @param numClasses Number of all classes, as an integer.\n * Its value must be larger than the largest element in `labels` and\n * `predictions`.\n * @returns The confusion matrix as a int32-type 2D tensor. The value at\n * row `r` and column `c` is the number of times examples of actual class\n * `r` were predicted as class `c`.\n *\n * @doc {heading: 'Operations', subheading: 'Evaluation'}\n */\nexport function confusionMatrix_(\n labels: Tensor1D|TensorLike, predictions: Tensor1D|TensorLike,\n numClasses: number): Tensor2D {\n const $labels = convertToTensor(labels, 'labels', 'confusionMatrix');\n const $predictions =\n convertToTensor(predictions, 'predictions', 'confusionMatrix');\n\n util.assert(\n numClasses == null || numClasses > 0 && Number.isInteger(numClasses),\n () => `If provided, numClasses must be a positive integer, ` +\n `but got ${numClasses}`);\n util.assert(\n $labels.rank === 1,\n () => `Expected the rank of labels to be 1, but got ${$labels.rank}`);\n util.assert(\n $predictions.rank === 1,\n () => `Expected the rank of predictions to be 1, ` +\n `but got ${$predictions.rank}`);\n util.assert(\n $labels.shape[0] === $predictions.shape[0],\n () => `Mismatch in the number of examples: ` +\n `${$labels.shape[0]} vs. ${$predictions.shape[0]}. ` +\n `Labels and predictions should have the same number of elements.`);\n util.assert(\n numClasses > 0 && Number.isInteger(numClasses),\n () => `numClasses is required to be a positive integer, but got ` +\n `${numClasses}`);\n // TODO(cais): In the future, if oneHot supports tensors inputs for\n // `numClasses`, `confusionMatrix` can make `numClasses` optional.\n\n const oneHotLabels = oneHot(cast($labels, 'int32'), numClasses) as Tensor2D;\n const oneHotPredictions =\n oneHot(cast($predictions, 'int32'), numClasses) as Tensor2D;\n const oneHotLabelsT: Tensor2D = transpose(oneHotLabels);\n const product: Tensor2D = matMul(oneHotLabelsT, oneHotPredictions);\n return cast(product, 'int32');\n}\n\nexport const confusionMatrix = op({confusionMatrix_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\n/**\n * Exports under the tf.math.* namespace.\n */\n\nimport {confusionMatrix} from

'./ops/confusion_matrix';\n\nexport {confusionMatrix};\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {Tensor3D} from '../tensor';\nimport {inferShape} from '../tensor_util_env';\nimport {TensorLike3D} from '../types';\nimport {DataType} from '../types';\nimport {assertNonNull} from '../util';\nimport {makeTensor} from './tensor_ops_util';\n\n/**\n * Creates rank-3 `tf.Tensor` with the provided values, shape and dtype.\n *\n * The same functionality can be achieved with `tf.tensor`, but in general\n * we recommend using `tf.tensor3d` as it makes the code more readable.\n *\n * ```js\n * // Pass a nested array.\n * tf.tensor3d([[[1], [2]], [[3], [4]]]).print();\n * ```\n * ```js\n * // Pass a flat array and specify a shape.\n * tf.tensor3d([1, 2, 3, 4], [2, 2, 1]).print();\n * ```\n *\n * @param values The values of the tensor. Can be nested array of numbers,\n * or a flat array, or a `TypedArray`.\n * @param shape The shape of the tensor. If not provided, it is inferred from\n * `values`.\n * @param dtype The data type.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function tensor3d(\n values: TensorLike3D, shape?: [number, number, number],\n dtype?: DataType): Tensor3D {\n assertNonNull(values);\n if (shape != null && shape.length !== 3) {\n throw new Error('tensor3d() requires shape to have three numbers');\n }\n const inferredShape = inferShape(values, dtype);\n if (inferredShape.length !== 3 && inferredShape.length !== 1) {\n throw new Error(\n 'tensor3d() requires values to be number[][][] or flat/TypedArray');\n }\n if (inferredShape.length === 1 && shape == null) {\n throw new Error(\n 'tensor3d() requires shape to be provided when `values` ' +\n 'are a flat array');\n }\n return makeTensor(values, shape, inferredShape, dtype) as Tensor3D;\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ENGINE} from '../engine';\nimport {FromPixels, FromPixelsAttrs, FromPixelsInputs} from '../kernel_names';\nimport {getKernel, NamedAttrMap} from '../kernel_registry';\nimport {Tensor, Tensor2D, Tensor3D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {PixelData, TensorLike} from '../types';\n\nimport {cast} from './cast';\nimport {op} from './operation';\nimport {tensor3d} from './tensor3d';\n\nlet fromPixels2DContext: CanvasRenderingContext2D;\n\n/**\n * Creates a `tf.Tensor` from an image.\n *\n * ```js\n * const image = new ImageData(1, 1);\n * image.data[0] = 100;\n * image.data[1] = 150;\n * image.data[2] = 200;\n * image.data[3] = 255;\n *\n * tf.browser.fromPixels(image).print();\n * ```\n *\n * @param pixels The input image to construct the tensor from. The\n * supported image types are all 4-channel. You can also pass in an image\n * object with following attributes:\n * `{data: Uint8Array; width: number; height: number}`\n * @param numChannels The number of channels of the output tensor. A\n * numChannels value less than 4 allows you to ignore channels. Defaults to\n * 3 (ignores alpha channel of input image).\n *\n * @doc {heading: 'Browser', namespace: 'browser', ignoreCI: true}\n */\nfunction fromPixels_(\n pixels: PixelData|ImageData|HTMLImageElement|HTMLCanvasElement|\n HTMLVideoElement|ImageBitmap,\n numChannels = 3): Tensor3D {\n // Sanity checks.\n if (numChannels > 4) {\n throw new Error(\n 'Cannot construct Tensor with more than 4 channels from pixels.');\n }\n if (pixels == null) {\n throw new Error('pixels passed to tf.browser.fromPixels() can not be null');\n }\n let isPixelData = false;\n let isImageData = false;\n let

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isVideo = false;\n  let isImage = false;\n  let isCanvasLike = false;\n  let isImageBitmap = false;\n  if ((pixels as PixelData).data instanceof Uint8Array) {\n    isPixelData = true;\n  } else if (\n      typeof (ImageData) !== 'undefined' && pixels
 instanceof ImageData) {\n    isImageData = true;\n  } else if (\n      typeof (HTMLVideoElement) !== 'undefined' &&\n      pixels instanceof HTMLVideoElement) {\n    isVideo = true;\n  } else if (\n      typeof (HTMLImageElement) !== 'undefined' &&\n      pixels instanceof HTMLImageElement) {\n    isImage = true;\n    // tslint:disable-next-line: no-any\n  } else if ((pixels as any).getContext != null) {\n    isCanvasLike = true;\n  } else if (\n      typeof (ImageBitmap) !== 'undefined' &&\n      pixels instanceof ImageBitmap) {\n    isImageBitmap = true;\n  } else {\n    throw new Error(\n        'pixels passed to tf.browser.fromPixels() must be either an ' +\n        `HTMLVideoElement, HTMLImageElement, HTMLCanvasElement, ImageData ` +\n        `in browser, or OffscreenCanvas, ImageData in webworker` +\n        ` or {data: Uint32Array, width: number, height: number}, ` +\n        `but was ${(pixels as {}).constructor.name}`);\n  }\n  if (isVideo) {\n    const HAVE_CURRENT_DATA_READY_STATE
 = 2;\n    if (isVideo &&\n        (pixels as HTMLVideoElement).readyState <\n        HAVE_CURRENT_DATA_READY_STATE) {\n      throw new Error(\n          'The video element has not loaded data yet. Please wait for ' +\n          '`loadeddata` event on the <video> element.');\n    }\n  }\n  // If the current backend has 'FromPixels' registered, it has a more\n  // efficient way of handling pixel uploads, so we call that.\n  const kernel = getKernel(FromPixels, ENGINE.backendName);\n  if (kernel != null) {\n    const inputs: FromPixelsInputs = {pixels};\n    const attrs: FromPixelsAttrs = {numChannels};\n    return ENGINE.runKernel(\n        FromPixels, inputs as {} as NamedTensorMap,\n        attrs as {} as NamedAttrMap);\n  }\n\n  const [width, height] = isVideo ?\n      [\n        (pixels as HTMLVideoElement).videoWidth,\n        (pixels as HTMLVideoElement).videoHeight\n      ] :\n      [pixels.width, pixels.height];\n  let vals: Uint8ClampedArray|Uint8Array;\n\n  if (isCanvasLike)
 {\n    vals =\n        // tslint:disable-next-line:no-any\n        (pixels as any).getContext('2d').getImageData(0, 0, width, height).data;\n  } else if (isImageData || isPixelData) {\n    vals = (pixels as PixelData | ImageData).data;\n  } else if (isImage || isVideo || isImageBitmap) {\n    if (fromPixels2DContext == null) {\n      fromPixels2DContext = document.createElement('canvas').getContext('2d');\n    }\n    fromPixels2DContext.canvas.width = width;\n    fromPixels2DContext.canvas.height = height;\n    fromPixels2DContext.drawImage(\n        pixels as HTMLVideoElement, 0, 0, width, height);\n    vals = fromPixels2DContext.getImageData(0, 0, width, height).data;\n  }\n  let values: Int32Array;\n  if (numChannels === 4) {\n    values = new Int32Array(vals);\n  } else {\n    const numPixels = width * height;\n    values = new Int32Array(numPixels * numChannels);\n    for (let i = 0; i < numPixels; i++) {\n      for (let channel = 0; channel < numChannels; ++channel) {\n        values[i * numChannels + channel] = vals[i * 4 + channel];\n      }\n    }\n  }\n  const outShape: [number, number, number] = [height, width, numChannels];\n  return tensor3d(values, outShape, 'int32');\n}\n\n/**\n * Draws a `tf.Tensor` of pixel values to a byte array or optionally a\n * canvas.\n *\n * When the dtype of the input is 'float32', we assume values in the range\n * [0-1]. Otherwise, when input is 'int32', we assume values in the range\n * [0-255].\n *\n * Returns a promise that resolves when the canvas has been drawn to.\n *\n * @param img A rank-2 or rank-3 tensor. If rank-2, draws grayscale. If\n *     rank-3, must have depth of 1, 3 or 4. When depth of 1, draws\n * grayscale. When depth of 3, we draw with the first three components of\n * the depth dimension corresponding to r, g, b and alpha = 1. When depth of\n * 4, all four components of the depth dimension correspond to r, g, b, a.\n * @param canvas The canvas to draw to.\n *\n * @doc {heading: 'Browser', namespace:
 'browser'}\n */\nexport async function toPixels(\n    img: Tensor2D|Tensor3D|TensorLike,\n    canvas?:
HTMLCanvasElement): Promise<Uint8ClampedArray> {\n  let $img = convertToTensor(img, 'img', 'toPixels');\n  if (!(img instanceof Tensor)) {\n    // Assume int32 if user passed a native array.\n    const originalImgTensor = $img;\n    $img = cast(originalImgTensor, 'int32');\n    originalImgTensor.dispose();\n  }\n  if ($img.rank !== 2 && $img.rank !== 3) {\n    throw new Error(\n        `toPixels only supports rank 2 or 3 tensors, got rank ${$img.rank}.`);\n  }\n  const [height, width] = $img.shape.slice(0, 2);\n  const depth = $img.rank === 2 ? 1 : $img.shape[2];\n\n  if (depth > 4 || depth === 2) {\n    throw new Error(\n        `toPixels only supports depth of size `
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+\n `1, 3 or 4 but got ${depth}`);\n }\n\n if ($img.dtype !== 'float32' && $img.dtype !== 'int32') {\n throw new Error(\n `Unsupported type for toPixels: ${$img.dtype}.` +\n ` Please use float32 or int32 tensors.`);\n }\n\n const data = await $img.data();\n const multiplier = $img.dtype === 'float32' ? 255 : 1;\n const bytes = new Uint8ClampedArray(width * height * 4);\n\n for (let i = 0; i < height * width; ++i) {\n const rgba = [0, 0, 0, 255];\n\n for (let d = 0; d < depth; d++) {\n const value = data[i * depth + d];\n\n if ($img.dtype === 'float32') {\n if (value < 0 || value > 1) {\n throw new Error(\n `Tensor values for a float32 Tensor must be in the ` +\n `range [0 - 1] but encountered ${value}.`);\n }\n } else if ($img.dtype === 'int32') {\n if (value < 0 || value > 255) {\n throw new Error(\n `Tensor values for a int32 Tensor must be in the ` +\n `range [0 - 255] but encountered ${value}.`);\n }\n }\n\n if (depth === 1) {\n rgba[0] = value * multiplier;\n rgba[1] = value * multiplier;\n rgba[2] = value * multiplier;\n } else {\n rgba[d] = value * multiplier;\n }\n }\n\n const j = i * 4;\n bytes[j + 0] = Math.round(rgba[0]);\n bytes[j + 1] = Math.round(rgba[1]);\n bytes[j + 2] = Math.round(rgba[2]);\n bytes[j + 3] = Math.round(rgba[3]);\n }\n\n if (canvas != null) {\n canvas.width = width;\n canvas.height = height;\n const ctx = canvas.getContext('2d');\n const imageData = new ImageData(bytes, width, height);\n ctx.putImageData(imageData, 0, 0);\n }\n if ($img !== img) {\n $img.dispose();\n }\n return bytes;\n}\n\nexport const fromPixels = op({fromPixels_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\nimport {TensorInfo} from '../kernel_registry';\nimport {computeStrides, sizeFromShape} from '../util';\n\n/**\n * Validate gather nd inputs.\n *\n * @param tensor The tensor contains the source values.\n * @param indices The tensor contains the indices to slice the source.\n *\n * @returns [resultShape, numUpdates, sliceSize, strides]\n */\nexport function prepareAndValidate(tensor: TensorInfo, indices: TensorInfo):\n [number[], number, number, number[]] {\n const tensorRank = tensor.shape.length;\n const indicesRank = indices.shape.length;\n if (tensorRank < 1) {\n throw new Error(\n 'tf.gatherND() expects the input to be rank 1 or higher,' +\n ` but the rank was ${tensorRank}.`);\n }\n if (indicesRank < 1) {\n throw new Error(\n 'tf.gatherND() expects the indices to be rank 1 or higher,' +\n ` but the rank was ${indicesRank}.`);\n }\n if (indices.dtype !== 'int32') {\n throw new Error(\n 'tf.gatherND() expects the indices to be int32 type,' +\n ` but the dtype was ${indices.dtype}.`);\n }\n if (indices.shape[indicesRank - 1] > tensorRank) {\n throw new Error(\n 'index innermost dimension length must be <= tensor rank; saw: ' +\n `${indices.shape[indicesRank - 1]} vs. ${tensorRank}`);\n }\n\n if (sizeFromShape(tensor.shape) === 0) {\n throw new Error(\n 'Requested more than 0 entries, but input is empty.' +\n ` Input shape: ${tensor.shape}.`);\n }\n\n const indicesShape = indices.shape;\n const sliceRank = indicesShape[indicesShape.length - 1];\n\n // The result shape is\n // indices.shape[:-1] + params.shape[indices.shape[-1]:]\n let nResult = 1;\n for (let i = 0; i < indicesShape.length - 1; ++i) {\n nResult *= indicesShape[i];\n }\n\n const inputShape = tensor.shape;\n\n const resultShape = indicesShape.slice();\n resultShape.pop();\n\n let sliceSize = 1;\n for (let i = sliceRank; i < tensorRank; ++i) {\n sliceSize *= inputShape[i];\n resultShape.push(inputShape[i]);\n }\n\n const strides =\n [...computeStrides(tensor.shape).map(stride => stride / sliceSize),\n 1].slice(0, sliceRank);\n\n return [resultShape, nResult, sliceSize, strides];\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a

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==========================================================================\n */\nimport {TensorInfo} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {computeStrides, sizeFromShape} from '../util';\n\n/**\n * Check whether updates.shape = indices.shape[:batchDim] +\n * shape[sliceDim:]\n *\n * @param x The input tensor.\n */\nexport function validateUpdateShape(\n    shape: number[], indices: Tensor, updates: Tensor) {\n  const sliceDim = (indices.rank > 1) ? indices.shape[indices.rank - 1] : 1;\n  const batchDim = (indices.rank > 1) ? indices.rank - 1 : 1;\n\n  const shapeError = 'Must have updates.shape = indices.shape[:batchDim] + ' +\n      `shape[sliceDim:], got updates.shape: ${updates.shape}` +\n      `, indices.shape: ${indices.shape}, shape: ${shape}`
 +\n      `, sliceDim: ${sliceDim}, and batchDim: ${batchDim}.`;\n\n  if (updates.rank < batchDim) {\n    throw new Error(shapeError + ` update.rank < ${batchDim}. `);\n  }\n  if (shape.length < sliceDim + (updates.rank - batchDim)) {\n    throw new Error(\n        shapeError +\n        ` Output shape length < ${sliceDim + (updates.rank - batchDim)}`);\n  }\n  if (updates.rank !== batchDim + shape.length - sliceDim) {\n    throw new Error(\n shapeError + ` update.rank != ${batchDim + shape.length - sliceDim}`);\n  }\n  for (let d = 0; d < batchDim; ++d) {\n    if (updates.shape[d] !== indices.shape[d]) {\n      throw new Error(\n          shapeError +\n          ` updates.shape[${d}] (${updates.shape[d]}) != indices.shape[${d}] (${\n              indices.shape[d]}).`);\n    }\n  }\n  for (let d = 0; d < updates.rank - batchDim; ++d) {\n    if (updates.shape[d + batchDim] !== shape[d + sliceDim]) {\n      throw new Error(\n          shapeError +\n          ` updates.shape[${d
 + batchDim}] (${\n              updates.shape[d + batchDim]}) != shape[${d + batchDim}] (${\n              shape[d + batchDim]})`);\n    }\n  }\n}\n\nexport interface ScatterShapeInfo {\n  sliceRank: number;\n  numUpdates: number;\n  sliceSize: number;\n  strides: number[];\n  outputSize: number;\n}\n/**\n * Validate scatter nd inputs.\n *\n * @param update The tensor contains the update values.\n * @param indices The tensor contains the indices for the update values.\n * @param shape The shape of the output tensor.\n */\nexport function validateInput(\n updates: Tensor, indices: Tensor, shape: number[]) {\n  if (indices.rank < 1) {\n    throw new Error(\n 'tf.scatterND() expects the indices to be rank 1 or higher,' +\n        ` but the rank was ${indices.rank}.`);\n  }\n  if (updates.rank < 1) {\n    throw new Error(\n        'tf.scatterND() expects the updates to be rank 1 or higher,' +\n        ` but the rank was ${updates.rank}.`);\n  }\n  if (indices.dtype !== 'int32')
 {\n    throw new Error(`The dtype of 'indices' should be int32, but got dtype: ${\n        indices.dtype}`);\n  }\n  if (shape.length < 1) {\n    throw new Error(\n        `Output rank must be greater or equal to 1, but got shape: ${shape}`);\n  }\n\n  if (shape.length === 0) {\n    if (indices.size === 0) {\n      throw new Error(`Indices specified for empty output. indices shape: ${\n          indices.shape}`);\n    }\n    if (updates.size === 0) {\n      throw new Error(`Updates specified for empty output. updates shape: ${\n          updates.shape}`);\n    }\n  }\n\n validateUpdateShape(shape, indices, updates);\n}\n\n/**\n * Calculate the shape information for the output.\n *\n * @param update The tensor contains the update values.\n * @param indices The tensor contains the indices for the update values.\n * @param shape The shape of the output tensor.\n *\n * @returns ScatterShapeInfo\n */\nexport function calculateShapes(\n    updates: TensorInfo, indices: TensorInfo,\n    shape:
 number[]): ScatterShapeInfo {\n  // Calculate the number of dimensions in indices\n  const indicesRank = indices.shape.length;\n  const sliceRank = (indicesRank > 1) ? indices.shape[indicesRank - 1] : 1;\n\n  // Calculate the number of elements that make up each slice of our updated\n  // tensor. This allows us to work with flattened tensors and copy over whole\n  // slices at a time.\n  const totalNd = shape.length;\n\n  let sliceSize = 1;\n  for (let i = sliceRank; i < totalNd; ++i) {\n    sliceSize *= shape[i];\n  }\n\n  const safeSliceDim = (sliceRank < 1) ? 1 : sliceRank;\n  const numUpdates = sizeFromShape(indices.shape) / safeSliceDim;\n\n  const strides = [...computeStrides(shape.slice(0, sliceRank)), 1];\n  const outputSize = sizeFromShape(shape);\n  return {sliceRank, numUpdates, sliceSize, strides, outputSize};\n}\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights
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==========================================================================\n
*/\n\nimport {TensorInfo} from '../kernel_registry';\nimport * as util from '../util';\n\nexport type SliceInfo = {\n
nonStrided: boolean,\n  $begin: number[],\n  $end: number[],\n  $strides: number[],\n  size: number[],\n  newShape:
number[],\n  outShape: number[]\n};\n\nexport function assertParamsValid(\n    input: TensorInfo, begin: number[],
size: number[]): void {\n  const inputRank = input.shape.length;\n  util.assert(\n
   inputRank === begin.length,\n      () => `Error in slice${inputRank}D: Length of begin ${begin} must ` +\n
`match the rank of the array (${inputRank}).`);\n  util.assert(\n      inputRank === size.length,\n      () => `Error in
slice${inputRank}D: Length of size ${size} must ` +\n          `match the rank of the array (${inputRank}).`);\n\n  for
(let i = 0; i < inputRank; ++i) {\n    util.assert(\n        begin[i] + size[i] <= input.shape[i],\n        () => `Error in
slice${inputRank}D: begin[${i}] + size[${i}] ` +\n            `(${begin[i] + size[i]}) would overflow input.shape[${i}]
(${\n                input.shape[i]})`);\n  }\n}\n\n/** Converts a binary mask to an array of axes. Used in stridedSlice().
*/\nexport function maskToAxes(mask: number): number[] {\n  const axes = [];\n  let axis = 0;\n  while (mask > 0)
{\n    if (mask & 1) {\n      axes.push(axis);\n    }\n    mask /= 2;\n    axis++;\n  }\n  return axes;\n}\n\n/** Computes
the output shape given the strided
 slice params. */\nexport function computeOutShape(\n    begin: number[], end: number[], strides: number[]):
number[] {\n  const size = [];\n  for (let axis = 0; axis < begin.length; axis++) {\n    size[axis] = Math.ceil((end[axis]
- begin[axis]) / strides[axis]);\n  }\n  return size;\n}\n\n// Creates full selection at the elided dimensions. If the
dimension matches\n// the ellipsis mask, override the current stride value. Otherwise, insert.\nexport function
stridesWithElidedDims(\n    strides: number[], ellipsisInsertionIndex: number, numElidedAxes: number,\n
inputShape: number[]): number[] {\n  const newStrides = [...strides];\n  for (let i = newStrides.length; i <
inputShape.length; i++) {\n    newStrides.push(1);\n  }\n  for (let i = 0; i < numElidedAxes; i++) {\n    if (i === 0)
{\n      newStrides[ellipsisInsertionIndex] = 1;\n    } else {\n      newStrides.splice(\n          ellipsisInsertionIndex, 0 /*
num elements to delete */,\n          1 /* element to add */);\n      newStrides.pop();\n
   }\n  }\n  return newStrides;\n}\n\nfunction unnormalizeAxis(\n    ellipsisInsertionIndex: number, numElidedAxes:
number,\n    normalizedAxis: number): number {\n  if (normalizedAxis <= ellipsisInsertionIndex) {\n    return
normalizedAxis;\n  }\n\n  return normalizedAxis - (numElidedAxes - 1);\n}\n\nfunction
getElidedAxes(numElidedAxes: number, ellipsisInsertionIndex: number) {\n  const elidedAxes = [];\n  for (let i = 0;
i < numElidedAxes; i++) {\n    elidedAxes.push(ellipsisInsertionIndex + i);\n  }\n  return elidedAxes;\n}\n\n//
Normalize the start, end and strides.\nexport function getNormalizedAxes(\n    inputShape: number[], ellipsisAxes:
number[], numInterpolatedAxes: number,\n    begin: number[], end: number[], strides: number[], beginMask:
number,\n    endMask: number,\n    ellipsisMask: number): {begin: number[], end: number[], strides: number[]} {\n
const inputRank = inputShape.length;\n  let normalizedBegin = new Array(inputRank),\n      normalizedEnd =
 new Array(inputRank),\n      normalizedStrides = new Array(inputRank);\n  if (ellipsisAxes.length &&
numInterpolatedAxes > 0) {\n    const fullIndex = ellipsisAxes[0];\n\n    // The ellipsis applies to the masked index
as well as any dimensions\n    // that are interpolated.\n    const numElidedAxes = numInterpolatedAxes + 1;\n
normalizedBegin = startIndicesWithElidedDims(\n        beginMask, fullIndex, numElidedAxes, begin,
inputShape);\n    normalizedEnd = stopIndicesWithElidedDims(\n        endMask, fullIndex, numElidedAxes, end,
inputShape);\n    normalizedStrides =\n        stridesWithElidedDims(strides, fullIndex, numElidedAxes,
inputShape);\n  } else {\n    for (let axis = 0; axis < inputRank; axis++) {\n      normalizedBegin[axis] =
startForAxis(\n          beginMask, begin, strides, inputShape, axis, ellipsisMask);\n      normalizedEnd[axis] =\n
stopForAxis(endMask, end, strides, inputShape, axis, ellipsisMask);\n      normalizedStrides[axis] =
stridesForAxis(strides,
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 axis, ellipsisMask);\n    }\n  }\n\n  return {\n    begin: normalizedBegin,\n    end: normalizedEnd,\n    strides: normalizedStrides\n  };\n}\n\n// Creates full selection at the elided dimensions. If the dimension matches\n// the ellipsis mask, override the current start value. Otherwise, insert.\nexport function startIndicesWithElidedDims(\n beginMask: number, ellipsisInsertionIndex: number, numElidedAxes: number,\n    originalBegin: number[], inputShape: number[]): number[] {\n  const newIndices = [...inputShape];\n  const elidedAxes = getElidedAxes(numElidedAxes, ellipsisInsertionIndex);\n\n  for (let axis = 0; axis < newIndices.length; axis++) {\n if (elidedAxes.indexOf(axis) > -1) {\n      newIndices[axis] = 0;\n    } else {\n      const originalAxis =\n unnormalizeAxis(ellipsisInsertionIndex, numElidedAxes, axis);\n      let originalValue = originalBegin[originalAxis];\n      if (beginMask & 1 << originalAxis) {\n        originalValue = 0;\n      }\n\n newIndices[axis]
 = originalValue;\n    }\n  }\n  return newIndices;\n}\n\n// Creates full selection at the elided dimensions. If the dimension matches\n// the ellipsis mask, override the current stop value. Otherwise, insert.\nexport function stopIndicesWithElidedDims(\n    endMask: number, ellipsisInsertionIndex: number, numElidedAxes: number,\n originalEnd: number[], inputShape: number[]): number[] {\n  const newIndices = [...inputShape];\n  const elidedAxes = getElidedAxes(numElidedAxes, ellipsisInsertionIndex);\n\n  for (let axis = 0; axis < newIndices.length; axis++) {\n    if (elidedAxes.indexOf(axis) > -1) {\n      newIndices[axis] = Number.MAX_SAFE_INTEGER;\n    } else {\n      const originalAxis =\n unnormalizeAxis(ellipsisInsertionIndex, numElidedAxes, axis);\n      let originalValue = originalEnd[originalAxis];\n      if (endMask & 1 << originalAxis) {\n        originalValue = Number.MAX_SAFE_INTEGER;\n      }\n      newIndices[axis] = originalValue;\n    }\n  }\n\n
  for (let i = 0; i < newIndices.length; i++) {\n    // Handle negative indices\n    const axisSize = inputShape[i];\n    if (newIndices[i] < 0) {\n      newIndices[i] += axisSize;\n    }\n    newIndices[i] = util.clamp(0, newIndices[i], inputShape[i]);\n  }\n  return newIndices;\n}\n\nexport function stridesForAxis(\n    strides: number[], axis: number, ellipsisMask: number): number {\n  let stride = strides[axis];\n  if (ellipsisMask & (1 << axis) || stride == null) {\n stride = 1;\n  }\n\n  return stride;\n}\n\nexport function startForAxis(\n    beginMask: number, startIndices: number[], strides: number[],\n    inputShape: number[], axis: number, ellipsisMask: number): number {\n  // Begin with the specified index\n  let start = startIndices[axis];\n  const stride = strides[axis] || 1;\n\n  // Check the axis bit from right of masked axes, or the begin index is not set\n  // for the axis.\n  if (beginMask & 1 << axis || ellipsisMask & 1 << axis || start == null) {\n    if (stride
 > 0) {\n      // Forward iteration - use the first element. These values will get\n      // clamped below (Note: We could have set them to 0 and axis_size-1, but\n      // use lowest() and max() to maintain symmetry with StopForAxis())\n
 start = Number.MIN_SAFE_INTEGER;\n    } else {\n      // Backward iteration - use the last element.\n      start = Number.MAX_SAFE_INTEGER;\n    }\n  }\n\n  // Handle negative indices\n  const axisSize = inputShape[axis];\n  if (start < 0) {\n    start += axisSize;\n  }\n\n  // Clamping\n  start = util.clamp(0, start, axisSize - 1);\n\n  return start;\n}\n\nexport function stopForAxis(\n    endMask: number, stopIndices: number[], strides: number[],\n inputShape: number[], axis: number, ellipsisMask: number): number {\n  // Begin with the specified index\n  let stop = stopIndices[axis];\n  const stride = strides[axis] || 1;\n\n  // Check the axis bit from right of masked axes, or if the stop index is not\n  // set for this axis.\n  if (endMask &
 (1 << axis) || ellipsisMask & (1 << axis) || stop == null) {\n    if (stride > 0) {\n      // Forward iteration - use the last element. These values will get\n      // clamped below\n      stop = Number.MAX_SAFE_INTEGER;\n    } else {\n      // Backward iteration - use the first element.\n      stop = Number.MIN_SAFE_INTEGER;\n    }\n  }\n\n  // Handle negative indices\n  const axisSize = inputShape[axis];\n  if (stop < 0) {\n    stop += axisSize;\n  }\n\n  // Clamping\n  // Because the end index points one past the last element, we need slightly\n  // different clamping ranges depending on the direction.\n  if (stride > 0) {\n    // Forward iteration\n    stop = util.clamp(0, stop, axisSize);\n  } else {\n    // Backward iteration\n    stop = util.clamp(-1, stop, axisSize - 1);\n  }\n\n  return stop;\n}\n\n/**\n * Returns true if the slice occupies a continous set of elements in the\n * 'flat' space.\n */\nexport function isSliceContinous(\n    shape: number[], begin: number[], size:
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number[]) {\n // Index of the first axis that has size > 1.\n let firstNonOneAxis = size.length;\n for (let i = 0; i < size.length; i++) {\n   if (size[i] > 1) {\n   firstNonOneAxis = i;\n   break;\n   }\n }\n\n for (let i = firstNonOneAxis + 1; i < size.length; i++) {\n   if (begin[i] > 0 || size[i] !== shape[i]) {\n   return false;\n   }\n }\n return true;\n}\n\nexport function computeFlatOffset(begin: number[], strides: number[]): number {\n let flatOffset = begin.length > 0 ? begin[begin.length - 1] : 1;\n for (let i = 0; i < begin.length - 1; i++) {\n   flatOffset += begin[i] * strides[i];\n }\n return flatOffset;\n}\n\nexport function parseSliceParams(\n   x: TensorInfo, begin: number|number[], size?: number|number[]) {\n // The following logic allows for more ergonomic calls.\n let begin_: number[];\n const xRank = x.shape.length;\n if (typeof begin === 'number') {\n   begin_ = [begin, ...new Array(xRank - 1).fill(0)];\n } else if (begin.length < xRank) {\n   begin_ = begin.concat(new Array(xRank - begin.length).fill(0));\n } else {\n   begin_ = begin.slice();\n }\n begin_.forEach(d => {\n   util.assert(\n   d !== -1, () => 'slice() does not support negative begin indexing.');\n });\n let size_: number[];\n if (size == null) {\n   size_ = new Array(xRank).fill(-1);\n } else if (typeof size === 'number') {\n   size_ = [size, ...new Array(xRank - 1).fill(-1)];\n } else if (size.length < xRank) {\n   size_ = size.concat(new Array(xRank - size.length).fill(-1));\n } else {\n   size_ = size;\n }\n size_ = size_.map((d, i) => {\n   if (d >= 0) {\n   return d;\n   } else {\n   util.assert(\n   d === -1,\n   () => `Negative size values should be exactly -1 but got ` +\n   `${d} for the slice() size at index ${i}.`);\n   return x.shape[i] - begin_[i];\n   }\n });\n return [begin_, size_];\n}\n\nexport function sliceInfo(\n   xShape: number[], begin: number[], end: number[],
 strides: number[],\n   beginMask: number, endMask: number, ellipsisMask: number,\n   newAxisMask: number, shrinkAxisMask: number): SliceInfo {\n // make a copy because it may be modified further down.\n let $begin = begin.slice();\n let $end = end.slice();\n let $strides = strides;\n\n if (strides == null) {\n $strides = new Array($begin.length);\n }\n\n const ellipsisAxes = maskToAxes(ellipsisMask);\n if (ellipsisAxes.length > 1) {\n   throw new Error('Multiple ellipses in slice is not allowed.');\n }\n\n if (ellipsisMask !== 0 && newAxisMask !== 0) {\n   throw new Error(\n   'Using both ellipsisMask and newAxisMask is not yet supported.');\n }\n\n if (ellipsisMask !== 0 && shrinkAxisMask !== 0) {\n   throw new Error(\n   'Using both ellipsisMask and shrinkAxisMask is not yet supported.');\n }\n\n const numInterpolatedAxes = xShape.length - $begin.length;\n\n // Expand the dims of x based on the newAxisMask.\n const expandAxes = maskToAxes(newAxisMask);\n
  const newShape = xShape.slice();\n expandAxes.forEach(axis => {\n $begin[axis] = 0;\n $end[axis] = 1;\n   newShape.splice(axis, 0, 1);\n });\n\n const {\n   begin: normalizedBegin,\n   end: normalizedEnd,\n   strides: normalizedStrides\n } =\n   getNormalizedAxes(\n   newShape, ellipsisAxes, numInterpolatedAxes, $begin, $end, $strides,\n   beginMask, endMask, ellipsisMask);\n $begin = normalizedBegin;\n $end = normalizedEnd;\n $strides = normalizedStrides;\n\n const shrinkAxes = maskToAxes(shrinkAxisMask);\n // Adjust the ends based on the shrink mask.\n shrinkAxes.forEach(axis => {\n $end[axis] = $begin[axis] + 1;\n $strides[axis] = 1;\n });\n\n // Figure out the output shape.\n const size = computeOutShape($begin, $end, $strides);\n // Remove the axes based on shrinkMask.\n const outShape = size.filter((_, axis) => shrinkAxes.indexOf(axis) === -1);\n\n const nonStrided = $strides.every(v => v === 1);\n\n return {nonStrided, $begin,
 $end, $strides, size, newShape, outShape};\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {assert} from './util';\n\n/**\n * Types to support JSON-esque data structures internally.\n *\n * Internally ConfigDict's use camelCase keys and values where the\n * values are class names to be instantiated. On

the python side, these\n * will be snake_case. Internally we allow Enums into the values for better\n * type safety, but these need to be converted to raw primitives (usually\n * strings) for round-tripping with python.\n *\n * toConfig returns the TS-friendly representation. model.toJSON() returns\n * the pythonic version as that's the portable format. If you need to\n * python-ify a non-model level toConfig output, you'll need to use a\n * convertTsToPythonic from serialization_utils in -Layers.\n *\n */\nexport declare type ConfigDictValue =\n boolean | number | string | null | ConfigDictArray | ConfigDict;\nexport declare interface ConfigDict {\n [key: string]: ConfigDictValue;\n}\nexport declare interface ConfigDictArray extends Array<ConfigDictValue> {}\n\n/**\n * Type to represent the class-type of Serializable objects.\n *\n * Ie the class prototype with access to the constructor and any\n * static members/methods. Instance methods are not listed here.\n *\n * Source for this idea: https://stackoverflow.com/a/43607255\n */\nexport declare type SerializableConstructor<T extends Serializable> = {\n // tslint:disable-next-line:no-any\n new (...args: any[]): T; className: string; fromConfig: FromConfigMethod<T>;\n};\nexport declare type FromConfigMethod<T extends Serializable> =\n   (cls: SerializableConstructor<T>, config: ConfigDict) => T;\n\n/**\n * Serializable defines the serialization contract.\n *\n * TFJS requires serializable classes to return their className when asked\n * to avoid issues with minification.\n */\nexport abstract class Serializable {\n /**\n   * Return the class name for this class to use in serialization contexts.\n   *\n   * Generally speaking this will be the same thing that constructor.name\n   * would have returned. However, the class name needs to be robust\n   * against minification for serialization/deserialization to work properly.\n   *\n   * There's also places such as initializers.VarianceScaling, where\n   * implementation details between different languages led to different\n   * class hierarchies and a non-leaf node is used for serialization purposes.\n   */\n getClassName(): string {\n   return (this.constructor as SerializableConstructor<Serializable>)\n   .className;\n }\n\n /**\n   * Return all the non-weight state needed to serialize this object.\n   */\n abstract getConfig(): ConfigDict;\n\n /**\n   * Creates an instance of T from a ConfigDict.\n   *\n   * This works for most descendants of serializable. A few need to\n   * provide special handling.\n   * @param cls A Constructor for the class to instantiate.\n   * @param config The Configuration for the object.\n   */\n /** @nocollapse */\n static fromConfig<T extends Serializable>(\n   cls: SerializableConstructor<T>, config: ConfigDict): T {\n   return new cls(config);\n }\n}\n\n/**\n * Maps string keys to class constructors.\n *\n * Used during (de)serialization from the cross-language JSON format, which\n * requires the class name in the serialization format matches the class\n * names as used in Python, should it exist.\n */\nexport class SerializationMap {\n private static instance: SerializationMap;\n classNameMap: {\n[className: string]:\n   [SerializableConstructor<Serializable>, FromConfigMethod<Serializable>]\n };\n\n private constructor() {\n   this.classNameMap = {};\n }\n\n /**\n   * Returns the singleton instance of the map.\n   */\n static getMap(): SerializationMap {\n   if (SerializationMap.instance == null) {\n   SerializationMap.instance = new SerializationMap();\n   }\n   return SerializationMap.instance;\n }\n\n /**\n   * Registers the class as serializable.\n   */\n static register<T extends Serializable>(cls: SerializableConstructor<T>) {\n   SerializationMap.getMap().classNameMap[cls.className] =\n   [cls, cls.fromConfig];\n }\n}\n\n/**\n * Register a class with the serialization map of TensorFlow.js.\n *\n * This is often used for registering custom Layers, so they can be\n * serialized and deserialized.\n *\n * Example:\n *\n * ```js\n * class MyCustomLayer extends tf.layers.Layer {\n *   static className = 'MyCustomLayer';\n *\n *   constructor(config) {\n *   super(config);\n *   }\n * }\n * tf.serialization.registerClass(MyCustomLayer);\n * ```\n *\n * @param cls The class to be registered. It must have a public static member\n *   called `className` defined and the value must be a non-empty string.\n *\n * @doc {heading: 'Models', subheading: 'Serialization', ignoreCI: true}\n */\nexport function registerClass<T extends Serializable>(\n   cls: SerializableConstructor<T>) {\n assert(\n   cls.className != null,\n   () => `Class being registered does not have the static className ` +\n   `property defined.`);\n assert(\n   typeof cls.className === 'string',\n   () => `className is required to be a string, but got type ` +\n   typeof cls.className);\n assert(\n   cls.className.length > 0,\n   () => `Class being registered has an empty-string as its className, ` +\n   `which is disallowed.`);\n\n SerializationMap.register(cls);\n}\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n *

Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {ENGINE} from './engine';\nimport {inferShape} from './tensor_util_env';\nimport {RecursiveArray, TensorLike,
TypedArray} from './types';\nimport {arraysEqual, encodeString, flatten, isString, isTypedArray} from './util';\n\nconst TEST_EPSILON_FLOAT32 = 1e-3;\nexport const TEST_EPSILON_FLOAT16 = 1e-1;\n\nexport function expectArraysClose(\n actual: TypedArray|number|RecursiveArray<number>,\n expected: TypedArray|number|RecursiveArray<number>, epsilon?: number) {\n if (epsilon == null) {\n epsilon = testEpsilon();\n }\n return expectArraysPredicate(\n actual, expected, (a, b) => areClose(a as number, b as number, epsilon));\n}\n\nexport function testEpsilon() {\n return ENGINE.backend.floatPrecision() === 32 ? TEST_EPSILON_FLOAT32 :\n TEST_EPSILON_FLOAT16;\n}\n\nfunction expectArraysPredicate(\n actual: TensorLike, expected: TensorLike,\n predicate: (a: {}, b: {}) => boolean) {\n let checkClassType = true;\n if (isTypedArray(actual) || isTypedArray(expected)) {\n checkClassType = false;\n }\n if (isTypedArray(actual)
&& isTypedArray(expected)) {\n checkClassType = true;\n }\n if (checkClassType) {\n const aType = actual.constructor.name;\n const bType = expected.constructor.name;\n\n if (aType !== bType) {\n throw new Error(\n `Arrays are of different type. Actual: ${aType}. ` +\n `Expected: ${bType}`);\n }\n }\n\n if (Array.isArray(actual) && Array.isArray(expected)) {\n const actualShape = inferShape(actual);\n const expectedShape = inferShape(expected);\n if (!arraysEqual(actualShape, expectedShape)) {\n throw new Error(\n `Arrays have different shapes. ` +\n `Actual: [${actualShape}]. Expected: [${expectedShape}]`);\n }\n }\n\n const actualFlat =\n isTypedArray(actual) ? actual : flatten(actual as RecursiveArray<number>);\n const expectedFlat = isTypedArray(expected) ?\n expected :\n flatten(expected as RecursiveArray<number>);\n\n if (actualFlat.length !== expectedFlat.length) {\n throw
new Error(\n `Arrays have different lengths actual: ${actualFlat.length} vs ` +\n `expected: ${expectedFlat.length}.\\n` +\n `Actual: ${actualFlat}.\\n` +\n `Expected: ${expectedFlat}.`);\n }\n for (let i = 0; i < expectedFlat.length; ++i) {\n const a = actualFlat[i];\n const e = expectedFlat[i];\n\n if (!predicate(a, e)) {\n throw new Error(\n `Arrays differ: actual[${i}] = ${a}, expected[${i}] = ${e}.\\n` +\n `Actual: ${actualFlat}.\\n` +\n `Expected: ${expectedFlat}.`);\n }\n }\n}\n\nexport interface DoneFn {\n (): void;\n fail: (message?: Error|string) => void;\n}\n\nexport function expectPromiseToFail(fn: () => Promise<{}>, done: DoneFn): void {\n fn().then(() => done.fail(), () => done());\n}\n\nexport function expectArraysEqual(actual: TensorLike, expected: TensorLike) {\n const exp = typeof expected === 'string' || typeof expected === 'number' ||\n typeof expected === 'boolean' ?\n [expected] as number[] :\n expected as number[];\n if (isString(actual) || isString((actual as string[])[0]) ||\n isString(expected) || isString((expected as string[])[0])) {\n // tslint:disable-next-line: triple-equals\n return expectArraysPredicate(actual, exp, (a, b) => a == b);\n }\n return expectArraysPredicate(\n actual, expected, (a, b) => areClose(a as number, b as number, 0));\n}\n\nexport function expectNumbersClose(a: number, e: number, epsilon?: number) {\n if (epsilon == null) {\n epsilon = testEpsilon();\n }\n if (!areClose(a, e, epsilon)) {\n throw new Error(`Numbers differ: actual === ${a}, expected === ${e}`);\n }\n}\n\nfunction areClose(a: number, e: number, epsilon: number): boolean {\n if (!isFinite(a) && !isFinite(e)) {\n return true;\n }\n if (isNaN(a) || isNaN(e) || Math.abs(a - e) > epsilon) {\n return false;\n }\n return true;\n}\n\nexport function expectValuesInRange(\n actual: TypedArray|number[], low: number,
high: number) {\n for (let i = 0; i < actual.length; i++) {\n if (actual[i] < low || actual[i] > high) {\n throw new Error(\n `Value out of range:${actual[i]} low: ${low}, high: ${high}`);\n }\n }\n}\n\nexport function

expectArrayBuffersEqual(\n   actual: ArrayBuffer, expected: ArrayBuffer) {\n // Safari & Jasmine don't like comparing ArrayBuffers directly. Wrapping in\n // a Float32Array solves this issue.\n expect(new Float32Array(actual)).toEqual(new Float32Array(expected));\n}\n\n/** Encodes strings into utf-8 bytes. */\nexport function encodeStrings(a: RecursiveArray<{}>):\n   RecursiveArray<Uint8Array> {\n for (let i = 0; i < (a as Array<{}>).length; i++) {\n   const val = a[i];\n   if (Array.isArray(val)) {\n   encodeStrings(val);\n   } else {\n   a[i] = encodeString(val as string);\n   }\n }\n return a as RecursiveArray<Uint8Array>;\n}\n","/** @license See the LICENSE file. */\n\n// This code is auto-generated, do not modify this file!\nconst
 version = '3.1.0';\nexport {version};\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {KernelBackend} from './backends/backend';\nimport {ENGINE, Engine, MemoryInfo, ProfileInfo, ScopeFn, TimingInfo} from './engine';\nimport {env} from './environment';\n\nimport {Platform} from
'./platforms/platform';\nimport
 {setDeprecationWarningFn, Tensor} from './tensor';\nimport {TensorContainer} from './tensor_types';\nimport {getTensorsInContainer} from './tensor_util';\n\n/**\n * Enables production mode which disables correctness checks in favor of\n * performance.\n *\n * @doc {heading: 'Environment'}\n */\nexport function enableProdMode(): void {\n env().set('PROD', true);\n}\n\n/**\n * Enables debug mode which will log information about all executed kernels:\n * the elapsed time of the kernel execution, as well as the rank, shape, and\n * size of the output tensor.\n *\n * Debug mode will significantly slow down your application as it will\n * download the result of every operation to the CPU. This should not be used in\n * production. Debug mode does not affect the timing information of the kernel\n * execution as we do not measure download time in the kernel execution time.\n *\n * See also: `tf.profile`, `tf.memory`.\n *\n * @doc {heading: 'Environment'}\n */\nexport function enableDebugMode():
 void {\n env().set('DEBUG', true);\n}\n\n/** Globally disables deprecation warnings */\nexport function disableDeprecationWarnings(): void {\n env().set('DEPRECATION_WARNINGS_ENABLED', false);\n console.warn(`TensorFlow.js deprecation warnings have been disabled.`);\n}\n\n/** Warn users about deprecated functionality. */\nexport function deprecationWarn(msg: string) {\n if (env().getBool('DEPRECATION_WARNINGS_ENABLED')) {\n   console.warn(\n   msg + ' You can disable deprecation warnings with ' +\n   'tf.disableDeprecationWarnings().');\n }\n}\nsetDeprecationWarningFn(deprecationWarn);\n\n/**\n * Dispose all variables kept in backend engine.\n *\n * @doc {heading: 'Environment'}\n */\nexport function disposeVariables(): void {\n ENGINE.disposeVariables();\n}\n\n/**\n * It returns the global engine that keeps track of all tensors and backends.\n *\n * @doc {heading: 'Environment'}\n */\nexport function engine(): Engine {\n return ENGINE;\n}\n\n/**\n * Returns memory
 info at the current time in the program. The result is an\n * object with the following properties:\n *\n * - `numBytes`: Number of bytes allocated (undisposed) at this time.\n * - `numTensors`: Number of unique tensors allocated.\n * - `numDataBuffers`: Number of unique data buffers allocated\n *   (undisposed) at this time, which is the number of tensors\n *   (e.g. `a.reshape(newShape)` makes a new Tensor that shares the same\n *   data buffer with `a`).\n * - `unreliable`: True if the memory usage is unreliable. See `reasons` when\n *   `unreliable` is true.\n * - `reasons`: `string[]`, reasons why the memory is unreliable, present if\n *   `unreliable` is true.\n *\n * WebGL Properties:\n * - `numBytesInGPU`: Number of bytes allocated (undisposed) in the GPU only at\n *   this time.\n *\n * @doc {heading: 'Performance', subheading: 'Memory'}\n */\nexport function memory(): MemoryInfo {\n return ENGINE.memory();\n}\n\n/**\n * Executes the provided function `f()` and returns

a promise that resolves\n * with information about the function's memory use:\n * - `newBytes`: the number of new bytes allocated\n * - `newTensors`: the number of new tensors created\n * - `peakBytes`: the peak number of bytes allocated\n * - `kernels`: an array of objects for each kernel involved that reports\n * their input and output shapes, number of bytes used, and number of new\n * tensors created.\n * - `kernelNames`: an array of unique strings with just the names of the\n * kernels in the `kernels` array.\n *\n * ```js\n * const profile = await tf.profile(() => {\n * const x = tf.tensor1d([1, 2, 3]);\n * let x2 = x.square();\n * x2.dispose();\n * x2 = x.square();\n * x2.dispose();\n * return x;\n * });\n *\n * console.log(`newBytes: ${profile.newBytes}`);\n * console.log(`newTensors: ${profile.newTensors}`);\n * console.log(`byte usage over all kernels: ${profile.kernels.map(k =>\n * k.totalBytesSnapshot)}`);\n * ```\n *\n *\n * @doc {heading: 'Performance', subheading: 'Profile'}\n */\nexport function profile(f: () => (TensorContainer | Promise<TensorContainer>)):\n Promise<ProfileInfo> {\n return ENGINE.profile(f);\n}\n\n/**\n * Executes the provided function `fn` and after it is executed, cleans up all\n * intermediate tensors allocated by `fn` except those returned by `fn`.\n * `fn` must not return a Promise (async functions not allowed). The returned\n * result can be a complex object.\n *\n * Using this method helps avoid memory leaks. In general, wrap calls to\n * operations in `tf.tidy` for automatic memory cleanup.\n *\n * NOTE: Variables do *not* get cleaned up when inside a tidy(). If you want to\n * dispose variables, please use `tf.disposeVariables` or call dispose()\n * directly on variables.\n *\n * ```js\n * // y = 2 ^ 2 + 1\n * const y = tf.tidy(() => {\n * // a, b, and one will be cleaned up when the tidy ends.\n * const one = tf.scalar(1);\n * const a = tf.scalar(2);\n * const b = a.square();\n *\n * console.log('numTensors (in tidy): ' + tf.memory().numTensors);\n *\n * // The value returned inside the tidy function will return\n * // through the tidy, in this case to the variable y.\n * return b.add(one);\n * });\n *\n * console.log('numTensors (outside tidy): ' + tf.memory().numTensors);\n * y.print();\n * ```\n *\n * @param nameOrFn The name of the closure, or the function to execute.\n *   If a name is provided, the 2nd argument should be the function.\n *   If debug mode is on, the timing and the memory usage of the function\n *   will be tracked and displayed on the console using the provided name.\n * @param fn The function to execute.\n *\n * @doc {heading: 'Performance', subheading: 'Memory'}\n */\nexport function tidy<T extends TensorContainer>(\n nameOrFn: string|ScopeFn<T>, fn?: ScopeFn<T>): T {\n return ENGINE.tidy(nameOrFn, fn);\n}\n\n/**\n * Disposes any `tf.Tensor`s found within the provided object.\n *\n * @param container an object that may be a `tf.Tensor`\n *   or may directly\n *   contain `tf.Tensor`s, such as a `Tensor[]` or `{key: Tensor, ...}`. If\n *   the object is not a `tf.Tensor` or does not contain `Tensors`, nothing\n *   happens. In general it is safe to pass any object here, except that\n *   `Promise`s are not supported.\n *\n * @doc {heading: 'Performance', subheading: 'Memory'}\n */\nexport function dispose(container: TensorContainer) {\n const tensors = getTensorsInContainer(container);\n tensors.forEach(tensor => tensor.dispose());\n}\n\n/**\n * Keeps a `tf.Tensor` generated inside a `tf.tidy` from being disposed\n * automatically.\n *\n * ```js\n * let b;\n * const y = tf.tidy(() => {\n * const one = tf.scalar(1);\n * const a = tf.scalar(2);\n *\n * // b will not be cleaned up by the tidy. a and one will be cleaned up\n * // when the tidy ends.\n * b = tf.keep(a.square());\n *\n * console.log('numTensors (in tidy): ' + tf.memory().numTensors);\n *\n * // The value returned inside the tidy function\n * will return\n * // through the tidy, in this case to the variable y.\n * return b.add(one);\n * });\n *\n * console.log('numTensors (outside tidy): ' + tf.memory().numTensors);\n * console.log('y:');\n * y.print();\n * console.log('b:');\n * b.print();\n * ```\n *\n * @param result The tensor to keep from being disposed.\n *\n * @doc {heading: 'Performance', subheading: 'Memory'}\n */\nexport function keep<T extends Tensor>(result: T): T {\n return ENGINE.keep(result);\n}\n\n/**\n * Executes `f()` and returns a promise that resolves with timing\n * information.\n *\n * The result is an object with the following properties:\n *\n * - `wallMs`: Wall execution time.\n * - `kernelMs`: Kernel execution time, ignoring data transfer. If using the\n * WebGL backend and the query timer extension is not available, this will\n * return an error object.\n * - On `WebGL` The following additional properties exist:\n * - `uploadWaitMs`: CPU blocking time on texture uploads.\n * - `downloadWaitMs`:
CPU blocking time on texture downloads (readPixels).\n *\n * ```js\n * const x = tf.randomNormal([20, 20]);\n * const time = await tf.time(() => x.matMul(x));\n *\n * console.log(`kernelMs: ${time.kernelMs}, wallTimeMs: ${time.wallMs}`);\n * ```\n *\n * @param f The function to execute and time.\n *\n * @doc {heading:

'Performance', subheading: 'Timing'}\n */\nexport function time(f: () => void): Promise<TimingInfo> {\n return ENGINE.time(f);\n}\n\n/**\n * Sets the backend (cpu, webgl, wasm, etc) responsible for creating tensors and\n * executing operations on those tensors. Returns a promise that resolves\n * to a boolean if the backend initialization was successful.\n *\n * Note this disposes the current backend, if any, as well as any tensors\n * associated with it. A new backend is initialized, even if it is of the\n * same type as the previous one.\n *\n * @param backendName The name of the backend. Currently supports\n *   `'webgl'|'cpu'` in the browser, `'tensorflow'`
 under node.js\n *   (requires tfjs-node), and `'wasm'` (requires tfjs-backend-wasm).\n *\n * @doc {heading: 'Backends'}\n */\nexport function setBackend(backendName: string): Promise<boolean> {\n return ENGINE.setBackend(backendName);\n}\n\n/**\n * Returns a promise that resolves when the currently selected backend (or the\n * highest priority one) has initialized. Await this promise when you are using\n * a backend that has async initialization.\n *\n * @doc {heading: 'Backends'}\n */\nexport function ready(): Promise<void> {\n return ENGINE.ready();\n}\n\n/**\n * Returns the current backend name (cpu, webgl, etc). The backend is\n * responsible for creating tensors and executing operations on those tensors.\n *\n * @doc {heading: 'Backends'}\n */\nexport function getBackend(): string {\n return ENGINE.backendName;\n}\n\n/**\n * Removes a backend and the registered factory.\n *\n * @doc {heading: 'Backends'}\n */\nexport function removeBackend(name: string): void {\n ENGINE.removeBackend(name);\n}\n\n/**\n
 * Finds the backend registered under the provided name. Returns null if the\n * name is not in the registry, or the registration hasn't finished yet.\n */\nexport function findBackend(name: string): KernelBackend {\n return ENGINE.findBackend(name);\n}\n\n/**\n * Finds the backend factory registered under the provided name. Returns a\n * function that produces a new backend when called. Returns null if the name\n * is not in the registry.\n */\nexport function findBackendFactory(name: string): () =>\n   KernelBackend | Promise<KernelBackend> {\n return ENGINE.findBackendFactory(name);\n}\n\n/**\n * Registers a global backend. The registration should happen when importing\n * a module file (e.g. when importing `backend_webgl.ts`), and is used for\n * modular builds (e.g. custom tfjs bundle with only webgl support).\n *\n * @param factory The backend factory function. When called, it should\n * return a backend instance, or a promise of an instance.\n *
 @param priority The priority of the backend (higher = more important).\n *   In case multiple backends are registered, the priority is used to find\n *   the best backend. Defaults to 1.\n * @return False if there is already a registered backend under this name, true\n *   if not.\n *\n * @doc {heading: 'Backends'}\n */\nexport function registerBackend(\n   name: string, factory: () => KernelBackend | Promise<KernelBackend>,\n   priority = 1): boolean {\n return ENGINE.registerBackend(name, factory, priority);\n}\n\n/**\n * Gets the current backend. If no backends have been initialized, this will\n * attempt to initialize the best backend. Will throw an error if the highest\n * priority backend has async initialization, in which case, you should call\n * 'await tf.ready()' before running other code.\n *\n * @doc {heading: 'Backends'}\n */\nexport function backend(): KernelBackend {\n return ENGINE.backend;\n}\n\n/**\n * Sets the global platform.\n *\n * @param platformName The
 name of this platform.\n * @param platform A platform implementation.\n */\nexport function setPlatform(platformName: string, platform: Platform) {\n env().setPlatform(platformName, platform);\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n
*/\nimport {ENGINE} from '../engine';\nimport {Add, AddInputs} from '../kernel_names';\nimport
 {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {makeTypesMatch} from '../tensor_util';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Adds two `tf.Tensor`s element-wise, A + B. Supports broadcasting.\n *\n *\n * ```js\n * const a = tf.tensor1d([1, 2, 3, 4]);\n * const b = tf.tensor1d([10, 20, 30, 40]);\n *\n * a.add(b).print(); // or

tf.add(a, b)\n * ```\n *\n * ```js\n * // Broadcast add a with b.\n * const a = tf.scalar(5);\n * const b = tf.tensor1d([10, 20, 30, 40]);\n *\n * a.add(b).print(); // or tf.add(a, b)\n * ```\n * @param a The first `tf.Tensor` to add.\n * @param b The second `tf.Tensor` to add. Must have the same type as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Arithmetic'}\n */\nfunction add_<T extends Tensor>(a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'add');\n let $b =
 convertToTensor(b, 'b', 'add');\n [$a, $b] = makeTypesMatch($a, $b);\n\n const inputs: AddInputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(Add, inputs as {} as NamedTensorMap);\n}\n\nexport const add = op({add_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {FloorDiv,
 FloorDivInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {makeTypesMatch} from '../tensor_util';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Divides two `tf.Tensor`s element-wise, A / B. Supports broadcasting.\n * The result is rounded with floor function.\n *\n *\n * ```js\n * const a = tf.tensor1d([1, 4, 9, 16]);\n * const b = tf.tensor1d([1, 2, 3, 4]);\n *\n * a.floorDiv(b).print(); // or tf.div(a, b)\n * ```\n *\n * ```js\n * // Broadcast div a with b.\n * const a = tf.tensor1d([2, 4, 6, 8]);\n * const b = tf.scalar(2);\n *\n * a.floorDiv(b).print(); // or tf.floorDiv(a, b)\n * ```\n *\n * @param a The first tensor as the numerator.\n * @param b The second tensor as the denominator. Must have the same dtype as\n * `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Arithmetic'}\n */\nfunction floorDiv_<T extends
 Tensor>(\n   a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'floorDiv');\n let $b = convertToTensor(b, 'b', 'floorDiv');\n [$a, $b] = makeTypesMatch($a, $b);\n\n const inputs: FloorDivInputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(FloorDiv, inputs as {} as NamedTensorMap);\n}\n\nexport const floorDiv = op({floorDiv_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under
 the License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {RealDiv, RealDivInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {makeTypesMatch} from '../tensor_util';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {floorDiv} from './floorDiv';\nimport {op} from './operation';\n\n/**\n * Divides two `tf.Tensor`s element-wise, A / B. Supports broadcasting.\n *\n * ```js\n * const a = tf.tensor1d([1, 4, 9, 16]);\n * const b = tf.tensor1d([1, 2, 3, 4]);\n *\n * a.div(b).print(); // or tf.div(a, b)\n * ```\n *\n * ```js\n * // Broadcast div a with b.\n * const a = tf.tensor1d([2, 4, 6, 8]);\n * const b = tf.scalar(2);\n *\n * a.div(b).print(); // or tf.div(a, b)\n * ```\n *\n * @param a The first tensor as the numerator.\n * @param b The second tensor as the denominator. Must have
 the same dtype as\n * `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Arithmetic'}\n */\nfunction div_<T extends Tensor>(a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'div');\n let $b = convertToTensor(b, 'b', 'div');\n [$a, $b] = makeTypesMatch($a, $b);\n\n if ($a.dtype === 'int32' && $b.dtype

=== 'int32') {\n return floorDiv($a, $b);\n }\n\n const inputs: RealDivInputs = {a: $a, b: $b};\n const attrs = {};\n\n // tslint:disable-next-line: no-unnecessary-type-assertion\n return ENGINE.runKernel(RealDiv, inputs as {} as NamedTensorMap, attrs) as T;\n}\n\nexport const div = op({div_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {ENGINE} from '../engine';\nimport {Multiply, MultiplyInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {makeTypesMatch} from '../tensor_util';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Multiplies two `tf.Tensor`s element-wise, A * B. Supports broadcasting.\n *\n * We also expose `tf.mulStrict` which has the same signature as this op and\n * asserts that `a` and `b` are the same shape (does not broadcast).\n *\n * ```js\n * const a = tf.tensor1d([1, 2, 3, 4]);\n * const b = tf.tensor1d([2, 3, 4, 5]);\n *\n * a.mul(b).print(); // or tf.mul(a, b)\n * ```\n *\n * ```js\n * // Broadcast mul a with b.\n * const a = tf.tensor1d([1, 2, 3, 4]);\n * const b = tf.scalar(5);\n *\n * a.mul(b).print(); // or tf.mul(a, b)\n * ```\n * @param a The first tensor to multiply.\n * @param b The second tensor to multiply. Must have the same dtype as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Arithmetic'}\n */\nfunction mul_<T extends Tensor>(a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'mul');\n let $b = convertToTensor(b, 'b', 'mul');\n [$a, $b] = makeTypesMatch($a, $b);\n\n const inputs: MultiplyInputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(Multiply, inputs as {} as NamedTensorMap);\n}\n\nexport const mul = op({mul_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {ENGINE} from '../engine';\nimport {Abs, AbsInputs, ComplexAbs, ComplexAbsInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes absolute value element-wise: `abs(x)`\n *\n * ```js\n * const x = tf.tensor1d([-1, 2, -3, 4]);\n *\n * x.abs().print(); // or tf.abs(x)\n * ```\n * @param x The input `tf.Tensor`.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction abs_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'abs');\n\n if ($x.dtype === 'complex64') {\n const inputs: ComplexAbsInputs = {x: $x};\n return ENGINE.runKernel(ComplexAbs, inputs as {} as NamedTensorMap);\n } else {\n const inputs: AbsInputs = {x: $x};\n return ENGINE.runKernel(Abs, inputs as {} as NamedTensorMap);\n }\n}\n\nexport const abs = op({abs_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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==========\n
*/\nimport {ENGINE} from '../engine';\nimport {Acos, AcosInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes acos of the input `tf.Tensor` element-wise: `acos(x)`\n *\n * ```js\n * const x = tf.tensor1d([0, 1, -1, .7]);\n *\n * x.acos().print();  // or tf.acos(x)\n * ```\n * @param x The input tensor.\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction acos_<T extends Tensor>(x: T|TensorLike): T {\n  const $x = convertToTensor(x, 'x', 'acos');\n  const inputs:
 AcosInputs = {x: $x};\n\n  return ENGINE.runKernel(Acos, inputs as {} as NamedTensorMap);\n}\nexport const acos = op({acos_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {ENGINE} from '../engine';\nimport {Acosh, AcoshInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap}
 from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes the inverse hyperbolic cos of the input `tf.Tensor` element-wise:\n * `acosh(x)`\n *\n * ```js\n * const x = tf.tensor1d([10, 1, 3, 5.7]);\n *\n * x.acosh().print();  // or tf.acosh(x)\n * ```\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction acosh_<T extends Tensor>(x: T|TensorLike): T {\n  const $x = convertToTensor(x, 'x', 'acosh');\n  const inputs: AcoshInputs = {x: $x};\n\n  return ENGINE.runKernel(Acosh, inputs as {} as NamedTensorMap);\n}\nexport const acosh = op({acosh_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n
 *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\nimport {ENGINE} from '../engine';\nimport {AddN, AddNInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {op} from './operation';\n\n/**\n * Adds a list of `tf.Tensor`s element-wise, each with the same shape and dtype.\n *\n * ```js\n * const a = tf.tensor1d([1, 2]);\n * const b = tf.tensor1d([3, 4]);\n * const c = tf.tensor1d([5, 6]);\n *\n * tf.addN([a,
 b, c]).print();\n * ```\n * @param tensors A list of tensors with the same shape and dtype.\n * @doc {heading: 'Operations', subheading: 'Arithmetic'}\n */\nfunction addN_<T extends Tensor>(tensors: Array<T|TensorLike>): T {\n  util.assert(\n      Array.isArray(tensors),\n      () => 'The argument passed to tf.addN() must be a list of tensors');\n  util.assert(\n      tensors.length >= 1,\n      () => `Must pass at least one tensor to tf.addN(), but got ` +\n
     `${tensors.length}`);\n\n  const $tensors =\n      tensors.map((t, i) => convertToTensor(t, `tensors${i}`,
'addN'));\n\n  const firstTensor = $tensors[0];\n  $tensors.forEach(t => {\n    if (t.dtype !== firstTensor.dtype) {\n      throw new Error(\n          'All tensors passed to tf.addN() must have the same dtype');\n    }\n  });\n\n
$tensors.forEach(t => {\n    if (!util.arraysEqual(t.shape, firstTensor.shape)) {\n      throw new Error(\n          'All
tensors passed to tf.addN() must have the same shape');\n    }\n
```

});\n\n const inputs: AddNInputs = $tensors;\n\n return ENGINE.runKernel(AddN, inputs as {} as NamedTensorMap);\n}\n\nexport const addN = op({addN_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {ENGINE} from '../engine';\nimport {All, AllAttrs, AllInputs} from '../kernel_names';\nimport {NamedAttrMap}
 from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes the logical and of elements across dimensions of a `tf.Tensor`.\n *\n * Reduces the input along the dimensions given in `axes`. Unless `keepDims`\n * is true, the rank of the `tf.Tensor` is reduced by 1 for each entry in\n * `axes`. If `keepDims` is true, the reduced dimensions are retained with\n * length 1. If `axes` has no entries, all dimensions are reduced, and an\n * `tf.Tensor` with a single element is returned.\n *\n * ```js\n * const x = tf.tensor1d([1, 1, 1], 'bool');\n *\n * x.all().print(); // or tf.all(x)\n * ```\n *\n * ```js\n * const x = tf.tensor2d([1, 1, 0, 0], [2, 2], 'bool');\n *\n * const axis = 1;\n * x.all(axis).print(); // or tf.all(x, axis)\n * ```\n *\n * @param x The input tensor. Must be of dtype bool.\n
 * @param axis The dimension(s) to reduce. By default it reduces\n *   all dimensions.\n * @param keepDims If true, retains reduced dimensions with size 1.\n *\n * @doc {heading: 'Operations', subheading: 'Reduction'}\n */\nfunction all_<T extends Tensor>(\n   x: Tensor|TensorLike, axis: number|number[] = null, keepDims = false): T {\n const $x = convertToTensor(x, 'x', 'all', 'bool');\n\n const inputs: AllInputs = {x: $x};\n const attrs: AllAttrs = {axis, keepDims};\n\n return ENGINE.runKernel(\n   All, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const all = op({all_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n
 * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {ENGINE} from '../engine';\nimport {Any, AnyAttrs, AnyInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes the logical or of elements across dimensions of a `tf.Tensor`.\n *\n * Reduces the input along the dimensions given in `axes`. Unless `keepDims`\n * is true, the rank of the `tf.Tensor` is reduced by 1 for each entry in\n * `axes`. If `keepDims` is true, the reduced dimensions are
 retained with\n * length 1. If `axes` has no entries, all dimensions are reduced, and an\n * `tf.Tensor` with a single element is returned.\n *\n * ```js\n * const x = tf.tensor1d([1, 1, 1], 'bool');\n *\n * x.any().print(); // or tf.any(x)\n * ```\n *\n * ```js\n * const x = tf.tensor2d([1, 1, 0, 0], [2, 2], 'bool');\n *\n * const axis = 1;\n * x.any(axis).print(); // or tf.any(x, axis)\n * ```\n *\n * @param x The input tensor. Must be of dtype bool.\n * @param axis The dimension(s) to reduce. By default it reduces\n *   all dimensions.\n * @param keepDims If true, retains reduced dimensions with size 1.\n *\n * @doc {heading: 'Operations', subheading: 'Reduction'}\n */\nfunction any_<T extends Tensor>(\n   x: Tensor|TensorLike, axis: number|number[] = null, keepDims = false): T {\n const $x = convertToTensor(x, 'x', 'any', 'bool');\n\n const inputs: AnyInputs = {x: $x};\n const attrs: AnyAttrs = {axis,

keepDims};\n\n return ENGINE.runKernel(\n   Any, inputs as {} as NamedTensorMap,
 attrs as {} as NamedAttrMap);\n}\n\n// tslint:disable-next-line:variable-name\nexport const any =
op({any_});\n","/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
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Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
==\n
*/\n\nimport {ENGINE} from '../engine';\nimport {ArgMax, ArgMaxAttrs, ArgMaxInputs} from
'../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport
 {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from
'../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Returns the
indices of the maximum values along an `axis`.\n *\n * The result has the same shape as `input` with the dimension
along `axis`\n * removed.\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3]);\n *\n * x.argMax().print(); // or
tf.argMax(x)\n * ```\n *\n * ```js\n * const x = tf.tensor2d([1, 2, 4, 3], [2, 2]);\n *\n * const axis = 1;\n *
x.argMax(axis).print(); // or tf.argMax(x, axis)\n * ```\n *\n * @param x The input tensor.\n * @param axis The
dimension to reduce. Defaults to 0 (outer-most dimension).\n *\n * @doc {heading: 'Operations', subheading:
'Reduction'}\n */\nfunction argMax_<T extends Tensor>(x: Tensor|TensorLike, axis = 0): T {\n const $x =
convertToTensor(x, 'x', 'argMax');\n\n const inputs: ArgMaxInputs = {x: $x};\n const attrs: ArgMaxAttrs
 = {axis};\n\n return ENGINE.runKernel(\n   ArgMax, inputs as {} as NamedTensorMap, attrs as {} as
NamedAttrMap);\n}\n\nexport const argMax = op({argMax_});\n","/**\n * @license\n * Copyright 2020 Google
Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {ENGINE} from '../engine';\nimport {ArgMin, ArgMinAttrs, ArgMinInputs} from
'../kernel_names';\nimport
 {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from
'../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from
'../types';\n\nimport {op} from './operation';\n\n/**\n * Returns the indices of the minimum values along an `axis`.\n
*\n * The result has the same shape as `input` with the dimension along `axis`\n * removed.\n *\n * ```js\n * const x
= tf.tensor1d([1, 2, 3]);\n *\n * x.argMin().print(); // or tf.argMin(x)\n * ```\n *\n * ```js\n * const x = tf.tensor2d([1,
2, 4, 3], [2, 2]);\n *\n * const axis = 1;\n * x.argMin(axis).print(); // or tf.argMin(x, axis)\n * ```\n *\n * @param x
The input tensor.\n * @param axis The dimension to reduce. Defaults to 0 (outer-most dimension).\n *\n * @doc
{heading: 'Operations', subheading: 'Reduction'}\n */\nfunction argMin_<T extends Tensor>(x: Tensor|TensorLike,
axis = 0): T {\n const $x = convertToTensor(x, 'x', 'argMin');\n\n const inputs:
 ArgMinInputs = {x: $x};\n const attrs: ArgMinAttrs = {axis};\n\n return ENGINE.runKernel(\n   ArgMin,
inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const argMin =
op({argMin_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or

implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Asin, AsinInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes asin of the input `tf.Tensor` element-wise: `asin(x)`\n *\n * ```js\n * const x = tf.tensor1d([0, 1, -1, .7]);\n *\n * x.asin().print(); // or tf.asin(x)\n * ```\n * @param x The input tensor.\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction asin_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'asin');\n const inputs: AsinInputs = {x: $x};\n\n return ENGINE.runKernel(Asin, inputs as {} as NamedTensorMap);\n}\nexport const asin = op({asin_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy
of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Asinh, AsinhInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes inverse hyperbolic sin of the input `tf.Tensor` element-wise:\n * `asinh(x)`\n *\n * ```js\n * const x = tf.tensor1d([0, 1, -1, .7]);\n *\n * x.asinh().print(); // or tf.asinh(x)\n * ```\n
* @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction asinh_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'asinh');\n\n const inputs: AsinhInputs = {x: $x};\n\n return ENGINE.runKernel(Asinh, inputs as {} as NamedTensorMap);\n}\nexport const asinh = op({asinh_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Atan, AtanInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes atan of the input `tf.Tensor` element-wise: `atan(x)`\n *\n * ```js\n * const x = tf.tensor1d([0, 1, -1, .7]);\n *\n * x.atan().print(); // or tf.atan(x)\n * ```\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction atan_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'atan');\n\n const inputs: AtanInputs = {x: $x};\n\n return ENGINE.runKernel(Atan, inputs as {} as NamedTensorMap);\n}\nexport const atan = op({atan_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or

implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Atan2, Atan2Inputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {makeTypesMatch} from '../tensor_util';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes
arctangent of `tf.Tensor`s a / b element-wise: `atan2(a, b)`.\n * Supports broadcasting.\n *\n * ```js\n * const a = tf.tensor1d([1.0, 1.0, -1.0, .7]);\n * const b = tf.tensor1d([2.0, 13.0, 3.5, .21]);\n *\n * tf.atan2(a, b).print()\n * ```\n *\n * @param a The first tensor.\n * @param b The second tensor. Must have the same dtype as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction atan2_<T extends Tensor>(\n a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'atan2');\n let $b = convertToTensor(b, 'b', 'atan2');\n [$a, $b] = makeTypesMatch($a, $b);\n\n const inputs: Atan2Inputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(Atan2, inputs as {} as NamedTensorMap);\n}\n\nexport const atan2 = op({atan2_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n
* You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Atanh, AtanhInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes inverse hyperbolic tan of the input `tf.Tensor` element-wise:\n * `atanh(x)`\n *\n * ```js\n * const x = tf.tensor1d([0, .1, -.1, .7]);\n *\n * x.atanh().print();
// or tf.atanh(x)\n * ```\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction atanh_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'atanh');\n\n const inputs: AtanhInputs = {x: $x};\n\n return ENGINE.runKernel(Atanh, inputs as {} as NamedTensorMap);\n}\nexport const atanh = op({atanh_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations
under the License.\n *
==========\n */\n\ntype PadType = 'SAME'|'VALID'|'NUMBER'|'EXPLICIT';\n\n// For NHWC should be in the following form:\n// [[0, 0], [pad_top,pad_bottom], [pad_left, pad_right], [0, 0]]\n// For NCHW should be in the following form:\n// [[0, 0], [0, 0], [pad_top,pad_bottom], [pad_left, pad_right]]\n// Reference: https://www.tensorflow.org/api_docs/python/tf/nn/conv2d\nexport type ExplicitPadding =\n [[number, number], [number, number], [number, number], [number, number]];\n\nexport type PadInfo = {\n top: number,\n left: number,\n right: number,\n bottom: number,\n type: PadType\n};\n\nexport type PadInfo3D = {\n top: number,\n left: number,\n right: number,\n bottom: number,\n front: number,\n back: number,\n type: PadType\n};\n\n/**\n * Information about the forward pass of a convolution/pooling operation.\n * It includes input and output shape, strides, filter size and padding\n

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 * information.\n */\nexport type Conv2DInfo = {\n  batchSize: number,\n  inHeight: number,\n  inWidth: number,\n inChannels: number,\n  outHeight: number,\n  outWidth: number,\n  outChannels: number,\n  dataFormat: 'channelsFirst'|'channelsLast',\n  strideHeight: number,\n  strideWidth: number,\n  dilationHeight: number,\n dilationWidth: number,\n  filterHeight: number,\n  filterWidth: number,\n  effectiveFilterHeight: number,\n effectiveFilterWidth: number,\n  padInfo: PadInfo,\n  inShape: [number, number, number, number],\n  outShape: [number, number, number, number],\n  filterShape: [number, number, number, number]\n};\n\n/**\n *\n * @param inputShape Input tensor shape is of the following dimensions:\n *     `[batch, height, width, inChannels]`.\n * @param filterShape The filter shape is of the following dimensions:\n *     `[filterHeight, filterWidth, depth]`.\n * @param strides The strides of the sliding window for each dimension of the\n *     input tensor: `[strideHeight, strideWidth]`.\n
 *     If `strides` is a single number,\n *     then `strideHeight == strideWidth`.\n * @param pad The type of padding algorithm.\n *    - `same` and stride 1: output will be of same size as input,\n *       regardless of filter size.\n *    - `valid`: output will be smaller than input if filter is larger\n *       than 1*1x1.\n *    - For more info, see this guide:\n *     [https://www.tensorflow.org/api_guides/python/nn#Convolution](\n * https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dataFormat The data format of the input and output data.\n *     Defaults to 'NHWC'.\n * @param dilations The dilation rates: `[dilationHeight, dilationWidth]`.\n *     Defaults to `[1, 1]`. If `dilations` is a single number, then\n *     `dilationHeight == dilationWidth`.\n */\nexport function computeDilation2DInfo(\n    inputShape: [number, number, number, number],\n    filterShape: [number, number, number], strides: number|[number, number],\n    pad: 'same'|'valid'|number,
 dataFormat: 'NHWC' = 'NHWC',\n    dilations: number|[number, number]) {\n  // `computerConv2DInfo` require filterShape to be in the dimension of:\n  // `[filterHeight, filterWidth, depth, outDepth]`, dilation2d doesn't have\n  // outDepth, it should have the same depth as the input.\n  // Input shape: [batch, height, width, inChannels]\n  const inputChannels = inputShape[3];\n  const $filterShape =\n      [...filterShape, inputChannels] as [number, number, number, number];\n  const $dataFormat = convertConv2DDataFormat(dataFormat);\n\n  return computeConv2DInfo(\n      inputShape, $filterShape, strides, dilations, pad,\n      null /* roundingMode */, null /* depthWise */, $dataFormat);\n}\n\nexport function computePool2DInfo(\n    inShape: [number, number, number, number],\n    filterSize: [number, number]|number, strides: number|[number, number],\n    dilations: number|[number, number], pad: 'same'|'valid'|number,\n    roundingMode?: 'floor'|'round'|'ceil',\n    dataFormat:
 'channelsFirst'|'channelsLast' = 'channelsLast'): Conv2DInfo {\n  const [filterHeight, filterWidth] = parseTupleParam(filterSize);\n\n  let filterShape: [number, number, number, number];\n  if (dataFormat === 'channelsLast') {\n    filterShape = [filterHeight, filterWidth, inShape[3], inShape[3]];\n  } else if (dataFormat === 'channelsFirst') {\n    filterShape = [filterHeight, filterWidth, inShape[1], inShape[1]];\n  } else {\n    throw new Error(`Unknown dataFormat ${dataFormat}`);\n  }\n\n  return computeConv2DInfo(\n      inShape, filterShape, strides, dilations, pad, roundingMode, false,\n      dataFormat);\n}\n\n/**\n * Computes the information for a forward pass of a pooling3D operation.\n */\nexport function computePool3DInfo(\n    inShape: [number, number, number, number, number],\n    filterSize: number|[number, number, number],\n    strides: number|[number, number, number],\n    dilations: number|[number, number, number], pad: 'same'|'valid'|number,\n    roundingMode?: 'floor'|'round'|'ceil',\n    dataFormat: 'NDHWC'|'NCDHW' = 'NDHWC'): Conv3DInfo {\n  const [filterDepth, filterHeight, filterWidth] = parse3TupleParam(filterSize);\n\n  let filterShape: [number, number, number, number, number];\n  let $dataFormat: 'channelsFirst'|'channelsLast';\n  if (dataFormat === 'NDHWC') {\n    $dataFormat = 'channelsLast';\n    filterShape =\n        [filterDepth, filterHeight, filterWidth, inShape[4], inShape[4]];\n  } else if (dataFormat === 'NCDHW') {\n    $dataFormat = 'channelsFirst';\n    filterShape =\n        [filterDepth, filterHeight, filterWidth, inShape[1], inShape[1]];\n  } else {\n    throw new Error(`Unknown dataFormat ${dataFormat}`);\n  }\n\n  return computeConv3DInfo(\n      inShape, filterShape, strides, dilations, pad, false, $dataFormat,\n roundingMode);\n}\n\n/**\n * Computes the information for a forward pass of a convolution/pooling\n * operation.\n */\nexport function computeConv2DInfo(\n    inShape: [number, number, number, number],\n
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 filterShape: [number, number, number, number],\n  strides: number|[number, number], dilations:
number|[number, number],\n  pad: 'same'|'valid'|number|ExplicitPadding,\n  roundingMode?: 'floor'|'round'|'ceil',
depthwise = false,\n  dataFormat: 'channelsFirst'|'channelsLast' = 'channelsLast'): Conv2DInfo {\n  let [batchSize,
inHeight, inWidth, inChannels] = [-1, -1, -1, -1];\n  if (dataFormat === 'channelsLast') {\n  [batchSize, inHeight,
inWidth, inChannels] = inShape;\n  } else if (dataFormat === 'channelsFirst') {\n  [batchSize, inChannels,
inHeight, inWidth] = inShape;\n  } else {\n  throw new Error(`Unknown dataFormat ${dataFormat}`);\n  }\n\n
const [filterHeight, filterWidth, , filterChannels] = filterShape;\n  const [strideHeight, strideWidth] =
parseTupleParam(strides);\n  const [dilationHeight, dilationWidth] = parseTupleParam(dilations);\n\n  const
effectiveFilterHeight =\n  getEffectiveFilterSize(filterHeight, dilationHeight);\n  const effectiveFilterWidth
 =\n  getEffectiveFilterSize(filterWidth, dilationWidth);\n  const {padInfo, outHeight, outWidth} =
getPadAndOutInfo(\n  pad, inHeight, inWidth, strideHeight, strideWidth, effectiveFilterHeight,\n
effectiveFilterWidth, roundingMode, dataFormat);\n\n  const outChannels = depthwise ? filterChannels *
inChannels : filterChannels;\n\n  let outShape: [number, number, number, number];\n  if (dataFormat ===
'channelsFirst') {\n  outShape = [batchSize, outChannels, outHeight, outWidth];\n  } else if (dataFormat ===
'channelsLast') {\n  outShape = [batchSize, outHeight, outWidth, outChannels];\n  }\n\n  return {\n  batchSize,\n
dataFormat,\n  inHeight,\n  inWidth,\n  inChannels,\n  outHeight,\n  outWidth,\n  outChannels,\n
padInfo,\n  strideHeight,\n  strideWidth,\n  filterHeight,\n  filterWidth,\n  effectiveFilterHeight,\n
effectiveFilterWidth,\n  dilationHeight,\n  dilationWidth,\n  inShape,\n  outShape,\n  filterShape\n
};\n}\n\n/**\n
 * Information about the forward pass of a 3D convolution/pooling operation.\n * It includes input and output shape,
strides, filter size and padding\n * information.\n */\nexport type Conv3DInfo = {\n  batchSize: number,\n  inDepth:
number,\n  inHeight: number,\n  inWidth: number,\n  inChannels: number,\n  outDepth: number,\n  outHeight:
number,\n  outWidth: number,\n  outChannels: number,\n  dataFormat: 'channelsFirst'|'channelsLast',\n  strideDepth:
number,\n  strideHeight: number,\n  strideWidth: number,\n  dilationDepth: number,\n  dilationHeight: number,\n
dilationWidth: number,\n  filterDepth: number,\n  filterHeight: number,\n  filterWidth: number,\n
effectiveFilterDepth: number,\n  effectiveFilterHeight: number,\n  effectiveFilterWidth: number,\n  padInfo:
PadInfo3D,\n  inShape: [number, number, number, number, number],\n  outShape: [number, number, number,
number, number],\n  filterShape: [number, number, number, number, number]\n};\n\n/**\n * Computes the
information
 for a forward pass of a 3D convolution/pooling\n * operation.\n */\nexport function computeConv3DInfo(\n
inShape: [number, number, number, number, number],\n  filterShape: [number, number, number, number,
number],\n  strides: number|[number, number, number],\n  dilations: number|[number, number, number], pad:
'same'|'valid'|number,\n  depthwise = false,\n  dataFormat: 'channelsFirst'|'channelsLast' = 'channelsLast',\n
roundingMode?: 'floor'|'round'|'ceil'): Conv3DInfo {\n  let [batchSize, inDepth, inHeight, inWidth, inChannels] =\n
 [-1, -1, -1, -1, -1];\n  if (dataFormat === 'channelsLast') {\n  [batchSize, inDepth, inHeight, inWidth, inChannels]
= inShape;\n  } else if (dataFormat === 'channelsFirst') {\n  [batchSize, inChannels, inDepth, inHeight, inWidth] =
inShape;\n  } else {\n  throw new Error(`Unknown dataFormat ${dataFormat}`);\n  }\n\n  const [filterDepth,
filterHeight, filterWidth, , filterChannels] =\n  filterShape;\n  const [strideDepth,
 strideHeight, strideWidth] = parse3TupleParam(strides);\n  const [dilationDepth, dilationHeight, dilationWidth] =\n
  parse3TupleParam(dilations);\n\n  const effectiveFilterDepth =\n  getEffectiveFilterSize(filterDepth,
dilationDepth);\n  const effectiveFilterHeight =\n  getEffectiveFilterSize(filterHeight, dilationHeight);\n  const
effectiveFilterWidth =\n  getEffectiveFilterSize(filterWidth, dilationWidth);\n  const {padInfo, outDepth,
outHeight, outWidth} = get3DPadAndOutInfo(\n  pad, inDepth, inHeight, inWidth, strideDepth, strideHeight,
strideWidth,\n  effectiveFilterDepth, effectiveFilterHeight, effectiveFilterWidth,\n  roundingMode);\n\n  const
outChannels = depthwise ? filterChannels * inChannels : filterChannels;\n\n  let outShape: [number, number,
number, number, number];\n  if (dataFormat === 'channelsFirst') {\n  outShape = [batchSize, outChannels,
outDepth, outHeight, outWidth];\n  } else if (dataFormat === 'channelsLast') {\n  outShape = [batchSize,
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outDepth, outHeight, outWidth, outChannels];\n }\n\n return {\n batchSize,\n dataFormat,\n inDepth,\n inHeight,\n inWidth,\n inChannels,\n outDepth,\n outHeight,\n outWidth,\n outChannels,\n padInfo,\n strideDepth,\n strideHeight,\n strideWidth,\n filterDepth,\n filterHeight,\n filterWidth,\n effectiveFilterDepth,\n effectiveFilterHeight,\n effectiveFilterWidth,\n dilationDepth,\n dilationHeight,\n dilationWidth,\n inShape,\n outShape,\n filterShape\n };\n}\n\nfunction computeOutputShape2D(\n inShape: [number, number], fieldSize: number, stride: number,\n zeroPad?: number, roundingMode?:\n 'floor'|'round'|'ceil'): [number, number] {\n if (zeroPad == null) {\n zeroPad = computeDefaultPad(inShape, fieldSize, stride);\n }\n const inputRows = inShape[0];\n const inputCols = inShape[1];\n\n const outputRows =\n round((inputRows - fieldSize + 2 * zeroPad) / stride + 1, roundingMode);\n\n const outputCols =\n round((inputCols - fieldSize + 2 * zeroPad) / stride + 1, roundingMode);\n\n return [outputRows, outputCols];\n}\n\nfunction computeOutputShape4D(\n inShape: [number, number, number, number], fieldSize: number,\n outChannels: number, stride: number, zeroPad?: number,\n roundingMode?:\n 'floor'|'round'|'ceil'): [number, number, number, number] {\n if (zeroPad == null) {\n zeroPad = computeDefaultPad(inShape, fieldSize, stride);\n }\n const inputDepth = inShape[0];\n const inputRows = inShape[1];\n const inputCols = inShape[2];\n\n const outputDepths =\n round((inputDepth - fieldSize + 2 * zeroPad) / stride + 1, roundingMode);\n const outputRows =\n round((inputRows - fieldSize + 2 * zeroPad) / stride + 1, roundingMode);\n const outputCols =\n round((inputCols - fieldSize + 2 * zeroPad) / stride + 1, roundingMode);\n\n return [outputDepths, outputRows, outputCols, outChannels];\n}\n\nexport function computeDefaultPad(\n inputShape:\n [number, number]|[number, number, number, number],\n fieldSize: number, stride: number, dilation = 1): number {\n const effectiveFieldSize = getEffectiveFilterSize(fieldSize, dilation);\n return Math.floor(\n (inputShape[0] * (stride - 1) - stride + effectiveFieldSize) / 2);\n}\n\nfunction parseTupleParam(param: number|number[]): [number, number, number] {\n if (typeof param === 'number') {\n return [param, param, param];\n }\n if (param.length === 2) {\n return [param[0], param[1], 1];\n }\n return param as [number, number, number];\n}\n\nfunction parse3TupleParam(param: number|[number, number, number]):\n [number, number, number] {\n return typeof param === 'number' ? [param, param, param] : param;\n}\n\n/* See https://www.tensorflow.org/api_docs/python/tf/nn/atrous_conv2d\n * Atrous convolution is equivalent to standard convolution with upsampled\n * filters with effective_filter_height =\n * filter_height + (filter_height - 1) * (dilation - 1)\n * and effective_filter_width =\n * filter_width + (filter_width - 1) * (dilation - 1),\n * produced by inserting dilation - 1 zeros along consecutive elements across\n * the filters' spatial dimensions.\n * When there is a dilation, this converts a filter dimension to the\n * effective filter dimension, so it can be used in a standard convolution.\n */\nfunction getEffectiveFilterSize(filterSize: number, dilation: number) {\n if (dilation <= 1) {\n return filterSize;\n }\n\n return filterSize + (filterSize - 1) * (dilation - 1);\n}\n\nfunction getPadAndOutInfo(\n pad: 'same'|'valid'|number|ExplicitPadding, inHeight: number,\n inWidth: number, strideHeight: number, strideWidth: number,\n filterHeight: number, filterWidth: number,\n roundingMode: 'floor'|'round'|'ceil',\n dataFormat: 'channelsFirst'|\n 'channelsLast'): {padInfo: PadInfo, outHeight: number, outWidth: number} {\n let padInfo: PadInfo;\n let outHeight: number;\n let outWidth: number;\n\n if (typeof pad === 'number') {\n const padType = (pad === 0) ? 'VALID' : 'NUMBER';\n padInfo = {top: pad, bottom: pad, left: pad, right: pad, type: padType};\n const outShape = computeOutputShape2D(\n [inHeight, inWidth], filterHeight, strideHeight, pad, roundingMode);\n outHeight = outShape[0];\n outWidth = outShape[1];\n } else if (pad === 'same') {\n outHeight = Math.ceil(inHeight / strideHeight);\n outWidth = Math.ceil(inWidth / strideWidth);\n const padAlongHeight =\n Math.max(0, (outHeight - 1) * strideHeight + filterHeight - inHeight);\n const padAlongWidth =\n Math.max(0, (outWidth - 1) * strideWidth + filterWidth - inWidth);\n const top = Math.floor(padAlongHeight / 2);\n const bottom = padAlongHeight - top;\n const left = Math.floor(padAlongWidth / 2);\n const right = padAlongWidth - left;\n padInfo = {top, bottom, left, right, type: 'SAME'};\n } else if (pad === 'valid') {\n padInfo = {top: 0, bottom: 0, left: 0, right:

0, type: 'VALID'};\n outHeight = Math.ceil((inHeight - filterHeight + 1) / strideHeight);\n outWidth = Math.ceil((inWidth - filterWidth + 1) / strideWidth);\n } else if (typeof pad === 'object') {\n const top = dataFormat === 'channelsLast' ? pad[1][0] : pad[2][0];\n const bottom = dataFormat === 'channelsLast' ? pad[1][1] : pad[2][1];\n const left = dataFormat === 'channelsLast' ? pad[2][0] : pad[3][0];\n const right = dataFormat === 'channelsLast' ? pad[2][1] : pad[3][1];\n const padType = (top === 0 && bottom === 0 && left === 0 && right === 0) ?\n 'VALID' :\n 'EXPLICIT';\n padInfo = {top, bottom, left, right, type: padType};\n outHeight = round(\n (inHeight - filterHeight + top + bottom) / strideHeight + 1,\n roundingMode);\n outWidth = round(\n (inWidth - filterWidth + left + right) / strideWidth + 1, roundingMode);\n } else {\n throw Error(`Unknown padding parameter: ${pad}`);\n }\n return {padInfo, outHeight,
outWidth};\n}\n\nfunction get3DPadAndOutInfo(\n pad: 'same'|'valid'|number, inDepth: number, inHeight: number,\n inWidth: number, strideDepth: number, strideHeight: number,\n strideWidth: number, filterDepth: number, filterHeight: number,\n filterWidth: number, roundingMode?: 'floor'|'round'|'ceil'): {\n padInfo: PadInfo3D,\n outDepth: number,\n outHeight: number,\n outWidth: number\n} {\n let padInfo: PadInfo3D;\n let outDepth: number;\n let outHeight: number;\n let outWidth: number;\n\n if (typeof pad === 'number') {\n const padType = (pad === 0) ? 'VALID' : 'NUMBER';\n padInfo = {\n top: pad,\n bottom: pad,\n left: pad,\n right: pad,\n front: pad,\n back: pad,\n type: padType\n };\n const outShape = computeOutputShape4D(\n [inDepth, inHeight, inWidth, 1], filterDepth, 1, strideDepth, pad,\n roundingMode);\n outDepth = outShape[0];\n outHeight = outShape[1];\n outWidth = outShape[2];\n } else if (pad === 'same') {\n outDepth = Math.ceil(inDepth / strideDepth);\n outHeight = Math.ceil(inHeight / strideHeight);\n outWidth = Math.ceil(inWidth / strideWidth);\n const padAlongDepth = (outDepth - 1) * strideDepth + filterDepth - inDepth;\n const padAlongHeight =\n (outHeight - 1) * strideHeight + filterHeight - inHeight;\n const padAlongWidth = (outWidth - 1) * strideWidth + filterWidth - inWidth;\n const front = Math.floor(padAlongDepth / 2);\n const back = padAlongDepth - front;\n const top = Math.floor(padAlongHeight / 2);\n const bottom = padAlongHeight - top;\n const left = Math.floor(padAlongWidth / 2);\n const right = padAlongWidth - left;\n\n padInfo = {top, bottom, left, right, front, back, type: 'SAME'};\n } else if (pad === 'valid') {\n padInfo = {\n top: 0,\n bottom: 0,\n left: 0,\n right: 0,\n front: 0,\n back: 0,\n type: 'VALID'\n };\n outDepth = Math.ceil((inDepth - filterDepth + 1) / strideDepth);\n outHeight = Math.ceil((inHeight - filterHeight + 1) / strideHeight);\n outWidth = Math.ceil((inWidth - filterWidth + 1) / strideWidth);\n } else {\n throw Error(`Unknown padding parameter: ${pad}`);\n }\n return {padInfo, outDepth, outHeight, outWidth};\n}\n\n/**\n * Rounds a value depending on the rounding mode\n * @param value\n * @param roundingMode A string from: 'ceil', 'round', 'floor'. If none is\n * provided, it will default to truncate.\n */\nfunction round(value: number, roundingMode?: 'floor'|'round'|'ceil') {\n if (!roundingMode) {\n return Math.trunc(value);\n }\n switch (roundingMode) {\n case 'round':\n // used for Caffe Conv\n return Math.round(value);\n case 'ceil':\n // used for Caffe Pool\n return Math.ceil(value);\n case 'floor':\n return Math.floor(value);\n default:\n throw new Error(`Unknown roundingMode ${roundingMode}`);\n }\n}\n\nexport function tupleValuesAreOne(param: number|number[]): boolean {\n const [dimA, dimB, dimC] = parseTupleParam(param);\n return dimA === 1 && dimB === 1 && dimC === 1;\n}\n\nexport function eitherStridesOrDilationsAreOne(\n strides: number|number[], dilations: number|number[]): boolean {\n return tupleValuesAreOne(strides) || tupleValuesAreOne(dilations);\n}\n\n/**\n * Convert Conv2D dataFormat from 'NHWC'|'NCHW' to\n * 'channelsLast'|'channelsFirst'\n * @param dataFormat in 'NHWC'|'NCHW' mode\n * @return dataFormat in 'channelsLast'|'channelsFirst' mode\n * @throws unknown dataFormat\n */\nexport function convertConv2DDataFormat(dataFormat: 'NHWC'|'NCHW'):\n 'channelsLast'|'channelsFirst' {\n if (dataFormat === 'NHWC') {\n return 'channelsLast';\n } else if (dataFormat === 'NCHW') {\n return 'channelsFirst';\n } else {\n throw new Error(`Unknown dataFormat ${dataFormat}`);\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License,

Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Reshape, ReshapeAttrs, ReshapeInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {Rank, ShapeMap, TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Reshapes a `tf.Tensor` to a given shape.\n *\n * Given an input tensor, returns a new tensor with the same values as the\n * input tensor with shape `shape`.\n *\n * If one component of shape is the special value -1, the size of that\n * dimension is computed so that the total size remains constant. In\n * particular, a shape of [-1] flattens into 1-D. At most one component of\n * shape can be -1.\n *\n * If shape is 1-D or higher, then the operation returns a tensor with shape\n * shape filled with the values of tensor. In this case, the number of\n * elements implied by shape must be the same as the number of elements in\n * tensor.\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3, 4]);\n * x.reshape([2, 2]).print();\n * ```\n *\n * @param x The input tensor to be reshaped.\n * @param shape An array of integers defining the output tensor shape.\n *\n * @doc {heading: 'Tensors', subheading: 'Transformations'}\n */\nfunction reshape_<R extends Rank>(\n x: Tensor|TensorLike,
 shape: ShapeMap[R]): Tensor<R> {\n const $x = convertToTensor(x, 'x', 'reshape', 'string_or_numeric');\n\n const inputs: ReshapeInputs = {x: $x};\n const attrs: ReshapeAttrs = {shape};\n return ENGINE.runKernel(\n Reshape, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\nexport const reshape = op({reshape_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {AvgPool, AvgPoolAttrs, AvgPoolInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor3D, Tensor4D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {cast} from './cast';\nimport * as conv_util from './conv_util';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Computes the 2D average pooling of an image.\n *\n * @param x The input tensor, of rank 4 or rank 3 of shape\n * `[batch, height, width, inChannels]`. If rank 3, batch of 1 is assumed.\n * @param filterSize The filter size: `[filterHeight, filterWidth]`. If\n * `filterSize` is a single number, then `filterHeight == filterWidth`.\n * @param strides The strides of the pooling: `[strideHeight,
 strideWidth]`. If\n * `strides` is a single number, then `strideHeight == strideWidth`.\n * @param pad The type of padding algorithm:\n * - `same` and stride 1: output will be of same size as input,\n * regardless of filter size.\n * - `valid`: output will be smaller than input if filter is larger\n * than 1x1.\n * - For more info, see this guide:\n * [https://www.tensorflow.org/api_guides/python/nn#Convolution](\n * https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dimRoundingMode A string from: 'ceil', 'round', 'floor'. If none is\n * provided, it will default to truncate.\n */\nfunction avgPool_<T extends Tensor3D|Tensor4D>(\n x: T|TensorLike, filterSize: [number, number]|number,\n strides: [number, number]|number, pad: 'valid'|'same'|number,\n dimRoundingMode?: 'floor'|'round'|'ceil'): T {\n const $x = convertToTensor(x, 'x', 'avgPool', 'float32');\n const dilations = 1;\n\n util.assert(\n

```
conv_util.eitherStridesOrDilationsAreOne(strides,
 dilations),\n      () => 'Error in avgPool: Either strides or dilations must be 1. ' +\n          `Got strides ${strides} and
dilations '${dilations}'`);\n\n  let x4D = $x as Tensor4D;\n  let reshapedTo4D = false;\n  if ($x.rank === 3) {\n
reshapedTo4D = true;\n    x4D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2]]);\n  }\n\n  util.assert(\n
x4D.rank === 4,\n      () => `Error in avgPool: x must be rank 4 but got rank ${x4D.rank}.`);\n\n  if
(dimRoundingMode != null) {\n    util.assert(\n        util.isInt(pad as number),\n        () => `Error in avgPool: pad
must be an integer when using, ` +\n            `dimRoundingMode ${dimRoundingMode} but got pad ${pad}.`);\n
}\n\n  const inputs: AvgPoolInputs = {x: x4D};\n\n  const attrs: AvgPoolAttrs = {filterSize, strides, pad,
dimRoundingMode};\n\n  // tslint:disable-next-line: no-unnecessary-type-assertion\n  let res =
ENGINE.runKernel(\n              AvgPool, inputs as {} as NamedTensorMap,\n
          attrs as {} as NamedAttrMap) as T;\n\n  res = cast(res, $x.dtype);\n\n  if (reshapedTo4D) {\n    return
reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as T;\n  }\n\n  return res;\n}\n\nexport const avgPool =
op({avgPool_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
==========================================================================\n
*/\n\nimport {ENGINE}
 from '../engine';\nimport {AvgPool3D, AvgPool3DAttrs, AvgPool3DInputs} from '../kernel_names';\nimport
{NamedAttrMap} from '../kernel_registry';\nimport {Tensor4D, Tensor5D} from '../tensor';\nimport
{NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport
{TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {cast} from './cast';\nimport {op} from
'./operation';\nimport {reshape} from './reshape';\n\n/**\n * Computes the 3D average pooling.\n *\n * ```js\n * const
x = tf.tensor5d([1, 2, 3, 4, 5, 6, 7, 8], [1, 2, 2, 2, 1]);\n * const result = tf.avgPool3d(x, 2, 1, 'valid');\n *
result.print();\n * ```\n *\n * @param x The input tensor, of rank 5 or rank 4 of shape\n *     `[batch, depth, height,
width, inChannels]`.\n * @param filterSize The filter size:\n *     `[filterDepth, filterHeight, filterWidth]`.\n *     If
`filterSize` is a single number,\n *     then `filterDepth == filterHeight == filterWidth`.\n * @param
 strides The strides of the pooling:\n *     `[strideDepth, strideHeight, strideWidth]`.\n *     If `strides` is a single
number,\n *     then `strideDepth == strideHeight == strideWidth`.\n * @param pad The type of padding
algorithm.\n *    - `same` and stride 1: output will be of same size as input,\n *       regardless of filter size.\n *    -
`valid`: output will be smaller than input if filter is larger\n *       than 1*1x1.\n *    - For more info, see this guide:\n
*     [https://www.tensorflow.org/api_guides/python/nn#Convolution](\n *
https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dimRoundingMode A string from:
'ceil', 'round', 'floor'. If none is\n *     provided, it will default to truncate.\n * @param dataFormat An optional string
from: \"NDHWC\", \"NCDHW\". Defaults to\n *     \"NDHWC\". Specify the data format of the input and output
data. With the\n *     default format \"NDHWC\", the data is stored in the order of: [batch,\n *     depth,
 height, width, channels]. Only \"NDHWC\" is currently supported.\n *\n * @doc {heading: 'Operations',
subheading: 'Convolution'}\n */\nfunction avgPool3d_<T extends Tensor4D|Tensor5D>(\n    x: T|TensorLike,
filterSize: [number, number, number]|number,\n    strides: [number, number, number]|number, pad:
'valid'|'same'|number,\n    dimRoundingMode?: 'floor'|'round'|'ceil',\n    dataFormat: 'NDHWC'|'NCDHW' =
'NDHWC'): T {\n  const $x = convertToTensor(x, 'x', 'avgPool3d', 'float32');\n\n  let x5D = $x as Tensor5D;\n  let
reshapedTo5D = false;\n  if ($x.rank === 4) {\n    reshapedTo5D = true;\n    x5D = reshape($x, [1, $x.shape[0],
$x.shape[1], $x.shape[2], $x.shape[3]]);\n  }\n\n  util.assert(\n      x5D.rank === 5,\n      () => `Error in avgPool3d: x
must be rank 5 but got rank ${x5D.rank}.`);\n  util.assert(\n      dataFormat === 'NDHWC',\n      () => `Error in
avgPool3d: Only NDHWC is currently supported, ` +\n          `but got dataFormat of ${dataFormat}`);\n\n  if
```

(dimRoundingMode
 != null) {\n   util.assert(\n   util.isInt(pad as number),\n   () => `Error in avgPool3d: pad must be an integer when using, ` +\n   `dimRoundingMode ${dimRoundingMode} but got pad ${pad}.`);\n }\n\n const inputs: AvgPool3DInputs = {x: x5D};\n\n const attrs:\n   AvgPool3DAttrs = {filterSize, strides, pad, dimRoundingMode, dataFormat};\n\n // tslint:disable-next-line: no-unnecessary-type-assertion\n let res = ENGINE.runKernel(\n   AvgPool3D, inputs as {} as NamedTensorMap,\n   attrs as {} as NamedAttrMap) as T;\n\n res = cast(res, x5D.dtype);\n\n if (reshapedTo5D) {\n   return reshape(\n   res, [res.shape[1], res.shape[2], res.shape[3], res.shape[4]]) as\n   T;\n }\n\n return res;\n}\n\nexport const avgPool3d = op({avgPool3d_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance
 with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport {ENGINE} from '../engine';\nimport {Concat, ConcatAttrs, ConcatInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensorArray} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {assert} from '../util';\n\nimport {clone} from './clone';\nimport {op} from './operation';\n\n/**\n * Concatenates a list
 of `tf.Tensor`s along a given axis.\n *\n * The tensors ranks and types must match, and their sizes must match in all\n * dimensions except `axis`.\n *\n * Also available are stricter rank-specific methods that assert that\n * `tensors` are of the given rank:\n *   - `tf.concat1d`\n *   - `tf.concat2d`\n *   - `tf.concat3d`\n *   - `tf.concat4d`\n *\n * Except `tf.concat1d` (which does not have axis param), all methods have\n * same signature as this method.\n *\n * ```js\n * const a = tf.tensor1d([1, 2]);\n * const b = tf.tensor1d([3, 4]);\n * a.concat(b).print(); // or a.concat(b)\n * ```\n *\n * ```js\n * const a = tf.tensor1d([1, 2]);\n * const b = tf.tensor1d([3, 4]);\n * const c = tf.tensor1d([5, 6]);\n * tf.concat([a, b, c]).print();\n * ```\n *\n * ```js\n * const a = tf.tensor2d([[1, 2], [10, 20]]);\n * const b = tf.tensor2d([[3, 4], [30, 40]]);\n * const axis = 1;\n * tf.concat([a, b], axis).print();\n * ```\n * @param tensors A list of tensors to concatenate.\n * @param
 axis The axis to concate along. Defaults to 0 (the first dim).\n *\n * @doc {heading: 'Tensors', subheading: 'Slicing and Joining'}\n */\nfunction concat_<T extends Tensor>(tensors: Array<T|TensorLike>, axis = 0): T {\n assert(tensors.length >= 1, () => 'Pass at least one tensor to concat');\n\n const $tensors =\n   convertToTensorArray(tensors, 'tensors', 'concat', 'string_or_numeric');\n\n if ($tensors[0].dtype === 'complex64') {\n $tensors.forEach(tensor => {\n   if (tensor.dtype !== 'complex64') {\n   throw new Error(`Cannot concatenate complex64 tensors with a tensor\n            with dtype ${tensor.dtype}. `);\n   }\n   });\n }\n\n if ($tensors.length === 1) {\n   return clone($tensors[0]);\n }\n\n const inputs: ConcatInputs = $tensors;\n const attr: ConcatAttrs = {axis};\n\n return ENGINE.runKernel(\n   Concat, inputs as {} as NamedTensorMap, attr as {} as NamedAttrMap);\n}\n\nexport const concat = op({concat_});\n","/**\n * @license\n * Copyright 2018
 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {ENGINE} from '../engine';\nimport {Sigmoid, SigmoidInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from

'../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes sigmoid element-wise, `1 / (1 + exp(-x))`\n *\n * ```js\n * const x = tf.tensor1d([0, -1, 2, -3]);\n *\n * x.sigmoid().print(); // or tf.sigmoid(x)\n * ```\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction sigmoid_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'sigmoid');\n\n const inputs: SigmoidInputs = {x: $x};\n\n return ENGINE.runKernel(Sigmoid, inputs as {} as NamedTensorMap);\n}\nexport const sigmoid = op({sigmoid_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT
 WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {ENGINE} from '../engine';\nimport {Slice, SliceAttrs, SliceInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {Rank, TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Extracts a slice from a `tf.Tensor` starting at coordinates `begin`\n * and is of size `size`.\n *\n * Also available are stricter rank-specific methods with the same signature\n * as this method that assert that `x` is of the given rank:\n *   - `tf.slice1d`\n *   - `tf.slice2d`\n *   - `tf.slice3d`\n *   - `tf.slice4d`\n *\n * ```js\n * const x = tf.tensor1d([1,
 2, 3, 4]);\n *\n * x.slice([1], [2]).print();\n * ```\n *\n * ```js\n * const x = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n *\n * x.slice([1, 0], [1, 2]).print();\n * ```\n * @param x The input `tf.Tensor` to slice from.\n * @param begin The coordinates to start the slice from. The length can be\n *   less than the rank of x - the rest of the axes will have implicit 0 as\n *   start. Can also be a single number, in which case it specifies the\n *   first axis.\n * @param size The size of the slice. The length can be less than the rank of\n *   x - the rest of the axes will have implicit -1. A value of -1 requests\n *   the rest of the dimensions in the axis. Can also be a single number,\n *   in which case it specifies the size of the first axis.\n *\n * @doc {heading: 'Tensors', subheading: 'Slicing and Joining'}\n */\nfunction slice_<R extends Rank, T extends Tensor<R>>(\n   x: T|TensorLike, begin: number|number[], size?: number|number[]): T {\n const $x = convertToTensor(x,
 'x', 'slice', 'string_or_numeric');\n\n if ($x.rank === 0) {\n   throw new Error('Slicing scalar is not possible');\n }\n\n const inputs: SliceInputs = {x: $x};\n const attrs: SliceAttrs = {begin, size};\n\n return ENGINE.runKernel(\n   Slice, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const slice = op({slice_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n
 * ==\n
*/\n\nimport {ENGINE} from '../engine';\nimport {Tanh, TanhInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes hyperbolic tangent of the input `tf.Tensor` element-wise: `tanh(x)`\n *\n * ```js\n * const x = tf.tensor1d([0, 1, -1, 70]);\n *\n * x.tanh().print(); // or tf.tanh(x)\n * ```\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction tanh_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'tanh');\n\n const inputs: TanhInputs = {x: $x};\n\n return ENGINE.runKernel(Tanh, inputs

as {} as NamedTensorMap);\n}\nexport const tanh = op({tanh_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n
 * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {Scalar, Tensor1D, Tensor2D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {add} from './add';\nimport {concat} from './concat';\nimport {matMul} from './mat_mul';\nimport {mul} from './mul';\nimport {op} from './operation';\nimport {sigmoid} from './sigmoid';\nimport
 {slice} from './slice';\nimport {tanh} from './tanh';\n\n/**\n * Computes the next state and output of a BasicLSTMCell.\n *\n * Returns `[newC, newH]`.\n *\n * Derived from tf.contrib.rnn.BasicLSTMCell.\n *\n * @param forgetBias Forget bias for the cell.\n * @param lstmKernel The weights for the cell.\n * @param lstmBias The bias for the cell.\n * @param data The input to the cell.\n * @param c Previous cell state.\n * @param h Previous cell output.\n *\n * @doc {heading: 'Operations', subheading: 'RNN'}\n */\nfunction basicLSTMCell_(\n forgetBias: Scalar|TensorLike, lstmKernel: Tensor2D|TensorLike,\n   lstmBias: Tensor1D|TensorLike, data: Tensor2D|TensorLike,\n   c: Tensor2D|TensorLike, h: Tensor2D|TensorLike): [Tensor2D, Tensor2D] {\n const $forgetBias =\n   convertToTensor(forgetBias, 'forgetBias', 'basicLSTMCell');\n const $lstmKernel =\n convertToTensor(lstmKernel, 'lstmKernel', 'basicLSTMCell');\n const $lstmBias = convertToTensor(lstmBias, 'lstmBias',
 'basicLSTMCell');\n const $data = convertToTensor(data, 'data', 'basicLSTMCell');\n const $c = convertToTensor(c, 'c', 'basicLSTMCell');\n const $h = convertToTensor(h, 'h', 'basicLSTMCell');\n\n const combined = concat([$data, $h], 1);\n const weighted = matMul(combined, $lstmKernel);\n const res: Tensor2D = add(weighted, $lstmBias);\n\n // i = input_gate, j = new_input, f = forget_gate, o = output_gate\n const batchSize = res.shape[0];\n const sliceCols = res.shape[1] / 4;\n const sliceSize: [number, number] = [batchSize, sliceCols];\n const i = slice(res, [0, 0], sliceSize);\n const j = slice(res, [0, sliceCols], sliceSize);\n const f = slice(res, [0, sliceCols * 2], sliceSize);\n const o = slice(res, [0, sliceCols * 3], sliceSize);\n\n const newC: Tensor2D =\n add(mul(sigmoid(i), tanh(j)),\n   mul($c, sigmoid(add($forgetBias, f)) as Tensor2D));\n const newH: Tensor2D = mul(tanh(newC), sigmoid(o));\n return [newC, newH];\n}\n\nexport const basicLSTMCell
 = op({basicLSTMCell_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {ENGINE} from '../engine';\nimport {BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport
 {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {op} from './operation';\n\n/**\n * This operation reshapes the \"batch\" dimension 0 into `M + 1` dimensions of\n * shape `blockShape + [batch]`, interleaves these blocks back into the grid\n * defined by the spatial dimensions `[1, ..., M]`, to obtain a result with\n * the same rank as the input. The spatial dimensions of this intermediate\n * result are then optionally cropped according to `crops` to produce the\n * output. This is the reverse

of `tf.spaceToBatchND`. See below for a precise\n * description.\n *\n * ```js\n * const x = tf.tensor4d([1, 2, 3, 4], [4, 1, 1, 1]);\n * const blockShape = [2, 2];\n * const crops = [[0, 0], [0, 0]];\n *\n * x.batchToSpaceND(blockShape, crops).print();\n * ```\n *\n * @param x A `tf.Tensor`. N-D with `x.shape` = `[batch] + spatialShape +\n * remainingShape`, where spatialShape has `M` dimensions.\n
 * @param blockShape A 1-D array. Must have shape `[M]`, all values must\n * be >= 1.\n * @param crops A 2-D array. Must have shape `[M, 2]`, all values must be >= 0.\n * `crops[i] = [cropStart, cropEnd]` specifies the amount to crop from input\n * dimension `i + 1`, which corresponds to spatial dimension `i`. It is required\n * that `cropStart[i] + cropEnd[i] <= blockShape[i] * inputShape[i + 1]`\n *\n * This operation is equivalent to the following steps:\n *\n * 1. Reshape `x` to `reshaped` of shape: `[blockShape[0], ...,\n * blockShape[M-1], batch / prod(blockShape), x.shape[1], ...,\n * x.shape[N-1]]`\n *\n * 2. Permute dimensions of `reshaped`to produce `permuted` of shape `[batch /\n * prod(blockShape),x.shape[1], blockShape[0], ..., x.shape[M],\n * blockShape[M-1],x.shape[M+1], ..., x.shape[N-1]]`\n *\n * 3. Reshape `permuted` to produce `reshapedPermuted` of shape `[batch /\n * prod(blockShape),x.shape[1] * blockShape[0], ..., x.shape[M] *\n * blockShape[M-1],x.shape[M+1],
 ..., x.shape[N-1]]`\n *\n * 4. Crop the start and end of dimensions `[1, ..., M]` of `reshapedPermuted`\n * according to `crops` to produce the output of shape: `[batch /\n * prod(blockShape),x.shape[1] * blockShape[0] - crops[0,0] - crops[0,1],\n * ..., x.shape[M] * blockShape[M-1] - crops[M-1,0] -\n * crops[M-1,1],x.shape[M+1], ..., x.shape[N-1]]`\n *\n * @doc {heading: 'Tensors', subheading: 'Transformations'}\n */\nfunction batchToSpaceND_<T extends Tensor>(\n   x: T|TensorLike, blockShape: number[], crops: number[][]): T {\n const $x = convertToTensor(x, 'x', 'batchToSpaceND');\n const prod = blockShape.reduce((a, b) => a * b);\n\n util.assert(\n $x.rank >= 1 + blockShape.length,\n   () => `input rank is ${$x.rank} but should be > than blockShape.length ${\n blockShape.length}`);\n\n util.assert(\n   crops.length === blockShape.length,\n   () => `crops.length is ${\n  crops.length} but should be equal to blockShape.length  ${\n          blockShape.length}`);\n\n
  util.assert(\n $x.shape[0] % prod === 0,\n   () => `input tensor batch is ${\n              $x.shape[0]} but is not divisible by the product of ` +\n   `the elements of blockShape ${blockShape.join(' * ')} === ${prod}`);\n\n
 const inputs: BatchToSpaceNDInputs = {x: $x};\n const attrs: BatchToSpaceNDAttrs = {blockShape, crops};\n\n
 return ENGINE.runKernel(\n   BatchToSpaceND, inputs as {} as NamedTensorMap,\n   attrs as {} as NamedAttrMap);\n}\n\nexport const batchToSpaceND = op({batchToSpaceND_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n
 */\nimport {Tensor, Tensor4D} from '../tensor';\nimport {Rank} from '../types';\nimport {reshape} from './reshape';\n\nexport function xAs4D<R extends Rank>(x: Tensor<R>) {\n let x4D: Tensor4D;\n if (x.rank === 0 || x.rank === 1) {\n   x4D = reshape(x, [1, 1, 1, x.size]);\n } else if (x.rank === 2) {\n   x4D = reshape(x, [1, 1, x.shape[0], x.shape[1]]);\n } else if (x.rank === 3) {\n   x4D = reshape(x, [1, x.shape[0], x.shape[1], x.shape[2]]);\n } else {\n   x4D = x as Tensor4D;\n }\n\n return x4D;\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n
 * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ==\n
 */\n\nimport {ENGINE} from '../engine';\nimport {FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport

{Tensor, Tensor1D, Tensor4D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {Rank, TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {xAs4D} from './batchnorm_util';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Batch normalization.\n *\n * As described in\n * http://arxiv.org/abs/1502.03167.\n *\n * Mean, variance, scale, and offset can be of two shapes:\n *   - The same shape as the input.\n *   - In the common case, the depth dimension is the last dimension of x, so\n *   the values would be an `tf.Tensor1D` of shape [depth].\n *\n * Also available are stricter rank-specific methods with the same signature\n * as this method that assert that parameters passed are of given rank\n *   - `tf.batchNorm2d`\n *   - `tf.batchNorm3d`\n *   - `tf.batchNorm4d`\n *\n * @param x The input Tensor.\n * @param mean A mean Tensor.\n * @param variance A variance Tensor.\n * @param offset An offset Tensor.\n * @param scale A scale Tensor.\n * @param varianceEpsilon A small float number to avoid dividing by 0.\n *\n * @doc {heading: 'Operations', subheading: 'Normalization'}\n */\nfunction batchNorm_<R extends Rank>(\n x: Tensor<R>|TensorLike, mean: Tensor<R>|Tensor1D|TensorLike,\n   variance: Tensor<R>|Tensor1D|TensorLike,\n   offset?: Tensor<R>|Tensor1D|TensorLike,\n   scale?: Tensor<R>|Tensor1D|TensorLike,\n   varianceEpsilon?: number): Tensor<R> {\n if (varianceEpsilon == null) {\n varianceEpsilon = 0.001;\n }\n const $x = convertToTensor(x, 'x', 'batchNorm');\n const $mean = convertToTensor(mean, 'mean', 'batchNorm');\n const $variance = convertToTensor(variance, 'variance', 'batchNorm');\n let $scale: Tensor<R>|Tensor1D;\n if (scale != null) {\n $scale = convertToTensor(scale, 'scale', 'batchNorm');\n }\n let $offset: Tensor<R>|Tensor1D;\n if (offset != null) {\n $offset = convertToTensor(offset, 'offset', 'batchNorm');\n }\n\n util.assert(\n $mean.rank === $variance.rank,\n   () => 'Batch normalization gradient requires mean and variance to have ' +\n   'equal ranks.');\n util.assert(\n $offset == null || $mean.rank === $offset.rank,\n   () =>
'Batch normalization gradient requires mean and offset to have ' +\n   'equal ranks.');\n util.assert(\n $scale == null || $mean.rank === $scale.rank,\n   () => 'Batch normalization gradient requires mean and scale to have ' +\n   'equal ranks.');\n\n const x4D: Tensor4D = xAs4D($x);\n\n const inputs: FusedBatchNormInputs = {\n x: x4D,\n   scale: $scale,\n   offset: $offset,\n   mean: $mean,\n   variance: $variance\n };\n\n const attrs: FusedBatchNormAttrs = {varianceEpsilon};\n\n // tslint:disable-next-line: no-unnecessary-type-assertion\n const res = ENGINE.runKernel(\n   FusedBatchNorm, inputs as {} as NamedTensorMap,\n   attrs as {} as NamedAttrMap) as Tensor<R>;\n\n return reshape(res, $x.shape);\n}\n\nexport const batchNorm = op({batchNorm_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\nimport {Tensor1D, Tensor2D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {batchNorm} from './batchnorm';\nimport {op} from './operation';\n\n/**\n * Batch normalization, strictly for 2D. For the more relaxed version, see\n * `tf.batchNorm`.\n *\n * @param x The input Tensor.\n * @param mean A mean Tensor.\n * @param variance A variance
Tensor.\n * @param offset An offset Tensor.\n * @param scale A scale Tensor.\n * @param varianceEpsilon A small float number to avoid dividing by 0.\n */\nfunction batchNorm2d_(\n   x: Tensor2D|TensorLike, mean: Tensor2D|Tensor1D|TensorLike,\n   variance: Tensor2D|Tensor1D|TensorLike,\n   offset?: Tensor2D|Tensor1D|TensorLike, scale?: Tensor2D|Tensor1D|TensorLike,\n   varianceEpsilon?: number): Tensor2D {\n const $x = convertToTensor(x, 'x', 'batchNorm');\n const $mean = convertToTensor(mean, 'mean',

'batchNorm');\n const $variance = convertToTensor(variance, 'variance', 'batchNorm');\n let $scale: Tensor2D|Tensor1D;\n if (scale != null) {\n $scale = convertToTensor(scale, 'scale', 'batchNorm');\n }\n let $offset: Tensor2D|Tensor1D;\n if (offset != null) {\n $offset = convertToTensor(offset, 'offset', 'batchNorm');\n }\n util.assert(\n $x.rank === 2,\n   () => `Error in batchNorm2D: x must be rank 2 but got rank ` +\n   `${$x.rank}.`);\n util.assert(\n $mean.rank === 2 || $mean.rank === 1,\n   () => `Error in batchNorm2D: mean must be rank 2 or rank 1 but ` +\n   `got rank ${$mean.rank}.`);\n util.assert(\n $variance.rank === 2 || $variance.rank === 1,\n   () => `Error in batchNorm2D: variance must be rank 2 or rank 1 ` +\n   `but got rank ${$variance.rank}.`);\n if ($scale != null) {\n   util.assert(\n $scale.rank === 2 || $scale.rank === 1,\n   () => `Error in batchNorm2D: scale must be rank 2 or rank 1 ` +\n   `but got rank ${$scale.rank}.`);\n }\n if ($offset != null) {\n   util.assert(\n $offset.rank === 2 || $offset.rank === 1,\n   () => `Error in batchNorm2D: offset must be rank 2 or rank 1 ` +\n   `but got rank ${$offset.rank}.`);\n }\n\n return batchNorm($x, $mean, $variance, $offset, $scale, varianceEpsilon);\n}\n\nexport const batchNorm2d = op({batchNorm2d_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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==\n */\nimport {Tensor1D, Tensor3D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {batchNorm} from './batchnorm';\nimport {op} from './operation';\n\n/**\n * Batch normalization, strictly for 3D. For the more relaxed version, see\n * `tf.batchNorm`.\n *\n
 * @param x The input Tensor.\n * @param mean A mean Tensor.\n * @param variance A variance Tensor.\n * @param offset An offset Tensor.\n * @param scale A scale Tensor.\n * @param varianceEpsilon A small float number to avoid dividing by 0.\n */\nfunction batchNorm3d_(\n   x: Tensor3D|TensorLike, mean: Tensor3D|Tensor1D|TensorLike,\n   variance: Tensor3D|Tensor1D|TensorLike,\n   offset?: Tensor3D|Tensor1D|TensorLike, scale?: Tensor3D|Tensor1D|TensorLike,\n   varianceEpsilon?: number): Tensor3D {\n const $x = convertToTensor(x, 'x', 'batchNorm');\n const $mean = convertToTensor(mean, 'mean', 'batchNorm');\n const $variance = convertToTensor(variance, 'variance', 'batchNorm');\n let $scale: Tensor3D|Tensor1D;\n if (scale != null) {\n $scale = convertToTensor(scale, 'scale', 'batchNorm');\n }\n let $offset: Tensor3D|Tensor1D;\n if (offset != null) {\n $offset = convertToTensor(offset, 'offset', 'batchNorm');\n }\n util.assert(\n $x.rank === 3,\n   () => `Error
 in batchNorm3D: x must be rank 3 but got rank ` +\n          `${$x.rank}.`);\n  util.assert(\n      $mean.rank === 3 || $mean.rank === 1,\n      () => `Error in batchNorm3D: mean must be rank 3 or rank 1 but ` +\n          `got rank ${$mean.rank}.`);\n  util.assert(\n      $variance.rank === 3 || $variance.rank === 1,\n      () => `Error in batchNorm3D: variance must be rank 3 or rank 1 ` +\n          `but got rank ${$variance.rank}.`);\n  if ($scale != null) {\n    util.assert(\n        $scale.rank === 3 || $scale.rank === 1,\n        () => `Error in batchNorm3D: scale must be rank 3 or rank 1 ` +\n            `but got rank ${$scale.rank}.`);\n  }\n  if ($offset != null) {\n    util.assert(\n        $offset.rank === 3 || $offset.rank === 1,\n        () => `Error in batchNorm3D: offset must be rank 3 or rank 1 ` +\n            `but got rank ${$offset.rank}.`);\n }\n\n return batchNorm($x, $mean, $variance, $offset, $scale, varianceEpsilon);\n}\n\nexport const batchNorm3d = op({batchNorm3d_});\n","/**\n
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\nimport {Tensor1D, Tensor4D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {batchNorm} from './batchnorm';\nimport {op} from './operation';\n\n/**\n * Batch normalization, strictly for 4D. For the more relaxed version, see\n * `tf.batchNorm`.\n *\n * @param x The input Tensor.\n * @param mean A mean Tensor.\n * @param variance A variance Tensor.\n * @param offset An offset Tensor.\n * @param scale A scale Tensor.\n * @param varianceEpsilon A small float number to avoid dividing by 0.\n */\nfunction batchNorm4d_(\n x: Tensor4D|TensorLike, mean: Tensor4D|Tensor1D|TensorLike,\n variance: Tensor4D|Tensor1D|TensorLike,\n offset?: Tensor4D|Tensor1D|TensorLike, scale?: Tensor4D|Tensor1D|TensorLike,\n varianceEpsilon?: number): Tensor4D {\n const $x = convertToTensor(x, 'x', 'batchNorm');\n const $mean = convertToTensor(mean, 'mean', 'batchNorm');\n const $variance = convertToTensor(variance, 'variance', 'batchNorm');\n let $scale: Tensor4D|Tensor1D;\n if (scale != null) {\n $scale = convertToTensor(scale, 'scale', 'batchNorm');\n }\n let $offset: Tensor4D|Tensor1D;\n if (offset != null) {\n $offset = convertToTensor(offset, 'offset', 'batchNorm');\n }\n util.assert(\n $x.rank === 4,\n () => `Error in batchNorm4D: x must be rank 4 but got rank ` +\n `${$x.rank}.`);\n util.assert(\n $mean.rank === 4 || $mean.rank === 1,\n () => `Error in batchNorm4D: mean must be rank 4 or rank 1 but ` +\n `got rank ${$mean.rank}.`);\n util.assert(\n $variance.rank === 4 || $variance.rank === 1,\n () => `Error in batchNorm4D: variance must be rank 4 or rank 1 ` +\n `but got rank ${$variance.rank}.`);\n if ($scale != null) {\n util.assert(\n $scale.rank === 4 || $scale.rank === 1,\n () => `Error in batchNorm4D: scale must be rank 4 or rank 1 ` +\n `but got rank ${$scale.rank}.`);\n }\n if ($offset != null) {\n util.assert(\n $offset.rank === 4 || $offset.rank === 1,\n () => `Error in batchNorm4D: offset must be rank 4 or rank 1 ` +\n `but got rank ${$offset.rank}.`);\n }\n return batchNorm($x, $mean, $variance, $offset, $scale, varianceEpsilon);\n}\n\nexport const batchNorm4d = op({batchNorm4d_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Bincount, BincountAttrs, BincountInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor1D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {op} from './operation';\n\n/**\n * Outputs a vector with length `size` and the same dtype as `weights`.\n *\n * If `weights` are empty, then index `i` stores the number of times the value\n * `i` is counted in `x`. If `weights` are non-empty, then index `i` stores the\n * sum of the value in `weights` at each index where the corresponding value in\n * `x` is `i`.\n *\n * Values in `x` outside of the range [0, size) are ignored.\n *\n * @param x The input int tensor, rank 1.\n * @param weights The weights tensor, must have the same shape as x, or a\n * length-0 Tensor, in which case it acts as all weights equal to 1.\n * @param size Non-negative integer.\n *\n * @doc {heading: 'Operations', subheading: 'Reduction'}\n */\nfunction bincount_<T extends Tensor1D>(\n x: T|TensorLike, weights: T|TensorLike, size: number): T {\n const $x = convertToTensor(x, 'x', 'bincount');\n const $weights = convertToTensor(weights, 'weights', 'bincount');\n\n util.assert(\n $x.dtype === 'int32',\n () => `Error in bincount: input ` +\n `dtype must be int32, but got ${$x.dtype}`);\n util.assert(size >= 0, () => `size must be non-negative, but got ${size}.`);\n util.assert(\n $weights.size === $x.size || $weights.size === 0,\n () =>

`Error in bincount: weights must have the same size as input or` +\n `0-length, but got input shape: ${$x.shape}, weights shape: ` +\n `${$weights.shape}.`);\n\n const inputs: BincountInputs = {x: $x, weights: $weights};\n const attrs: BincountAttrs = {size};\n\n return ENGINE.runKernel(\n Bincount, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const bincount = op({bincount_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {ENGINE} from '../engine';\nimport {Tile, TileAttrs, TileInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {Rank, ShapeMap, TensorLike} from '../types';\n\nimport {clone} from './clone';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Broadcast an array to a compatible shape NumPy-style.\n *\n * The tensor's shape is compared to the broadcast shape from end to beginning.\n * Ones are prepended to the tensor's shape until is has the same length as\n * the broadcast shape. If input.shape[i]==shape[i], the (i+1)-th axis is\n * already broadcast-compatible. If input.shape[i]==1 and shape[i]==N, then\n * the input tensor is tiled N times along that axis (using tf.tile).\n *\n * @param input The tensor that is to be broadcasted.\n * @param shape The input is to be broadcast to this shape.\n *\n * @doc {heading: 'Tensors', subheading: 'Transformations'}\n */\nfunction broadcastTo_<R extends Rank>(\n x: Tensor|TensorLike, shape: ShapeMap[R]): Tensor<R> {\n let input = convertToTensor(x, 'broadcastTo', 'x');\n const xShape = input.shape;\n\n if (shape.some(d => !(d > 0) || d % 1 !== 0)) {\n throw new Error(`broadcastTo(): Invalid broadcast shape [${shape}].`);\n }\n\n if (shape.length < input.rank) {\n throw new Error(`broadcastTo(): shape.length=${shape.length} < input.rank=${\n input.rank}.`);\n }\n\n if (shape.length > input.rank) {\n const newShape = input.shape.slice();\n while (newShape.length < shape.length) {\n newShape.unshift(1);\n }\n input = reshape(input, newShape);\n }\n\n const inputShape = input.shape;\n const reps: number[] = Array.from(shape);\n for (let i = shape.length - 1; i >= 0; i--) {\n if (inputShape[i] === shape[i]) {\n reps[i] = 1;\n } else if (input.shape[i] !== 1) {\n throw new Error(\n `broadcastTo(): [${xShape}] cannot be broadcast to [${shape}].`);\n }\n }\n const axes = reps.map((n, i) => n > 1 ? i : -1).filter(i => i >= 0);\n\n if (axes.length === 0) {\n return clone(input) as Tensor<R>;\n }\n\n // TODO call broadcastTo kernel directly once backends implement broadcstTo\n const inputs: TileInputs = {x: input};\n const attrs: TileAttrs = {reps};\n return ENGINE.runKernel(\n Tile, inputs as {} as NamedTensorMap, attrs as unknown as NamedAttrMap);\n}\n\nexport const broadcastTo = op({broadcastTo_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {ENGINE} from '../engine';\nimport {Ceil, CeilInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from

'./operation';\n\n/**\n * Computes ceiling of input `tf.Tensor` element-wise: `ceil(x)`\n *\n * ```js\n * const x = tf.tensor1d([.6, 1.1, -3.3]);\n *\n * x.ceil().print(); // or tf.ceil(x)\n * ```\n * @param x The input Tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction ceil_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'ceil');\n\n const inputs: CeilInputs = {x: $x};\n return ENGINE.runKernel(Ceil, inputs as {} as NamedTensorMap);\n}\nexport const ceil = op({ceil_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of
the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport {ENGINE} from '../engine';\nimport {ClipByValue, ClipByValueAttrs, ClipByValueInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {op} from './operation';\n\n/**\n * Clips values element-wise. `max(min(x, clipValueMax), clipValueMin)`\n *\n * ```js\n * const
x = tf.tensor1d([-1, 2, -3, 4]);\n *\n * x.clipByValue(-2, 3).print(); // or tf.clipByValue(x, -2, 3)\n * ```\n * @param x The input tensor.\n * @param clipValueMin Lower-bound of range to be clipped to.\n * @param clipValueMax Upper-bound of range to be clipped to.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction clipByValue_<T extends Tensor>(\n   x: T|TensorLike, clipValueMin: number, clipValueMax: number): T {\n const $x = convertToTensor(x, 'x', 'clipByValue');\n util.assert(\n   (clipValueMin <= clipValueMax),\n   () => `Error in clip: min (${clipValueMin}) must be ` +\n   `less than or equal to max (${clipValueMax}).`);\n\n const inputs: ClipByValueInputs = {x: $x};\n const attrs: ClipByValueAttrs = {clipValueMin, clipValueMax};\n\n return ENGINE.runKernel(\n   ClipByValue, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const clipByValue = op({clipByValue_});\n","/**\n * @license\n * Copyright 2020
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport {Tensor1D} from '../tensor';\nimport {TensorLike} from '../types';\n\nimport {concat} from './concat';\nimport {op} from './operation';\n\n/**\n * Concatenates a list of`tf.Tensor1D`s along an axis. See `concat` for details.\n *\n * For example, if:\n * A: shape(3) = |r1, g1, b1|\n * B: shape(2) = |r2,
g2|\n * C = tf.concat1d([A, B]) == |r1, g1, b1, r2, g2|\n *\n * @param tensors A list of`tf.Tensor`s to concatenate.\n * @return The concatenated array.\n */\nfunction concat1d_(tensors: Array<Tensor1D|TensorLike>): Tensor1D {\n return concat(tensors, 0 /* axis */);\n}\n\nexport const concat1d = op({concat1d_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport {Tensor2D} from '../tensor';\nimport {TensorLike} from '../types';\n\nimport {concat} from './concat';\nimport {op} from './operation';\n\n/**\n * Concatenates a list of`tf.Tensor2D`s along an axis. See `concat` for details.\n *\n * For example, if:\n * A: shape(2, 3) = | r1, g1, b1 |\n * | r2, g2, b2 |\n *\n * B: shape(2, 3) = | r3, g3, b3 |\n * | r4, g4, b4 |\n *\n * C = tf.concat2d([A, B], axis)\n *\n * if axis = 0:\n * C: shape(4, 3) = | r1, g1, b1 |\n * | r2, g2, b2 |\n * | r3, g3, b3 |\n * | r4, g4, b4 |\n *\n * if axis = 1:\n * C = shape(2, 6) = | r1, g1, b1, r3, g3, b3 |\n * | r2, g2, b2, r4, g4, b4 |\n *\n *\n * @param tensors A list of `tf.Tensor`s to concatenate.\n * @param axis The axis to concatenate along.\n * @return The concatenated array.\n */\nfunction concat2d_(\n tensors: Array<Tensor2D|TensorLike>, axis: number): Tensor2D {\n return concat(tensors, axis);\n}\n\nexport const concat2d = op({concat2d_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ==\n */\nimport {Tensor3D} from '../tensor';\nimport {TensorLike} from '../types';\n\nimport {concat} from './concat';\nimport {op} from './operation';\n\n/**\n * Concatenates a list of `tf.Tensor3D`s along an axis.\n * See `concat` for details.\n *\n * For example, if:\n * A: shape(2, 1, 3) = | r1, g1, b1 |\n * | r2, g2, b2 |\n *\n * B: shape(2, 1, 3) = | r3, g3, b3 |\n * | r4, g4, b4 |\n *\n * C = tf.concat3d([A, B], axis)\n *\n * if axis = 0:\n * C: shape(4, 1, 3) = | r1, g1, b1 |\n * | r2, g2, b2 |\n * | r3, g3, b3 |\n * | r4, g4, b4 |\n *\n * if axis = 1:\n * C: shape(2, 2, 3) = | r1, g1, b1, r3, g3, b3 |\n * | r2, g2, b2, r4, g4, b4 |\n *\n * if axis = 2:\n * C = shape(2, 1, 6) = | r1, g1, b1, r3, g3, b3 |\n * | r2, g2, b2, r4, g4, b4 |\n *\n * @param tensors A list of`tf.Tensor`s to concatenate.\n * @param axis The axis to concate along.\n * @return The concatenated array.\n */\nfunction concat3d_(\n tensors: Array<Tensor3D|TensorLike>, axis: number): Tensor3D {\n return concat(tensors, axis);\n}\n\nexport const concat3d = op({concat3d_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ==\n */\nimport {Tensor4D} from '../tensor';\nimport {TensorLike} from '../types';\n\nimport {concat} from './concat';\nimport {op} from './operation';\n\n/**\n * Concatenates a list of `tf.Tensor4D`s along an axis.\n * See `concat` for details.\n *\n * @param tensors
A list of `tf.Tensor`s to concatenate.\n * @param axis The axis to concate along.\n * @return The concatenated array.\n */\nfunction concat4d_(\n tensors: Array<Tensor4D|TensorLike>, axis: number): Tensor4D {\n return concat(tensors, axis);\n}\n\nexport const concat4d = op({concat4d_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ==\n */

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*/\nimport {ENGINE} from '../engine';\nimport {Conv2D, Conv2DAttrs, Conv2DInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor3D, Tensor4D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport * as conv_util from './conv_util';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Computes a 2D convolution over the input x.\n *\n * @param x The input tensor, of rank 4 or rank 3, of shape\n *     `[batch, height, width, inChannels]`. If rank 3, batch of 1 is\n * assumed.\n * @param filter The filter, rank 4, of shape\n *     `[filterHeight, filterWidth, inDepth, outDepth]`.\n * @param strides The strides of the convolution: `[strideHeight,\n * strideWidth]`.\n * @param pad The type of padding algorithm.\n *    - `same` and stride 1: output will be of same size as input,\n *       regardless of filter size.\n *    - `valid`: output will be smaller than input if filter is larger\n *       than 1x1.\n *    - For more info, see this guide:\n *     [https://www.tensorflow.org/api_guides/python/nn#Convolution](\n *     https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dataFormat: An optional string from: \"NHWC\", \"NCHW\". Defaults to\n *     \"NHWC\". Specify the data format of the input and output data. With the\n *     default format \"NHWC\", the data is stored in the order of: [batch,\n *     height, width, channels].\n * @param dilations The dilation rates: `[dilationHeight, dilationWidth]`\n *     in which we sample input values across the height and width dimensions\n *     in atrous convolution. Defaults to `[1, 1]`. If `dilations` is a single\n *     number, then `dilationHeight == dilationWidth`. If it is greater than\n *     1, then all values of `strides` must be 1.\n * @param dimRoundingMode A string
 from: 'ceil', 'round', 'floor'. If none is\n *     provided, it will default to truncate.\n *\n * @doc {heading: 'Operations', subheading: 'Convolution'}\n */\nfunction conv2d_<T extends Tensor3D|Tensor4D>(\n    x: T|TensorLike, filter: Tensor4D|TensorLike,\n    strides: [number, number]|number,\n    pad: 'valid'|'same'|number|conv_util.ExplicitPadding,\n    dataFormat: 'NHWC'|'NCHW' = 'NHWC',\n    dilations: [number, number]|number = [1, 1],\n    dimRoundingMode?: 'floor'|'round'|'ceil'): T {\n  const $x = convertToTensor(x, 'x', 'conv2d');\n  const $filter = convertToTensor(filter, 'filter', 'conv2d');\n\n  let x4D = $x as Tensor4D;\n  let reshapedTo4D = false;\n\n  if ($x.rank === 3) {\n    reshapedTo4D = true;\n    x4D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2]]);\n  }\n\n  util.assert(\n      x4D.rank === 4,\n      () => `Error in conv2d: input must be rank 4, but got rank ${x4D.rank}.`);\n  util.assert(\n      $filter.rank === 4,\n      () => `Error in conv2d: filter
 must be rank 4, but got rank ` +\n          `${$filter.rank}.`);\n  if (dimRoundingMode != null) {\n    util.assert(\n        util.isInt(pad as number),\n        () => `Error in conv2d: pad must be an integer when using, ` +\n            `dimRoundingMode ${dimRoundingMode} but got pad ${pad}.`);\n  }\n\n  const inDepth = dataFormat === 'NHWC' ? x4D.shape[3] : x4D.shape[1];\n  util.assert(\n      inDepth === $filter.shape[2],\n      () => `Error in conv2d: depth of input (${inDepth}) must match ` +\n          `input depth for filter ${$filter.shape[2]}.`);\n  util.assert(\n      conv_util.eitherStridesOrDilationsAreOne(strides, dilations),\n      () => 'Error in conv2D: Either strides or dilations must be 1. ' +\n          `Got strides ${strides} and dilations '${dilations}'`);\n\n  const inputs: Conv2DInputs = {x: x4D, filter: $filter};\n  const attrs:\n      Conv2DAttrs = {strides, pad, dataFormat, dilations, dimRoundingMode};\n\n  // tslint:disable-next-line: no-unnecessary-type-assertion\n
  const res = ENGINE.runKernel(\n                Conv2D, inputs as {} as NamedTensorMap,\n                attrs as {} as NamedAttrMap) as T;\n\n  if (reshapedTo4D) {\n    return reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as T;\n  }\n  return res;\n}\n\nexport const conv2d = op({conv2d_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
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*/\nimport {Tensor2D, Tensor3D, Tensor4D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {conv2d} from './conv2d';\nimport * as conv_util from './conv_util';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Computes a 1D convolution over the input x.\n *\n * @param x The input tensor, of rank 3 or rank 2, of shape\n *     `[batch, width, inChannels]`. If rank 2, batch of 1 is assumed.\n * @param filter The filter, rank 3, of shape\n *     `[filterWidth, inDepth, outDepth]`.\n * @param stride The number of entries by which the filter is moved right at\n *     each step.\n * @param pad The type of padding algorithm.\n *    - `same` and stride 1: output will be of same size as input,\n *       regardless of filter size.\n *    - `valid`: output will be smaller than input if filter is larger\n *       than 1x1.\n
 *   - For more info, see this guide:\n *     [https://www.tensorflow.org/api_guides/python/nn#Convolution](\n * https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dataFormat An optional string from \"NWC\", \"NCW\". Defaults to \"NWC\",\n *     the data is stored in the order of [batch, in_width, in_channels]. Only\n *     \"NWC\" is currently supported.\n * @param dilation The dilation rate in which we sample input values in\n *     atrous convolution. Defaults to `1`. If it is greater than 1, then\n *     stride must be `1`.\n * @param dimRoundingMode A string from: 'ceil', 'round', 'floor'. If none is\n *     provided, it will default to truncate.\n *\n * @doc {heading: 'Operations', subheading: 'Convolution'}\n */\nfunction conv1d_<T extends Tensor2D|Tensor3D>(\n    x: T|TensorLike, filter: Tensor3D|TensorLike, stride: number,\n    pad: 'valid'|'same'|number|conv_util.ExplicitPadding,\n    dataFormat: 'NWC'|'NCW' = 'NWC', dilation = 1,\n dimRoundingMode?:
 'floor'|'round'|'ceil'): T {\n  const $x = convertToTensor(x, 'x', 'conv1d');\n  const $filter = convertToTensor(filter, 'filter', 'conv1d');\n\n  let x3D = $x as Tensor3D;\n  let reshapedTo3D = false;\n  if ($x.rank === 2) {\n reshapedTo3D = true;\n    x3D = reshape($x, [1, $x.shape[0], $x.shape[1]]);\n  }\n\n  util.assert(\n      x3D.rank === 3,\n      () => `Error in conv1d: input must be rank 3, but got rank ${x3D.rank}.`);\n  util.assert(\n      $filter.rank === 3,\n      () => `Error in conv1d: filter must be rank 3, but got rank ` +\n          `${$filter.rank}.`);\n  if (dimRoundingMode != null) {\n    util.assert(\n        util.isInt(pad as number),\n        () => `Error in conv1d: pad must be an integer when using, ` +\n            `dimRoundingMode ${dimRoundingMode} but got pad ${pad}.`);\n  }\n\n  util.assert(\n      x3D.shape[2] === $filter.shape[1],\n      () => `Error in conv1d: depth of input (${x3D.shape[2]}) must match ` +\n          `input depth for filter
 ${$filter.shape[1]}.`);\n  util.assert(\n      conv_util.eitherStridesOrDilationsAreOne(stride, dilation),\n      () => 'Error in conv1D: Either stride or dilation must be 1. ' +\n          `Got stride ${stride} and dilation '${dilation}'`);\n  util.assert(\n      dataFormat === 'NWC',\n      () => `Error in conv1d: got dataFormat of ${\n          dataFormat} but only NWC is currently supported.`);\n\n  const filter4D = reshape(\n      $filter, [1, $filter.shape[0], $filter.shape[1], $filter.shape[2]]);\n  const input4D = reshape(x3D, [x3D.shape[0], 1, x3D.shape[1], x3D.shape[2]]);\n  const strides: [number, number] = [1, stride];\n  const dilations: [number, number] = [1, dilation];\n\n  const conv2dDataFormat = 'NHWC';\n\n  const res = conv2d(\n      (input4D as Tensor4D), (filter4D as Tensor4D), strides, pad,\n conv2dDataFormat, dilations, dimRoundingMode);\n\n  if (reshapedTo3D) {\n    return reshape(res, [res.shape[2], res.shape[3]]) as T;\n  }\n\n  return reshape(res, [res.shape[0],
 res.shape[2], res.shape[3]]) as T;\n}\n\nexport const conv1d = op({conv1d_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\nimport {ENGINE} from '../engine';\nimport {Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport
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{Tensor3D, Tensor4D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport * as util from '../util';\n\nimport * as conv_util from './conv_util';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Computes the derivative of the input of a 2D convolution.\n *\n * @param xShape The shape of the input: [batch, height, width, inDepth].\n * If length of 3, batch of 1 is assumed.\n * @param dy The derivative of the output, of rank 4 or rank 3 of shape\n *   `[batch, outHeight, outWidth, outDepth]`. If rank 3, batch of 1 is\n * assumed.\n * @param filter The filter, rank 4, of shape\n *   `[filterHeight, filterWidth, inDepth, outDepth]`.\n * @param strides The strides of the convolution: `[strideHeight,\n * strideWidth]`.\n * @param pad The type of padding algorithm used:\n *   - `same` and stride 1: output will be of same size as input,\n *   regardless of filter size.\n *   - `valid`: output will be smaller than input if
filter is larger\n *   than 1x1.\n * @param dataFormat: An optional string from: \"NHWC\", \"NCHW\". Defaults to\n *   \"NHWC\". Specify the data format of the input and output data. With the\n *   default format \"NHWC\", the data is stored in the order of: [batch,\n *   height, width, channels].\n * @param dimRoundingMode A string from: 'ceil', 'round', 'floor'. If none is\n *   provided, it will default to truncate.\n */\nfunction conv2DBackpropInput_<T extends Tensor3D|Tensor4D>(\n   xShape: [number, number, number, number]|[number, number, number], dy: T,\n   filter: Tensor4D, strides: [number, number]|number,\n   pad: 'valid'|'same'|number|conv_util.ExplicitPadding,\n   dataFormat: 'NHWC'|'NCHW' = 'NHWC',\n   dimRoundingMode?: 'floor'|'round'|'ceil'): T {\n util.assert(\n   xShape.length === dy.rank,\n   () => `Length of inShape ` +\n   `(${xShape.length}) and rank of dy (${dy.rank}) must match`);\n\n let xShape4D = xShape as [number, number, number,
number];\n let dy4D = dy as Tensor4D;\n let reshapedTo4D = false;\n if (dy.rank === 3) {\n   reshapedTo4D = true;\n   dy4D = reshape(dy, [1, dy.shape[0], dy.shape[1], dy.shape[2]]);\n   xShape4D = [1, xShape[0], xShape[1], xShape[2]];\n }\n\n util.assert(\n   xShape4D.length === 4,\n   () =>\n   `Error in conv2dDerInput: inShape must be length 4, but got length ` +\n   `${xShape4D.length}.`);\n util.assert(\n   dy4D.rank === 4,\n   () => `Error in conv2dDerInput: dy must be rank 4, but got ` +\n   `rank ${dy4D.rank}`);\n util.assert(\n   filter.rank === 4,\n   () => `Error in conv2dDerInput: filter must be rank 4, but got ` +\n   `rank ${filter.rank}`);\n const inDepth = dataFormat === 'NHWC' ? xShape4D[3] : xShape4D[1];\n const outDepth = dataFormat === 'NHWC' ? dy4D.shape[3] : dy4D.shape[1];\n util.assert(\n   inDepth === filter.shape[2],\n   () => `Error in conv2dDerInput: depth of input (${inDepth}) must ` +\n
      `match input depth for filter ${filter.shape[2]}.`);\n util.assert(\n   outDepth === filter.shape[3],\n   () => `Error in conv2dDerInput: depth of output (${outDepth}) must ` +\n   `match output depth for filter ${filter.shape[3]}.`);\n if (dimRoundingMode != null) {\n   util.assert(\n   util.isInt(pad as number),\n   () => `Error in conv2dDerInput: pad must be an integer when using, ` +\n   `dimRoundingMode ${dimRoundingMode} but got pad ${pad}.`);\n }\n\n const inputs: Conv2DBackpropInputInputs = {dy: dy4D, filter};\n\n const attrs: Conv2DBackpropInputAttrs =\n   {strides, pad, dataFormat, dimRoundingMode, inputShape: xShape4D};\n\n // tslint:disable-next-line: no-unnecessary-type-assertion\n const res = ENGINE.runKernel(\n   Conv2DBackpropInput, inputs as {} as NamedTensorMap,\n   attrs as {} as NamedAttrMap) as T;\n\n if (reshapedTo4D) {\n   return reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as T;\n }\n return res;\n}\n\nexport const conv2DBackpropInput = op({conv2DBackpropInput_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport {Tensor3D, Tensor4D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {conv2DBackpropInput} from './conv2d_backprop_input';\nimport

{op} from './operation';\n\n/**\n * Computes the transposed 2D convolution of an image, also known as a\n * deconvolution.\n *\n * @param x The input image, of rank 4 or rank 3, of shape\n * `[batch, height, width, inDepth]`. If rank 3, batch of 1 is assumed.\n * @param filter The filter, rank 4, of shape\n * `[filterHeight, filterWidth, outDepth, inDepth]`.\n * `inDepth` must match `inDepth` in `x`.\n * @param outputShape Output shape, of rank 4 or rank 3:\n * `[batch, height, width, outDepth]`. If rank 3, batch of 1 is assumed.\n * @param strides The strides of the original convolution:\n * `[strideHeight, strideWidth]`.\n * @param pad The type of padding algorithm used in the non-transpose version\n * of the op.\n * @param dimRoundingMode A string from: 'ceil', 'round', 'floor'. If none is\n * provided, it will default to truncate.\n *\n * @doc {heading: 'Operations', subheading: 'Convolution'}\n */\nfunction conv2dTranspose_<T extends Tensor3D|Tensor4D>(\n x: T|TensorLike, filter: Tensor4D|TensorLike,\n outputShape: [number, number, number, number]|[number, number, number],\n strides: [number, number]|number, pad: 'valid'|'same'|number,\n dimRoundingMode?: 'floor'|'round'|'ceil'): T {\n const $x = convertToTensor(x, 'x', 'conv2dTranspose');\n const $filter = convertToTensor(filter, 'filter', 'conv2dTranspose');\n\n return conv2DBackpropInput(\n outputShape, $x, $filter, strides, pad, 'NHWC', dimRoundingMode);\n}\n\nexport const conv2dTranspose = op({conv2dTranspose_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ==\n */\nimport {ENGINE} from '../engine';\nimport {Conv3D, Conv3DAttrs, Conv3DInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor4D, Tensor5D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {eitherStridesOrDilationsAreOne} from './conv_util';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Computes a 3D convolution over the input x.\n *\n * @param x The input tensor, of rank 5 or rank 4, of shape\n * `[batch, depth, height, width, channels]`. If rank 4,\n * batch of 1 is assumed.\n * @param filter The filter, rank 5, of shape\n * `[filterDepth, filterHeight, filterWidth, inChannels, outChannels]`.\n * inChannels must match between input and filter.\n * @param strides The strides of the convolution: `[strideDepth, strideHeight,\n * strideWidth]`.\n * @param pad The type of padding algorithm.\n * - `same` and stride 1: output will be of same size as input,\n * regardless of filter size.\n * - `valid`: output will be smaller than input if filter is larger\n * than 1x1.\n * - For more info, see this guide:\n * [https://www.tensorflow.org/api_guides/python/nn#Convolution](\n * https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dataFormat: An optional string from: \"NDHWC\", \"NCDHW\". Defaults to\n * \"NDHWC\". Specify the data format of the input and output data. With the\n * default format \"NDHWC\", the data is stored in the order of: [batch,\n * depth, height, width, channels].\n * Only \"NDHWC\" is currently supported.\n * @param dilations The dilation rates: `[dilationDepth, dilationHeight,\n * dilationWidth]` in which we sample input values across the height\n * and width dimensions in atrous convolution. Defaults to `[1, 1, 1]`.\n * If `dilations` is a single number, then\n * `dilationDepth == dilationHeight == dilationWidth`. If it is greater\n * than 1, then all values of `strides` must be 1.\n *\n * @doc {heading: 'Operations', subheading: 'Convolution'}\n */\nfunction conv3d_<T extends Tensor4D|Tensor5D>(\n x: T|TensorLike, filter: Tensor5D|TensorLike,\n strides: [number, number, number]|number, pad: 'valid'|'same',\n dataFormat: 'NDHWC'|'NCDHW' = 'NDHWC',\n dilations: [number, number, number]|number = [1, 1, 1]): T {\n const $x = convertToTensor(x, 'x', 'conv3d');\n const $filter =

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convertToTensor(filter, 'filter', 'conv3d');\n\n  let x5D = $x as Tensor5D;\n  let reshapedTo5D = false;\n\n  if ($x.rank === 4) {\n    reshapedTo5D = true;\n    x5D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2], $x.shape[3]]);\n  }\n  util.assert(\n      x5D.rank === 5,\n      () => `Error in conv3d: input must be rank 5, but got rank ${x5D.rank}.`);\n  util.assert(\n      $filter.rank === 5,\n      () => `Error in conv3d: filter must be rank 5, but got rank ` +\n          `${$filter.rank}.`);\n  util.assert(\n      x5D.shape[4] === $filter.shape[3],\n      () => `Error in conv3d: depth of input (${x5D.shape[4]}) must match ` +\n          `input depth for filter ${$filter.shape[3]}.`);\n  util.assert(\n      eitherStridesOrDilationsAreOne(strides, dilations),\n      () => 'Error in conv3D: Either strides or dilations must be 1. ' +\n          `Got strides ${strides} and dilations '${dilations}'`);\n  util.assert(\n      dataFormat === 'NDHWC',\n      () => `Error in conv3d: got dataFormat of ${\n          dataFormat} but only NDHWC is currently supported.`);\n\n  const inputs: Conv3DInputs = {x: x5D, filter:
  $filter};\n\n  const attrs: Conv3DAttrs = {strides, pad, dataFormat, dilations};\n\n  // tslint:disable-next-line: no-unnecessary-type-assertion\n  const res = ENGINE.runKernel(\n                Conv3D, inputs as {} as NamedTensorMap,\n                attrs as {} as NamedAttrMap) as T;\n\n  if (reshapedTo5D) {\n    return reshape(\n        res, [res.shape[1], res.shape[2], res.shape[3], res.shape[4]]) as\n        T;\n  }\n  return res;\n}\n\nexport const conv3d = op({conv3d_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND,
  either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
  ==========================================================================\n */\nimport {ENGINE} from '../engine';\nimport {Conv3DBackpropInputV2, Conv3DBackpropInputV2Attrs, Conv3DBackpropInputV2Inputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor4D, Tensor5D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport * as util from '../util';\n\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Computes the derivative of the input of a 3D convolution.\n *\n * @param xShape The shape of the input: [batch, depth, height, width,\n * in_channels]. If length of 4, batch of 1 is assumed.\n * @param dy The derivative of the output, of rank 5 or rank 4 of shape\n *   `[batch, outDepth, outHeight, outWidth, in_channels]`.\n * If rank 4, batch of 1 is assumed.\n
  * @param filter The filter, rank 5, of shape\n *     `[filterDepth, filterHeight, filterWidth, inDepth, outDepth]`.\n * @param strides The strides of the convolution: `[strideDepth, strideHeight,\n * strideWidth]`.\n * @param pad The type of padding algorithm used:\n *    - `same` and stride 1: output will be of same size as input,\n *       regardless of filter size.\n *    - `valid`: output will be smaller than input if filter is larger\n *       than 1x1.\n */\nfunction conv3DBackpropInput_<T extends Tensor4D|Tensor5D>(\n    xShape:\n        [number, number, number, number,\n      number]|[number, number, number, number],\n    dy: T, filter: Tensor5D, strides: [number, number, number]|number,\n    pad: 'valid'|'same'): T {\n  util.assert(\n      xShape.length === dy.rank,\n      () => `Length of inShape ` +\n          `(${xShape.length}) and rank of dy (${dy.rank}) must match`);\n\n  let xShape5D = xShape as [number, number, number, number, number];\n  let dy5D = dy as Tensor5D;\n
  let reshapedTo5D = false;\n  if (dy.rank === 4) {\n    reshapedTo5D = true;\n    dy5D = reshape(dy, [1, dy.shape[0], dy.shape[1], dy.shape[2], dy.shape[3]]);\n    xShape5D = [1, xShape[0], xShape[1], xShape[2], xShape[3]];\n  }\n\n  const inDepth = xShape5D[4];\n  const outDepth = dy5D.shape[4];\n  util.assert(\n      xShape5D.length === 5,\n      () =>\n          `Error in conv3dDerInput: inShape must be length 5, but got length ` +\n          `${xShape5D.length}.`);\n  util.assert(\n      dy5D.rank === 5,\n      () => `Error in conv3dDerInput: dy must be rank 5, but got ` +\n          `rank ${dy5D.rank}`);\n  util.assert(\n      filter.rank === 5,\n      () => `Error in conv3dDerInput: filter must be rank 5, but got ` +\n          `rank ${filter.rank}`);\n  util.assert(\n      inDepth === filter.shape[3],\n      () => `Error in conv3dDerInput: depth of input (${inDepth}) must ` +\n          `match input
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depth for filter ${filter.shape[3]}.`);\n util.assert(\n   outDepth === filter.shape[4],\n
    () => `Error in conv3dDerInput: depth of output (${outDepth}) must ` +\n   `match output depth for filter ${filter.shape[4]}.`);\n\n const inputs: Conv3DBackpropInputV2Inputs = {dy: dy5D, filter};\n\n const attrs:\n Conv3DBackpropInputV2Attrs = {pad, strides, inputShape: xShape5D};\n\n // tslint:disable-next-line: no-unnecessary-type-assertion\n const res = ENGINE.runKernel(\n   Conv3DBackpropInputV2, inputs as {} as NamedTensorMap,\n   attrs as {} as NamedAttrMap) as T;\n\n if (reshapedTo5D) {\n   return reshape(\n   res, [res.shape[1], res.shape[2], res.shape[3], res.shape[4]]) as\n   T;\n }\n return res;\n}\n\nexport const conv3DBackpropInput = op({conv3DBackpropInput_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain
 a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport {Tensor4D, Tensor5D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {conv3DBackpropInput} from './conv3d_backprop_input';\nimport {op} from './operation';\n\n/**\n * Computes the transposed 3D convolution of a volume, also known as a\n * deconvolution.\n *\n * @param x The input image, of rank 5 or rank 4, of shape\n *   `[batch, depth, height, width, inDepth]`. If rank 4, batch of 1 is assumed.\n * @param filter The
 filter, rank 4, of shape\n *   `[depth, filterHeight, filterWidth, outDepth, inDepth]`.\n *   `inDepth` must match `inDepth` in `x`.\n * @param outputShape Output shape, of rank 5 or rank 4:\n *   `[batch, depth, height, width, outDepth]`. If rank 3, batch of 1 is\n *   assumed.\n * @param strides The strides of the original convolution:\n *   `[strideDepth, strideHeight, strideWidth]`.\n * @param pad The type of padding algorithm used in the non-transpose version\n *   of the op.\n *\n * @doc {heading: 'Operations', subheading: 'Convolution'}\n */\nfunction conv3dTranspose_<T extends Tensor4D|Tensor5D>(\n   x: T|TensorLike, filter: Tensor5D|TensorLike,\n outputShape:\n   [number, number, number, number,\n   number]|[number, number, number, number],\n strides: [number, number, number]|number, pad: 'valid'|'same'): T {\n const $x = convertToTensor(x, 'x', 'conv3dTranspose');\n const $filter = convertToTensor(filter, 'filter', 'conv3dTranspose');\n\n return
 conv3DBackpropInput(outputShape, $x, $filter, strides, pad);\n}\n\nexport const conv3dTranspose = op({conv3dTranspose_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {ENGINE} from '../engine';\nimport {Cos, CosInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from
 '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes cos of the input `tf.Tensor` element-wise: `cos(x)`\n *\n * ```js\n * const x = tf.tensor1d([0, Math.PI / 2, Math.PI * 3 / 4]);\n *\n * x.cos().print(); // or tf.cos(x)\n * ```\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction cos_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'cos');\n\n const inputs: CosInputs = {x: $x};\n\n return ENGINE.runKernel(Cos, inputs as {} as NamedTensorMap);\n}\nexport const cos = op({cos_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the

License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\n\nimport {ENGINE} from '../engine';\nimport {Cosh, CoshInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes hyperbolic cos of the input `tf.Tensor` element-wise: `cosh(x)`\n *\n * ```js\n * const x = tf.tensor1d([0, 1, -1, .7]);\n *\n * x.cosh().print(); // or tf.cosh(x)\n * ```\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction cosh_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'cosh');\n const inputs: CoshInputs = {x: $x};\n\n return ENGINE.runKernel(Cosh, inputs as {} as NamedTensorMap);\n}\nexport const cosh = op({cosh_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\n\nimport {ENGINE} from '../engine';\nimport {Cumsum, CumsumAttrs, CumsumInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes the cumulative sum of a `tf.Tensor` along `axis`.\n *\n * ```js\n * const x = tf.tensor([1, 2, 3, 4]);\n * x.cumsum().print();\n * ```\n * ```js\n * const x = tf.tensor([[1, 2], [3, 4]]);\n * x.cumsum().print();\n * ```\n *\n * @param x The input tensor to be summed.\n * @param axis The axis along which to sum. Optional. Defaults to 0.\n * @param exclusive Whether to perform exclusive cumulative sum. Optional.\n *   Defaults to false. If set to true then the sum of each tensor entry\n *   does not include its own value, but only the values previous to it\n *   along the specified axis.\n * @param reverse Whether to sum in the opposite direction. Optional.\n *   Defaults to false.\n *\n * @doc {heading: 'Operations', subheading: 'Scan'}\n */\nfunction cumsum_<T extends Tensor>(\n   x: Tensor|TensorLike, axis = 0, exclusive = false, reverse = false): T {\n const $x = convertToTensor(x, 'x', 'cumsum');\n\n const inputs: CumsumInputs = {x: $x};\n const attrs: CumsumAttrs = {axis, exclusive, reverse};\n\n return ENGINE.runKernel(\n   Cumsum, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const cumsum = op({cumsum_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT
WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\n\nimport {ENGINE} from '../engine';\nimport {DenseBincount, DenseBincountAttrs, DenseBincountInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor1D, Tensor2D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from

'../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {op} from './operation';\n\n/**\n * Outputs a vector with length `size` and the same dtype as `weights`.\n *\n * If `weights` are empty, then index `i` stores the number of times the value\n * `i` is counted in `x`. If `weights` are non-empty, then index `i` stores the\n * sum of the value in `weights` at each index where the corresponding value in\n * `x` is `i`.\n *\n * Values in `x` outside of the range [0, size) are ignored.\n *\n * @param x The input int tensor, rank 1 or rank 2.\n * @param weights The weights tensor, must have the same shape as x, or a\n * length-0 Tensor, in which case it acts as all weights equal to 1.\n * @param size Non-negative integer.\n * @param binaryOutput Optional. Whether the kernel should count the appearance\n * or number of occurrences. Defaults to False.\n *\n * @doc {heading: 'Operations', subheading: 'Reduction'}\n */\nfunction denseBincount_<T extends Tensor1D|Tensor2D>(\n x: T|TensorLike, weights: T|TensorLike, size: number,\n binaryOutput = false): T {\n const $x = convertToTensor(x, 'x', 'denseBincount');\n const $weights = convertToTensor(weights, 'weights', 'denseBincount');\n\n util.assert(\n $x.dtype === 'int32',\n () => `Error in denseBincount: input ` +\n `dtype must be int32, but got ${$x.dtype}`);\n util.assert($x.rank <= 2,\n () => `Error in denseBincount: input must be at most rank 2, but got ` +\n `rank ${$x.rank}.`);\n util.assert(size >= 0, () => `size must be non-negative, but got ${size}.`);\n util.assert(\n $weights.size === $x.size || $weights.size === 0,\n () =>\n `Error in denseBincount: weights must have the same shape as x or ` +\n `0-length, but got x shape: ${$x.shape}, weights shape: ` +\n `${$weights.shape}.`);\n\n const inputs: DenseBincountInputs = {x: $x, weights: $weights};\n const attrs: DenseBincountAttrs = {size, binaryOutput};\n\n return ENGINE.runKernel(\n DenseBincount, inputs as {} as NamedTensorMap,\n attrs as {} as NamedAttrMap);\n}\n\nexport const denseBincount = op({denseBincount_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ===\n */\n\nimport {ENGINE} from '../engine';\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor4D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike4D} from '../types';\nimport * as util from '../util';\n\nimport {op} from './operation';\n\n/**\n * Rearranges data from depth into blocks of spatial data. More specifically,\n * this op outputs a copy of the input tensor where values from the `depth`\n * dimension are moved in spatial blocks to the `height` and `width` dimensions.\n * The attr `blockSize` indicates the input block size and how the data is\n * moved.\n *\n * - Chunks of data of size `blockSize * blockSize` from depth are rearranged\n * into non-overlapping blocks of size `blockSize x blockSize`\n *\n * - The width the output tensor is `inputWidth * blockSize`, whereas the\n * height is `inputHeight * blockSize`\n *\n * - The Y, X coordinates within each block of the output image are determined\n * by the high order component of the input channel index\n *\n * - The depth of the input tensor must be divisible by `blockSize *\n * blockSize`\n *\n * The `dataFormat` attr specifies the layout of the input and output tensors\n * with the following options: \"NHWC\": [`batch, height, width, channels`]\n * \"NCHW\": [`batch, channels, height, width`]\n *\n * ```js\n * const x = tf.tensor4d([1, 2, 3, 4], [1, 1, 1, 4]);\n * const blockSize = 2;\n * const dataFormat = \"NHWC\";\n *\n * tf.depthToSpace(x, blockSize, dataFormat).print();\n * ```\n *\n * @param x The input tensor of rank 4\n * @param blockSIze An `int` that is `>= 2`. The size of the spatial block\n * @param dataFormat An optional string from: \"NHWC\", \"NCHW\". Defaults to \"NHWC\"\n *\n * @doc {heading: 'Tensors', subheading: 'Transformations'}\n */\nfunction depthToSpace_(\n x: Tensor4D|TensorLike4D, blockSize: number,\n dataFormat: 'NHWC'|'NCHW' = 'NHWC'): Tensor4D {\n const $x = convertToTensor(x, 'x', 'depthToSpace') as Tensor4D;\n\n const inputHeight = (dataFormat === 'NHWC') ? $x.shape[1] : $x.shape[2];\n const inputWidth = (dataFormat === 'NHWC') ?

$x.shape[2] : $x.shape[3];\n const inputDepth = (dataFormat === 'NHWC') ? $x.shape[3] : $x.shape[1];\n\n util.assert(\n   inputHeight * blockSize >= 0,\n   () => `Negative dimension size caused by overflow when multiplying\n    ${inputHeight} and ${blockSize}  for depthToSpace with input shape\n    ${$x.shape}`);\n\n util.assert(\n inputWidth * blockSize >= 0,\n   () => `Negative dimension size caused by overflow when multiplying\n ${inputWidth} and ${blockSize} for depthToSpace with input shape\n        ${$x.shape}`);\n\n util.assert(\n (inputDepth % (blockSize * blockSize) === 0),\n   () => `Dimension size must be evenly divisible by ${\n blockSize * blockSize} but is ${\n           inputDepth} for depthToSpace with input shape ${$x.shape}`);\n\n const inputs: DepthToSpaceInputs = {x: $x};\n const attrs: DepthToSpaceAttrs = {blockSize, dataFormat};\n\n return ENGINE.runKernel(\n   DepthToSpace, inputs as {} as NamedTensorMap,\n   attrs as {} as NamedAttrMap);\n}\n\nexport const depthToSpace = op({depthToSpace_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
 use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport {ENGINE} from '../engine';\nimport {DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs, DepthwiseConv2dNativeInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor3D, Tensor4D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {op}
 from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Depthwise 2D convolution.\n *\n * Given a 4D `input` array and a `filter` array of shape\n * `[filterHeight, filterWidth, inChannels, channelMultiplier]` containing\n * `inChannels` convolutional filters of depth 1, this op applies a\n * different filter to each input channel (expanding from 1 channel to\n * `channelMultiplier` channels for each), then concatenates the results\n * together. The output has `inChannels * channelMultiplier` channels.\n *\n * See\n * [https://www.tensorflow.org/api_docs/python/tf/nn/depthwise_conv2d](\n * https://www.tensorflow.org/api_docs/python/tf/nn/depthwise_conv2d)\n * for more details.\n *\n * @param x The input tensor, of rank 4 or rank 3, of shape\n *   `[batch, height, width, inChannels]`. If rank 3, batch of 1 is\n * assumed.\n * @param filter The filter tensor, rank 4, of shape\n *   `[filterHeight, filterWidth, inChannels, channelMultiplier]`.\n * @param strides The
 strides of the convolution: `[strideHeight,\n * strideWidth]`. If strides is a single number, then `strideHeight ==\n * strideWidth`.\n * @param pad The type of padding algorithm.\n *   - `same` and stride 1: output will be of same size as input,\n *   regardless of filter size.\n *   - `valid`: output will be smaller than input if filter is larger\n *   than 1x1.\n *   - For more info, see this guide:\n *   [https://www.tensorflow.org/api_guides/python/nn#Convolution](\n *   https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dilations The dilation rates: `[dilationHeight, dilationWidth]`\n *   in which we sample input values across the height and width dimensions\n *   in atrous convolution. Defaults to `[1, 1]`. If `rate` is a single\n *   number, then `dilationHeight == dilationWidth`. If it is greater than\n *   1, then all values of `strides` must be 1.\n * @param dataFormat: An optional string from: \"NHWC\", \"NCHW\". Defaults to\n
 *   \"NHWC\". Specify the data format of the input and output data. With the\n *   default format \"NHWC\", the data is stored in the order of: [batch,\n *   height, width, channels]. Only \"NHWC\" is currently supported.\n * @param dimRoundingMode A string from: 'ceil', 'round', 'floor'. If none is\n *   provided, it will default to truncate.\n *\n * @doc {heading: 'Operations', subheading: 'Convolution'}\n */\nfunction depthwiseConv2d_<T extends Tensor3D|Tensor4D>(\n   x: T|TensorLike, filter: Tensor4D|TensorLike,\n   strides: [number,

number]|number, pad: 'valid'|'same'|number,\n dataFormat: 'NHWC'|'NCHW' = 'NHWC',\n dilations: [number, number]|number = [1, 1],\n dimRoundingMode?: 'floor'|'round'|'ceil'): T {\n const $x = convertToTensor(x, 'x', 'depthwiseConv2d');\n const $filter = convertToTensor(filter, 'filter', 'depthwiseConv2d');\n\n let x4D = $x as Tensor4D;\n let reshapedTo4D = false;\n if ($x.rank === 3) {\n   reshapedTo4D = true;\n   x4D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2]]);\n }\n util.assert(\n   x4D.rank === 4,\n   () => `Error in depthwiseConv2d: input must be rank 4, but got ` +\n   `rank ${x4D.rank}.`);\n util.assert(\n $filter.rank === 4,\n   () => `Error in depthwiseConv2d: filter must be rank 4, but got rank ` +\n   `${$filter.rank}.`);\n util.assert(\n   x4D.shape[3] === $filter.shape[2],\n   () => `Error in depthwiseConv2d: number of input channels ` +\n   `(${x4D.shape[3]}) must match the inChannels dimension in ` +\n   `filter ${$filter.shape[2]}.`);\n\n if (dimRoundingMode != null) {\n   util.assert(\n   util.isInt(pad as number),\n   () => `Error in depthwiseConv2d: pad must be an integer when using, ` +\n   `dimRoundingMode ${dimRoundingMode} but got pad ${pad}.`);\n }\n\n const inputs: DepthwiseConv2dNativeInputs = {x: x4D, filter: $filter};\n const attrs: DepthwiseConv2dNativeAttrs =\n   {strides, pad, dataFormat, dilations, dimRoundingMode};\n\n // tslint:disable-next-line: no-unnecessary-type-assertion\n const res = ENGINE.runKernel(\n   DepthwiseConv2dNative, inputs as {} as NamedTensorMap,\n   attrs as {} as NamedAttrMap) as T;\n\n if (reshapedTo4D) {\n   return reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as T;\n }\n return res;\n}\n\nexport const depthwiseConv2d = op({depthwiseConv2d_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Diag, DiagInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\n\nimport {op} from './operation';\n\n/**\n * Returns a diagonal tensor with a given diagonal values.\n *\n * Given a diagonal, this operation returns a tensor with the diagonal and\n * everything else padded with zeros.\n *\n * Assume the input has dimensions `[D1,..., Dk]`, then the output is a tensor\n * of rank 2k with dimensions `[D1,..., Dk, D1,..., Dk]`\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3, 4]);\n *\n * tf.diag(x).print()\n * ```\n * ```js\n * const x = tf.tensor1d([1, 2, 3, 4, 5, 6, 6, 8], [4, 2])\n *\n * tf.diag(x).print()\n * ```\n * @param x The input tensor.\n */\nfunction diag_(x: Tensor): Tensor {\n const $x = convertToTensor(x, 'x', 'diag');\n\n const inputs: DiagInputs = {x: $x};\n\n return ENGINE.runKernel(Diag, inputs as {} as NamedTensorMap);\n}\n\nexport const diag = op({diag_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Dilation2D, Dilation2DAttrs, Dilation2DInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor3D, Tensor4D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Computes the grayscale dilation over the input `x`.\n *\n * @param x The input tensor, rank 3 or rank 4 of shape\n *   `[batch, height, width, inChannels]`. If rank 3, batch

of 1 is assumed.\n * @param filter The filter tensor, rank 3, of shape\n * `[filterHeight, filterWidth, depth]`.\n * @param strides The strides of the sliding window for each dimension of the\n * input tensor: `[strideHeight, strideWidth]`.\n * If `strides` is a single number,\n * then `strideHeight == strideWidth`.\n * @param pad The type of padding algorithm.\n * - `same` and stride 1: output
will be of same size as input,\n * regardless of filter size.\n * - `valid`: output will be smaller than input if filter is larger\n * than 1*1x1.\n * - For more info, see this guide:\n * [https://www.tensorflow.org/api_guides/python/nn#Convolution](\n * https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dataFormat Specify the data format of the input and output data.\n * Defaults to 'NHWC'. Only 'NHWC' is currently supported. With the\n * default format \"NHWC\", the data is stored in the order of: [batch,\n * height, width, channels].\n * @param dilations The dilation rates: `[dilationHeight, dilationWidth]`\n * in which we sample input values across the height and width dimensions\n * for atrous morphological dilation. Defaults to `[1, 1]`. If `dilations`\n * is a single number, then `dilationHeight == dilationWidth`. If it is\n * greater than 1, then all values of `strides` must be 1.\n *\n * @doc
{heading: 'Operations', subheading: 'Convolution'}\n */\nfunction dilation2d_<T extends Tensor3D|Tensor4D>(\n x: T|TensorLike, filter: Tensor3D|TensorLike,\n strides: [number, number]|number, pad: 'valid'|'same',\n dilations: [number, number]|number = [1, 1],\n dataFormat: 'NHWC' = 'NHWC'): T {\n const $x = convertToTensor(x, 'x', 'dilation2d');\n const $filter = convertToTensor(filter, 'filter', 'dilation2d');\n\n util.assert(\n $x.rank === 3 || $x.rank === 4,\n () => `Error in dilation2d: input must be rank 3 or 4, but got rank ` +\n `${$x.rank}.`);\n util.assert(\n $filter.rank === 3,\n () => `Error in dilation2d: filter must be rank 3, but got rank ` +\n `${$filter.rank}.`);\n util.assert(\n dataFormat === 'NHWC',\n () => `Error in dilation2d: Only NHWC is currently supported, ` +\n `but got dataFormat of ${dataFormat}`);\n\n let x4D = $x as Tensor4D;\n let reshapedTo4D = false;\n\n if ($x.rank === 3) {\n x4D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2]]);\n reshapedTo4D = true;\n }\n\n const inputs: Dilation2DInputs = {x: x4D, filter: $filter};\n const attrs: Dilation2DAttrs = {strides, pad, dilations};\n\n // tslint:disable-next-line: no-unnecessary-type-assertion\n const res = ENGINE.runKernel(\n Dilation2D, inputs as {} as NamedTensorMap,\n attrs as {} as NamedAttrMap) as T;\n\n if (reshapedTo4D) {\n return reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as T;\n }\n\n return res;\n}\n\nexport const dilation2d = op({dilation2d_});\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed
under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\n/**\n * Returns the dimensions in the input shape that are broadcasted to\n * produce the provided output shape.\n *\n * The returned dimensions are 0-indexed and sorted. An example:\n * inShape = [4, 1, 3]\n * outShape = [5, 4, 3, 3]\n * result = [1]. Dimension 1 (2nd dimension of input) gets broadcasted 1 => 3.\n */\nexport function getBroadcastDims(\n inShape: number[], outShape: number[]): number[] {\n const inRank = inShape.length;\n const dims: number[] = [];\n for (let i = 0; i < inRank; i++) {\n const dim = inRank - 1 - i;\n const a = inShape[dim] || 1;\n const b = outShape[outShape.length - 1 - i] || 1;\n if (b > 1 && a === 1)
{\n dims.unshift(dim);\n }\n }\n return dims;\n}\n\n/**\n * Returns the axes in the output space that should be reduced to produce\n * the input space.\n */\nexport function getReductionAxes(\n inShape: number[], outShape: number[]): number[] {\n const result: number[] = [];\n for (let i = 0; i < outShape.length; i++) {\n const inDim = inShape[inShape.length - i - 1];\n const outAxis = outShape.length - i - 1;\n const outDim = outShape[outAxis];\n if (inDim == null || (inDim === 1 && outDim > 1)) {\n result.unshift(outAxis);\n }\n }\n return result;\n}\n\nexport function assertAndGetBroadcastShape(\n shapeA: number[], shapeB: number[]):

number[] {\n const result: number[] = [];\n const l = Math.max(shapeA.length, shapeB.length);\n\n for (let i = 0; i < l; i++) {\n   let a = shapeA[shapeA.length - i - 1];\n   if (a == null) {\n   a = 1;\n   }\n   let b = shapeB[shapeB.length - i - 1];\n   if (b == null) {\n   b = 1;\n   }\n   if (a === 1) {\n   result.unshift(b);\n   } else if (b === 1) {\n   result.unshift(a);\n   } else if (a !== b) {\n   const errMsg = `Operands could not be broadcast together with shapes ` +\n   `${shapeA} and ${shapeB}.`;\n   throw Error(errMsg);\n   } else {\n   result.unshift(a);\n   }\n }\n return result;\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\nimport {ENGINE} from '../engine';\nimport {Equal, EqualInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {makeTypesMatch} from '../tensor_util';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {assertAndGetBroadcastShape} from './broadcast_util';\nimport {op} from './operation';\n\n/**\n * Returns the truth value of (a == b) element-wise. Supports broadcasting.\n *\n * ```js\n * const a = tf.tensor1d([1, 2, 3]);\n * const b = tf.tensor1d([2, 2, 2]);\n *\n * a.equal(b).print();\n * ```\n *\n * @param a The first input tensor.\n * @param b The second input tensor. Must have the same dtype as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Logical'}\n */\nfunction equal_<T extends Tensor>(\n   a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'equal');\n let $b = convertToTensor(b, 'b', 'equal');\n [$a, $b] = makeTypesMatch($a, $b);\n\n assertAndGetBroadcastShape($a.shape, $b.shape);\n\n const inputs: EqualInputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(Equal, inputs as {} as NamedTensorMap);\n}\n\nexport const equal = op({equal_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {ENGINE} from '../engine';\nimport {Select, SelectInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {assert, assertShapesMatch} from '../util';\n\nimport {broadcastTo} from './broadcast_to';\nimport {assertAndGetBroadcastShape} from './broadcast_util';\nimport {op} from './operation';\n\n/**\n * Returns the elements, either `a` or `b` depending on the `condition`.\n *\n * If the condition is true, select from `a`, otherwise select from `b`.\n *\n * ```js\n * const cond = tf.tensor1d([false, false, true], 'bool');\n * const a = tf.tensor1d([1 , 2, 3]);\n * const b = tf.tensor1d([-1, -2, -3]);\n *\n * a.where(cond, b).print();\n * ```\n *\n * @param condition The input condition. Must be of dtype bool.\n * @param a If `condition` is rank 1, `a` may have a higher rank but\n *   its first dimension must match the size of `condition`.\n * @param b A tensor with the same dtype as `a` and with shape that is\n * compatible with `a`.\n * @return A tensor with same dtype as `a` and `b`, and shape that is\n *   broadcastable from `a` and `b`.\n *\n * @doc {heading: 'Operations', subheading: 'Logical'}\n */\nfunction where_<T extends Tensor>(\n   condition: Tensor|TensorLike, a: T|TensorLike, b: T|TensorLike): T {\n const $a = convertToTensor(a, 'a', 'where');\n const $b = convertToTensor(b, 'b', 'where');\n const $condition = convertToTensor(condition, 'condition', 'where', 'bool');\n // TODO: move this logic to forward function when the broadcastTo op is\n // implemented in WASM.\n // Find the broadcastable shape for $a and $b.\n const

broadcastShape = assertAndGetBroadcastShape($a.shape, $b.shape);\n const $broadcastedA = broadcastTo($a, broadcastShape);\n const $broadcastedB = broadcastTo($b, broadcastShape);\n if ($condition.rank === 1) {\n   // If condition rank is
1, then the first dimension must match the size of\n   // condition.\n   assert(\n $condition.shape[0] === $a.shape[0],\n   () => 'The first dimension of `a` must match the size of `condition`.');\n }\n\n if ($condition.rank !== 1) {\n   // A must have the same shape as condition.\n   assertShapesMatch(\n $condition.shape, $broadcastedB.shape, 'Error in where: ');\n }\n\n const inputs: SelectInputs = {\n   condition: $condition,\n   t: $broadcastedA,\n   e: $broadcastedB\n };\n return ENGINE.runKernel(Select, inputs as unknown as NamedTensorMap);\n}\n\nexport const where = op({where_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {ZerosLike, ZerosLikeInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Creates a `tf.Tensor` with all elements set to 0 with the same shape as the\n * given tensor.\n *\n * ```js\n * const x = tf.tensor([1, 2]);\n * tf.zerosLike(x).print();\n * ```\n *\n * @param x The tensor of required shape.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nfunction zerosLike_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'zerosLike');\n const inputs: ZerosLikeInputs = {x: $x};\n return ENGINE.runKernel(ZerosLike, inputs as {} as NamedTensorMap);\n}\nexport const zerosLike = op({zerosLike_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {Tensor} from '../tensor';\nimport {makeTypesMatch} from '../tensor_util';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {div} from './div';\nimport {equal} from './equal';\nimport {op} from './operation';\nimport {where} from './where';\nimport {zerosLike} from './zeros_like';\n\n/**\n * Divides two `tf.Tensor`s element-wise, A / B. Supports broadcasting. Return 0\n * if denominator is 0.\n *\n *\n * ```js\n * const a = tf.tensor1d([1, 4, 9, 16]);\n * const b = tf.tensor1d([1, 2, 3, 4]);\n * const c = tf.tensor1d([0, 0, 0, 0]);\n *\n * a.divNoNan(b).print(); // or tf.divNoNan(a, b)\n * a.divNoNan(c).print(); // or tf.divNoNan(a, c)\n * ```\n *\n * ```js\n * // Broadcast div a with b.\n * const a = tf.tensor1d([2, 4, 6, 8]);\n * const b = tf.scalar(2);\n * const c = tf.scalar(0);\n *\n * a.divNoNan(b).print(); // or tf.divNoNan(a, b)\n * a.divNoNan(c).print(); // or tf.divNoNan(a, c)\n * ```\n *\n * @param a The first tensor as the numerator.\n * @param b
The second tensor as the denominator. Must have the same dtype as\n * `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Arithmetic'}\n */\nfunction divNoNan_<T extends Tensor>(\n   a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n // TODO: Make this into its own kernel.\n let $a = convertToTensor(a, 'a', 'div');\n let $b = convertToTensor(b, 'b', 'div');\n [$a, $b] = makeTypesMatch($a, $b);\n\n const divResult = div($a, $b);\n const zeros = zerosLike(divResult);\n const bEqualsZero = equal($b, zeros);\n return where(bEqualsZero, zeros, divResult) as T;\n}\n\nexport const divNoNan = op({divNoNan_});\n","/**\n * @license\n * Copyright 2020

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 * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {Tensor,} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {matMul} from './mat_mul';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Computes the dot product of two matrices and/or vectors, `t1` and `t2`.\n *\n * ```js\n * const a = tf.tensor1d([1, 2]);\n * const b = tf.tensor2d([[1, 2], [3, 4]]);\n * const c = tf.tensor2d([[1, 2, 3], [4, 5, 6]]);\n *\n * a.dot(b).print(); // or tf.dot(a, b)\n * b.dot(a).print();\n * b.dot(c).print();\n * ```\n * @param t1 The first tensor in the dot operation.\n *
 @param t2 The second tensor in the dot operation.\n *\n * @doc {heading: 'Operations', subheading: 'Matrices'}\n */\nfunction dot_(t1: Tensor|TensorLike, t2: Tensor|TensorLike): Tensor {\n const $t1 = convertToTensor(t1, 't1', 'dot');\n const $t2 = convertToTensor(t2, 't2', 'dot');\n\n util.assert(\n   ($t1.rank === 1 || $t1.rank === 2) && ($t2.rank === 1 || $t2.rank === 2),\n   () => `Error in dot: inputs must all be rank 1 or 2, but got ranks ` +\n   `${$t1.rank} and ${$t2.rank}.`);\n\n const t1Inner = ($t1.rank === 1 ? $t1.size : $t1.shape[1]);\n const t2Inner = ($t2.rank === 1 ? $t2.size : $t2.shape[0]);\n\n util.assert(\n   t1Inner === t2Inner,\n   () => `Error in dot: inner dimensions of inputs must match, but got ` +\n   `${t1Inner} and ${t2Inner}.`);\n\n if ($t1.rank === 1 && $t2.rank === 1) {\n   const t12D = reshape($t1, [1, -1]);\n   const t22D = reshape($t2, [-1, 1]);\n   const t1t2 = matMul(t12D, t22D);\n   return reshape(t1t2, []);\n
 } else if ($t1.rank === 1 && $t2.rank === 2) {\n   const t12D = reshape($t1, [1, -1]);\n   const t22D = reshape($t2, [$t2.shape[0], $t2.shape[1]]);\n   const t1t2 = matMul(t12D, t22D);\n   return reshape(t1t2, [t1t2.size]);\n } else if ($t1.rank === 2 && $t2.rank === 1) {\n   const t22D = reshape($t2, [-1, 1]);\n   const t1t2 = matMul($t1, t22D);\n
 return reshape(t1t2, [t1t2.size]);\n } else {\n   const t22D = reshape($t2, [$t2.shape[0], $t2.shape[1]]);\n   const t1t2 = matMul($t1, t22D);\n   return t1t2;\n }\n}\n\nexport const dot = op({dot_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on
 an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {ENGINE} from '../engine';\nimport {Elu, EluInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes exponential linear element-wise: `x > 0 ? e ^ x - 1 : 0`.\n *\n * ```js\n * const x = tf.tensor1d([-1, 1, -3, 2]);\n *\n * x.elu().print(); // or tf.elu(x)\n * ```\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction elu_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'elu');\n\n const inputs: EluInputs
 = {x: $x};\n\n return ENGINE.runKernel(Elu, inputs as {} as NamedTensorMap);\n}\n\nexport const elu = op({elu_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed

on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Erf, ErfInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {cast} from './cast';\nimport {op} from './operation';\n\n/**\n * Computes gause error function of the input `tf.Tensor` element-wise:\n * `erf(x)`\n *\n * ```js\n * const x = tf.tensor1d([0, .1, -.1, .7]);\n *\n * x.erf().print(); // or tf.erf(x);\n * ```\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction erf_<T extends Tensor>(x: T|TensorLike): T {\n let $x = convertToTensor(x, 'x', 'erf');\n util.assert(\n $x.dtype === 'int32' || $x.dtype === 'float32',\n   () => 'Input dtype must be `int32` or `float32`.');\n\n if ($x.dtype === 'int32') {\n $x = cast($x, 'float32');\n }\n\n const inputs: ErfInputs = {x: $x};\n return ENGINE.runKernel(Erf, inputs as {} as NamedTensorMap);\n}\nexport const erf = op({erf_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Exp, ExpInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes exponential of the input `tf.Tensor` element-wise. `e ^ x`\n *\n * ```js\n * const x = tf.tensor1d([1, 2, -3]);\n *\n * x.exp().print(); // or tf.exp(x)\n * ```\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction exp_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'exp');\n\n const inputs: ExpInputs = {x: $x};\n return ENGINE.runKernel(Exp, inputs as {} as NamedTensorMap);\n}\nexport const exp = op({exp_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {op} from './operation';\n\n/**\n * Returns a `tf.Tensor` that has expanded rank, by inserting a dimension\n * into the tensor's shape.\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3, 4]);\n * const axis = 1;\n * x.expandDims(axis).print();\n * ```\n *\n * @param x The input tensor whose dimensions to be expanded.\n * @param axis The dimension index at which to insert shape of `1`. Defaults\n *

to 0 (the first dimension).\n *\n * @doc {heading: 'Tensors', subheading: 'Transformations'}\n */\nfunction expandDims_<T extends Tensor>(x: Tensor|TensorLike, axis = 0): T {\n const $x = convertToTensor(x, 'x', 'expandDims', 'string_or_numeric');\n\n util.assert(axis <= $x.rank, () => 'Axis must be <= rank of the tensor');\n\n const inputs: ExpandDimsInputs = {input: $x};\n const attrs: ExpandDimsAttrs = {dim: axis};\n\n return ENGINE.runKernel(\n   ExpandDims, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const expandDims = op({expandDims_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the
License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Expm1, Expm1Inputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes exponential of the input `tf.Tensor` minus one element-wise.\n * `e ^ x - 1`\n *\n * ```js\n * const x = tf.tensor1d([1, 2, -3]);\n *\n * x.expm1().print(); // or tf.expm1(x)\n * ```\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction expm1_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x,
'x', 'expm1');\n\n const inputs: Expm1Inputs = {x: $x};\n return ENGINE.runKernel(Expm1, inputs as {} as NamedTensorMap);\n}\nexport const expm1 = op({expm1_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Tile, TileAttrs, TileInputs} from '../kernel_names';\nimport
{NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {op} from './operation';\n\n/**\n * Construct a tensor by repeating it the number of times given by reps.\n *\n * This operation creates a new tensor by replicating `input` `reps`\n * times. The output tensor's i'th dimension has `input.shape[i] *\n * reps[i]` elements, and the values of `input` are replicated\n * `reps[i]` times along the i'th dimension. For example, tiling\n * `[a, b, c, d]` by `[2]` produces `[a, b, c, d, a, b, c, d]`.\n *\n * ```js\n * const a = tf.tensor1d([1, 2]);\n *\n * a.tile([2]).print();   // or a.tile([2])\n * ```\n *\n * ```js\n * const a = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n *\n * a.tile([1, 2]).print(); // or a.tile([1, 2])\n * ```\n * @param x The tensor to tile.\n * @param reps Determines
the number of replications per dimension.\n *\n * @doc {heading: 'Tensors', subheading: 'Slicing and Joining'}\n */\nfunction tile_<T extends Tensor>(x: T|TensorLike, reps: number[]): T {\n const $x = convertToTensor(x, 'x', 'tile', 'string_or_numeric');\n util.assert(\n $x.rank === reps.length,\n   () => `Error in transpose: rank of input ${$x.rank} ` +\n   `must match length of reps ${reps}.`);\n\n const inputs: TileInputs = {x: $x};\n const attrs: TileAttrs = {reps};\n\n return ENGINE.runKernel(\n   Tile, inputs as unknown as NamedTensorMap,\n   attrs as unknown as NamedAttrMap);\n}\n\nexport const tile = op({tile_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *

http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {Tensor2D} from '../tensor';\nimport {DataType} from '../types';\n\nimport {buffer} from './buffer';\nimport {expandDims} from './expand_dims';\nimport {op} from './operation';\nimport {reshape} from './reshape';\nimport {tile} from './tile';\n\n/**\n * Create an identity matrix.\n *\n * @param numRows Number of rows.\n * @param numColumns Number of columns. Defaults to `numRows`.\n * @param batchShape If provided, will add the batch shape to the beginning\n * of the shape of the returned `tf.Tensor` by repeating the identity\n * matrix.\n * @param dtype Data type.\n * @returns Identity matrix of the specified size and data type, possibly\n * with batch repetition if `batchShape` is specified.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nfunction eye_(\n numRows: number, numColumns?: number,\n batchShape?:\n [\n number\n]|[number,\n number]|[number, number, number]|[number, number, number, number],\n dtype: DataType = 'float32'): Tensor2D {\n if (numColumns == null) {\n numColumns = numRows;\n }\n const buff = buffer([numRows, numColumns], dtype);\n const n = numRows <= numColumns ? numRows : numColumns;\n for (let i = 0; i < n; ++i) {\n buff.set(1, i, i);\n }\n const out: Tensor2D = reshape(buff.toTensor(), [numRows, numColumns]);\n if (batchShape == null) {\n return out;\n } else {\n if (batchShape.length === 1) {\n return tile(expandDims(out, 0), [batchShape[0], 1, 1]) as Tensor2D;\n } else if (batchShape.length === 2) {\n // tslint:disable-next-line:no-unnecessary-type-assertion\n return tile(\n expandDims(expandDims(out, 0), 0),\n [batchShape[0], batchShape[1], 1, 1]) as Tensor2D;\n } else if (batchShape.length === 3) {\n // tslint:disable-next-line:no-unnecessary-type-assertion\n return tile(expandDims(expandDims(expandDims(out, 0), 0), 0), [\n batchShape[0], batchShape[1], batchShape[2], 1, 1\n]) as Tensor2D;\n } else {\n throw new Error(\n `eye() currently supports only 1D and 2D ` +\n // tslint:disable-next-line:no-any\n `batchShapes, but received ${(batchShape as any).length}D.`);\n }\n }\n}\n\nexport const eye = op({eye_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Fill, FillAttrs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {DataType, Rank, ShapeMap} from '../types';\n\n/**\n * Creates a `tf.Tensor` filled with a scalar value.\n *\n * ```js\n * tf.fill([2, 2], 4).print();\n * ```\n *\n * @param shape An array of integers defining the output tensor shape.\n * @param value The scalar value to fill the tensor with.\n * @param dtype The type of an element in the resulting tensor. Defaults to\n * 'float'.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nfunction fill<R extends Rank>(\n shape: ShapeMap[R], value: number|string, dtype?: DataType): Tensor<R> {\n const attrs: FillAttrs = {shape, value, dtype};\n\n return ENGINE.runKernel(Fill, {}, attrs as {} as NamedAttrMap);\n}\n\nexport {fill};\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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=============================================================================\n
 */\nimport {ENGINE} from '../engine';\nimport {Floor, FloorInputs} from '../kernel_names';\nimport {Tensor}
from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from
'../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes
floor of input `tf.Tensor` element-wise: `floor(x)`.\n *\n * ```js\n * const x = tf.tensor1d([.6, 1.1, -3.3]);\n *\n *
x.floor().print();  // or tf.floor(x)\n * ```\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations',
subheading: 'Basic math'}\n */\nfunction floor_<T extends Tensor>(x: T|TensorLike): T {\n  const $x =
convertToTensor(x, 'x', 'floor');\n\n  const inputs: FloorInputs = {x: $x};\n  return ENGINE.runKernel(Floor, inputs
as {} as NamedTensorMap);\n}\nexport const floor = op({floor_});\n","/**\n * @license\n * Copyright 2018
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
=============================================================================\n
*/\n\nimport {ENGINE} from '../engine';\nimport {GatherV2, GatherV2Attrs, GatherV2Inputs} from
'../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport
{NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport
{TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Gather slices from tensor `x`'s axis `axis`
according
 to `indices`.\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3, 4]);\n * const indices = tf.tensor1d([1, 3, 3], 'int32');\n *\n
* x.gather(indices).print();\n * ```\n *\n * ```js\n * const x = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n * const indices =
tf.tensor1d([1, 1, 0], 'int32');\n *\n * x.gather(indices).print();\n * ```\n * @param x The input tensor whose slices to
be gathered.\n * @param indices The indices of the values to extract.\n * @param axis The axis over which to select
values. Defaults to 0.\n * @param batchDims Optional. The number of batch dimensions. It must be less\n *     than
or equal to rank(indices). Defaults to 0.\n *     The output tensor will have shape of\n *     `x.shape[:axis] +
indices.shape[batchDims:] + x.shape[axis + 1:]`\n *\n * @doc {heading: 'Tensors', subheading: 'Slicing and
Joining'}\n */\nfunction gather_<T extends Tensor>(\n    x: T|TensorLike, indices: Tensor|TensorLike, axis = 0,
batchDims = 0): T {\n  const $x = convertToTensor(x, 'x',
 'gather');\n  const $indices = convertToTensor(indices, 'indices', 'gather', 'int32');\n\n  const inputs: GatherV2Inputs
= {x: $x, indices: $indices};\n  const attrs: GatherV2Attrs = {axis, batchDims};\n\n  return ENGINE.runKernel(\n
GatherV2, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const gather =
op({gather_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
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Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
=============================================================================\n
 */\nimport {ENGINE} from '../engine';\nimport {Greater, GreaterInputs} from '../kernel_names';\nimport {Tensor}
from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {makeTypesMatch} from
'../tensor_util';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport
{assertAndGetBroadcastShape} from './broadcast_util';\nimport {op} from './operation';\n\n/**\n * Returns the truth
value of (a > b) element-wise. Supports broadcasting.\n *\n * ```js\n * const a = tf.tensor1d([1, 2, 3]);\n * const b =
tf.tensor1d([2, 2, 2]);\n *\n * a.greater(b).print();\n * ```\n *\n * @param a The first input tensor.\n * @param b The
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second input tensor. Must have the same dtype as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Logical'}\n */\nfunction greater_<T extends Tensor>(\n a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a,
'a', 'greater');\n let $b = convertToTensor(b, 'b', 'greater');\n [$a, $b] = makeTypesMatch($a, $b);\n\n assertAndGetBroadcastShape($a.shape, $b.shape);\n\n const inputs: GreaterInputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(Greater, inputs as {} as NamedTensorMap);\n}\n\nexport const greater = op({greater_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {ENGINE} from '../engine';\nimport {GreaterEqual, GreaterEqualInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {makeTypesMatch} from '../tensor_util';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {assertAndGetBroadcastShape} from './broadcast_util';\nimport {op} from './operation';\n\n/**\n * Returns the truth value of (a >= b) element-wise. Supports broadcasting.\n *\n * ```js\n * const a = tf.tensor1d([1, 2, 3]);\n * const b = tf.tensor1d([2, 2, 2]);\n *\n * a.greaterEqual(b).print();\n * ```\n *\n * @param a The first input tensor.\n * @param b The second input tensor. Must have the same dtype as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Logical'}\n */\nfunction greaterEqual_<T extends Tensor>(\n a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a',
'greaterEqual');\n let $b = convertToTensor(b, 'b', 'greaterEqual');\n [$a, $b] = makeTypesMatch($a, $b);\n\n assertAndGetBroadcastShape($a.shape, $b.shape);\n\n const inputs: GreaterEqualInputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(GreaterEqual, inputs as {} as NamedTensorMap);\n}\n\nexport const greaterEqual = op({greaterEqual_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Imag, ImagInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {op} from './operation';\n\n/**\n * Returns the imaginary part of a complex (or real) tensor.\n *\n * Given a tensor input, this operation returns a tensor of type float that is\n * the imaginary part of each element in input considered as a complex number.\n * If input is real, a tensor of all zeros is returned.\n *\n * ```js\n * const x = tf.complex([-2.25, 3.25], [4.75, 5.75]);\n * tf.imag(x).print();\n * ```\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nfunction imag_<T extends Tensor>(input: T|TensorLike): T {\n const $input = convertToTensor(input, 'input', 'imag');\n\n const inputs: ImagInputs = {input: $input};\n return
ENGINE.runKernel(Imag, inputs as {} as NamedTensorMap);\n}\n\nexport const imag = op({imag_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *

WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ENGINE} from '../engine';\nimport {IsFinite, IsFiniteInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Returns which elements of x are finite.\n *\n * ```js\n * const x = tf.tensor1d([NaN, Infinity, -Infinity, 0, 1]);\n *\n * x.isFinite().print(); // or tf.isNaN(x)\n * ```\n * @param x The input Tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction isFinite_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'isFinite');\n\n const inputs: IsFiniteInputs = {x: $x};\n\n return ENGINE.runKernel(IsFinite, inputs as {} as NamedTensorMap);\n}\nexport const isFinite = op({isFinite_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ENGINE} from '../engine';\nimport {IsInf, IsInfInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Returns which elements of x are Infinity or -Infinity.\n *\n * ```js\n * const x = tf.tensor1d([NaN, Infinity, -Infinity, 0, 1]);\n *\n * x.isInf().print(); // or tf.isNaN(x)\n * ```\n * @param x The input Tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction isInf_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'isInf');\n\n const inputs: IsInfInputs = {x: $x};\n\n return ENGINE.runKernel(IsInf, inputs as {} as NamedTensorMap);\n}\nexport const isInf = op({isInf_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ENGINE} from '../engine';\nimport {IsNan, IsNanInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * RReturns which elements of x are NaN.\n *\n * ```js\n * const x = tf.tensor1d([NaN, Infinity, -Infinity, 0, 1]);\n *\n * x.isNaN().print(); // or tf.isNaN(x)\n * ```\n * @param x The input Tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction isNaN_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'isNaN');\n const inputs: IsNanInputs = {x: $x};\n\n return ENGINE.runKernel(IsNan, inputs as {} as NamedTensorMap);\n}\nexport const isNaN = op({isNaN_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either

express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {LeakyRelu, LeakyReluAttrs, LeakyReluInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes leaky rectified linear element-wise.\n *\n * See\n * [http://web.stanford.edu/~awni/papers/relu_hybrid_icml2013_final.pdf](\n * http://web.stanford.edu/~awni/papers/relu_hybrid_icml2013_final.pdf)\n *\n * ```js\n * const x = tf.tensor1d([-1, 2, -3, 4]);\n *\n * x.leakyRelu(0.1).print(); // or tf.leakyRelu(x, 0.1)\n * ```\n * @param x The input tensor.\n * @param alpha The scaling factor for negative values, defaults to 0.2.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction leakyRelu_<T extends Tensor>(x: T|TensorLike, alpha = 0.2): T {\n const $x = convertToTensor(x, 'x', 'leakyRelu');\n\n const inputs: LeakyReluInputs = {x: $x};\n const attrs: LeakyReluAttrs = {alpha};\n\n return ENGINE.runKernel(\n   LeakyRelu, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const leakyRelu = op({leakyRelu_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {ENGINE} from '../engine';\nimport {Less, LessInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {makeTypesMatch} from '../tensor_util';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {assertAndGetBroadcastShape} from './broadcast_util';\nimport {op} from './operation';\n\n/**\n * Returns the truth value of (a < b) element-wise.
Supports broadcasting.\n *\n * ```js\n * const a = tf.tensor1d([1, 2, 3]);\n * const b = tf.tensor1d([2, 2, 2]);\n *\n * a.less(b).print();\n * ```\n * @param a The first input tensor.\n * @param b The second input tensor. Must have the same dtype as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Logical'}\n */\nfunction less_<T extends Tensor>(\n   a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'less');\n let $b = convertToTensor(b, 'b', 'less');\n [$a, $b] = makeTypesMatch($a, $b);\n\n assertAndGetBroadcastShape($a.shape, $b.shape);\n\n const inputs: LessInputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(Less, inputs as {} as NamedTensorMap);\n}\n\nexport const less = op({less_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {ENGINE} from '../engine';\nimport {LessEqual, LessEqualInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {makeTypesMatch} from '../tensor_util';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {assertAndGetBroadcastShape} from './broadcast_util';\nimport {op} from './operation';\n\n/**\n * Returns the truth value of (a <= b) element-wise. Supports broadcasting.\n *\n * ```js\n * const a =

tf.tensor1d([1, 2, 3]);\n * const b = tf.tensor1d([2, 2, 2]);\n *\n * a.lessEqual(b).print();\n * ```\n *\n * @param a The first input tensor.\n * @param b The second input tensor. Must have the same dtype as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Logical'}\n */\nfunction lessEqual_<T extends Tensor>(\n a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'lessEqual');\n let $b = convertToTensor(b, 'b', 'lessEqual');\n [$a, $b] = makeTypesMatch($a, $b);\n\n assertAndGetBroadcastShape($a.shape, $b.shape);\n\n const inputs: LessEqualInputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(LessEqual, inputs as {} as NamedTensorMap);\n}\n\nexport const lessEqual = op({lessEqual_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ENGINE} from '../engine';\nimport {LinSpace, LinSpaceAttrs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor1D} from '../tensor';\n\n/**\n * Return an evenly spaced sequence of numbers over the given interval.\n *\n * ```js\n * tf.linspace(0, 9, 10).print();\n * ```\n * @param start The start value of the sequence.\n * @param stop The end value of the sequence.\n * @param num The number of values to generate.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function linspace(start: number, stop: number, num: number): Tensor1D {\n if (num <= 0) {\n throw new Error('The number of values should be positive.');\n }\n\n const attrs: LinSpaceAttrs = {start, stop, num};\n return ENGINE.runKernel(LinSpace, {}, attrs as {} as NamedAttrMap);\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ENGINE} from '../engine';\nimport {LRN, LRNAttrs, LRNInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor3D, Tensor4D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Normalizes the activation of a local neighborhood across or within\n * channels.\n *\n * @param x The input tensor. The 4-D input tensor is treated as a 3-D array\n * of 1D vectors (along the last dimension), and each vector is\n * normalized independently.\n * @param depthRadius The number of adjacent channels in the 1D normalization\n * window.\n * @param bias A constant bias term for the basis.\n * @param alpha A scale factor, usually positive.\n * @param beta An exponent.\n *\n * @doc {heading: 'Operations', subheading:\n 'Normalization'}\n */\nfunction localResponseNormalization_<T extends Tensor3D|Tensor4D>(\n x: T|TensorLike, depthRadius = 5, bias = 1, alpha = 1, beta = 0.5): T {\n const $x = convertToTensor(x, 'x', 'localResponseNormalization');\n util.assert(\n $x.rank === 4 || $x.rank === 3,\n () => `Error in localResponseNormalization: x must be rank 3 or 4 but got\n rank ${$x.rank}.`);\n util.assert(\n util.isInt(depthRadius),\n () => `Error in localResponseNormalization: depthRadius must be an ` +\n `integer but got depthRadius ${depthRadius}.`);\n\n let x4D = $x as Tensor4D;\n let reshapedTo4D = false;\n if ($x.rank === 3) {\n reshapedTo4D = true;\n x4D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2]]);\n }\n\n const inputs: LRNInputs = {x: x4D};\n\n const attrs: LRNAttrs = {depthRadius, bias, alpha, beta};\n\n //

tslint:disable-next-line: no-unnecessary-type-assertion\n const res = ENGINE.runKernel(\n
LRN, inputs as {} as NamedTensorMap,\n attrs as {} as NamedAttrMap) as T;\n\n if (reshapedTo4D) {\n return reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as T;\n } else {\n return res;\n }\n}\n\nexport const localResponseNormalization = op({localResponseNormalization_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {ENGINE} from '../engine';\nimport {Log, LogInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes natural logarithm of the input `tf.Tensor` element-wise: `ln(x)`\n *\n * ```js\n * const x = tf.tensor1d([1, 2, Math.E]);\n *\n * x.log().print(); // or tf.log(x)\n * ```\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction log_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'log');\n\n const inputs: LogInputs = {x: $x};\n return ENGINE.runKernel(Log, inputs as {} as NamedTensorMap);\n}\nexport const log = op({log_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n
* you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {ENGINE} from '../engine';\nimport {Log1p, Log1pInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes natural logarithm of the input `tf.Tensor` plus one\n * element-wise: `ln(1 + x)`\n *\n
* ```js\n * const x = tf.tensor1d([1, 2, Math.E - 1]);\n *\n * x.log1p().print(); // or tf.log1p(x)\n * ```\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction log1p_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'log1p');\n\n const inputs: Log1pInputs = {x: $x};\n return ENGINE.runKernel(Log1p, inputs as {} as NamedTensorMap);\n}\nexport const log1p = op({log1p_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See
the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {CustomGradientFunc, ENGINE} from './engine';\nimport {Scalar, Tensor, Variable} from './tensor';\nimport {NamedTensorMap} from './tensor_types';\nimport {convertToTensor, convertToTensorArray} from './tensor_util_env';\nimport {TensorLike} from './types';\nimport * as util from './util';\n\n/**\n * Provided `f(x)`, returns another function `g(x, dy?)`, which gives the\n * gradient of `f(x)` with respect to `x`.\n *\n * If `dy` is provided, the gradient of `f(x).mul(dy).sum()` with respect to\n * `x` is computed instead. `f(x)` must take a single tensor `x` and return a\n * single tensor `y`. If `f()` takes multiple inputs, use `tf.grads` instead.\n *\n * ```js\n * //

f(x) = x ^ 2\n * const f = x => x.square();\n * // f'(x) = 2x\n * const g = tf.grad(f);\n *\n * const x = tf.tensor1d([2, 3]);\n
 * g(x).print();\n * ```\n *\n * ```js\n * // f(x) = x ^ 3\n * const f = x => x.pow(tf.scalar(3, 'int32'));\n * // f'(x) = 3x ^ 2\n * const g = tf.grad(f);\n * // f''(x) = 6x\n * const gg = tf.grad(g);\n *\n * const x = tf.tensor1d([2, 3]);\n * gg(x).print();\n * ```\n *\n * @param f The function f(x), to compute gradient for.\n *\n * @doc {heading: 'Training', subheading: 'Gradients'}\n */\nfunction grad(f: (x: Tensor) => Tensor): (\n   x: TensorLike|Tensor, dy?: TensorLike|Tensor) => Tensor {\n util.assert(\n   util.isFunction(f), () => 'The f passed in grad(f) must be a function');\n return (x: TensorLike|Tensor, dy?: TensorLike|Tensor): Tensor => {\n   // x can be of any dtype, thus null as the last argument.\n   const $x = convertToTensor(x, 'x', 'tf.grad', 'string_or_numeric');\n   const $dy: Tensor =\n   (dy != null) ? convertToTensor(dy, 'dy', 'tf.grad') : null;\n   return ENGINE.tidy(() => {\n   const {value, grads} = ENGINE.gradients(() => f($x), [$x], $dy);\n
      if ($dy != null) {\n   util.assertShapesMatch(\n   value.shape, $dy.shape,\n   'The shape of dy passed in grad(f)(x, dy) must match the shape ' +\n   'returned by f(x)');\n   }\n   checkGrads(grads);\n   return grads[0];\n   });\n };\n}\n\n/**\n * Provided `f(x1, x2,...)`, returns another function `g([x1, x2,...], dy?)`,\n * which gives an array of gradients of `f()` with respect to each input\n * [`x1`,`x2`,...].\n *\n * If `dy` is passed when calling `g()`, the gradient of\n * `f(x1,...).mul(dy).sum()` with respect to each input is computed instead.\n * The provided `f` must take one or more tensors and return a single tensor\n * `y`. If `f()` takes a single input, we recommend using `tf.grad` instead.\n *\n * ```js\n * // f(a, b) = a * b\n * const f = (a, b) => a.mul(b);\n * // df / da = b, df / db = a\n * const g = tf.grads(f);\n *\n * const a = tf.tensor1d([2, 3]);\n * const b = tf.tensor1d([-2, -3]);\n * const [da, db] = g([a,
 b]);\n * console.log('da');\n * da.print();\n * console.log('db');\n * db.print();\n * ```\n *\n * @param f The function `f(x1, x2,...)` to compute gradients for.\n *\n * @doc {heading: 'Training', subheading: 'Gradients'}\n */\nfunction grads(f: (...args: Tensor[]) => Tensor): (\n   args: Array<Tensor|TensorLike>, dy?: Tensor|TensorLike) => Tensor[] {\n util.assert(\n   util.isFunction(f), () => 'The f passed in grads(f) must be a function');\n return (args: Array<Tensor|TensorLike>, dy?: Tensor|TensorLike): Tensor[] => {\n   util.assert(\n   Array.isArray(args),\n   () => 'The args passed in grads(f)(args) must be an array ' +\n   'of `Tensor`s or `TensorLike`s');\n   // args can be of any dtype, thus null as the last argument.\n   const $args =\n   convertToTensorArray(args, 'args', 'tf.grads', 'string_or_numeric');\n   const $dy: Tensor =\n   (dy != null) ? convertToTensor(dy, 'dy', 'tf.grads') : null;\n   return ENGINE.tidy(() => {\n
      const {value, grads} = ENGINE.gradients(() => f(...$args), $args, $dy);\n   if ($dy != null) {\n   util.assertShapesMatch(\n   value.shape, $dy.shape,\n   'The shape of dy passed in grads(f)([x1,...], dy) must ' +\n   'match the shape returned by f([x1,...])');\n   }\n   checkGrads(grads);\n   return grads;\n   });\n };\n}\n\n/**\n * Like `tf.grad`, but also returns the value of `f()`. Useful when `f()`\n * returns a metric you want to show.\n *\n * The result is a rich object with the following properties:\n * - grad: The gradient of `f(x)` w.r.t `x` (result of `tf.grad`).\n * - value: The value returned by `f(x)`.\n *\n * ```js\n * // f(x) = x ^ 2\n * const f = x => x.square();\n * // f'(x) = 2x\n * const g = tf.valueAndGrad(f);\n *\n * const x = tf.tensor1d([2, 3]);\n * const {value, grad} = g(x);\n *\n * console.log('value');\n * value.print();\n * console.log('grad');\n * grad.print();\n * ```\n *\n * @doc {heading: 'Training', subheading:
 'Gradients'}\n */\nfunction valueAndGrad<I extends Tensor, O extends Tensor>(f: (x: I) => O): (\n   x: I, dy?: O) => {\n value: O;\n grad: I;\n} {\n util.assert(\n   util.isFunction(f),\n   () => 'The f passed in valueAndGrad(f) must be a function');\n return (x: I, dy?: O) => {\n   util.assert(\n   x instanceof Tensor,\n   () => 'The x passed in valueAndGrad(f)(x) must be a tensor');\n   util.assert(\n   dy == null || dy instanceof Tensor,\n   () => 'The dy passed in valueAndGrad(f)(x, dy) must be a tensor');\n   const {grads, value} = ENGINE.gradients(() => f(x), [x], dy);\n   checkGrads(grads);\n   return {grad: grads[0] as I, value};\n };\n}\n\n/**\n * Like `tf.grads`, but returns also the value of `f()`. Useful when `f()`\n * returns a metric you want to show.\n *\n * The result is a rich object with the following properties:\n * - grads: The gradients of `f()` w.r.t each input (result of `tf.grads`).\n * - value: The value returned

by `f(x)`.\n *\n * ```js\n * // f(a, b) = a * b\n * const f = (a, b) => a.mul(b);\n * // df/da = b, df/db = a\n * const g = tf.valueAndGrads(f);\n *\n * const a = tf.tensor1d([2, 3]);\n * const b = tf.tensor1d([-2, -3]);\n * const {value, grads} = g([a, b]);\n *\n * const [da, db] = grads;\n *\n * console.log('value');\n * value.print();\n *\n * console.log('da');\n * da.print();\n * console.log('db');\n * db.print();\n * ```\n *\n * @doc {heading: 'Training', subheading: 'Gradients'}\n */\nfunction valueAndGrads<O extends Tensor>(f: (...args: Tensor[]) => O): (\n args: Tensor[], dy?: O) => {\n grads: Tensor[];\n value: O;\n} {\n util.assert(\n util.isFunction(f),\n () => 'The f passed in valueAndGrads(f) must be a function');\n return (args: Tensor[], dy?: O) => {\n util.assert(\n Array.isArray(args) && args.every(arg => arg instanceof Tensor),\n () => 'The args passed in valueAndGrads(f)(args) must be array of ' +\n 'tensors');\n util.assert(\n dy == null || dy instanceof Tensor,\n () => 'The dy passed in valueAndGrads(f)(args, dy) must be a tensor');\n const res = ENGINE.gradients(() => f(...args), args, dy);\n if (dy != null) {\n util.assertShapesMatch(\n res.value.shape, dy.shape,\n 'The shape of dy passed in valueAndGrads(f)([x1,...], dy) must ' +\n 'match the shape returned by f([x1,...])');\n }\n checkGrads(res.grads);\n return res;\n };\n}\n\n/**\n * Computes and returns the gradient of f(x) with respect to the list of\n * trainable variables provided by `varList`. If no list is provided, it\n * defaults to all trainable variables.\n *\n * ```js\n * const a = tf.variable(tf.tensor1d([3, 4]));\n * const b = tf.variable(tf.tensor1d([5, 6]));\n * const x = tf.tensor1d([1, 2]);\n *\n * // f(a, b) = a * x ^ 2 + b * x\n * const f = () => a.mul(x.square()).add(b.mul(x)).sum();\n * // df/da = x ^ 2, df/db = x\n * const {value, grads} = tf.variableGrads(f);\n *\n * Object.keys(grads).forEach(varName => grads[varName].print());\n * ```\n *\n * @param f The function to execute. f() should return a scalar.\n * @param varList The list of variables to compute the gradients with respect\n * to. Defaults to all trainable variables.\n * @returns An object with the following keys and values:\n * - `value`: The value of the function `f`.\n * - `grads`: A map from the names of the variables to the gradients.\n * If the `varList` argument is provided explicitly and contains a subset of\n * non-trainable variables, this map in the return value will contain keys\n * that map the names of the non-trainable variables to `null`.\n *\n * @doc {heading: 'Training', subheading: 'Gradients'}\n */\nfunction variableGrads(f: () => Scalar, varList?: Variable[]):\n {value: Scalar, grads: NamedTensorMap} {\n util.assert(\n util.isFunction(f),\n () => 'The f passed in variableGrads(f) must be a function');\n util.assert(\n varList == null ||\n Array.isArray(varList) && varList.every(v => v instanceof Variable),\n () =>\n 'The varList passed in variableGrads(f, varList) must be an array ' +\n 'of variables');\n\n const specifiedVarList = varList != null;\n if (!specifiedVarList) {\n // Get all of the trainable variables.\n varList = [];\n for (const varName in ENGINE.registeredVariables) {\n varList.push(ENGINE.registeredVariables[varName]);\n }\n }\n\n const specifiedNonTrainable: Variable[] =\n specifiedVarList ? varList.filter(variable => !variable.trainable) : null;\n\n // Prune non-trainable variables.\n const originalVarCount = varList.length;\n varList = varList.filter(variable => variable.trainable);\n util.assert(\n varList.length > 0,\n () => `variableGrads() expects at least one of the input variables to ` +\n `be trainable, but none of the ${originalVarCount} variables is ` +\n `trainable.`);\n\n const allowNoGradients = true;\n const {value, grads} = ENGINE.gradients(f, varList, null, allowNoGradients);\n\n util.assert(\n grads.some(g => g != null),\n () => 'Cannot find a connection between any variable and the result of ' +\n 'the loss function y=f(x). Please make sure the operations that ' +\n 'use variables are inside the function f passed to minimize().');\n util.assert(\n value.rank === 0,\n () => `The f passed in variableGrads(f) must return a scalar, but it ` +\n `returned a rank-${value.rank} tensor`);\n\n const namedGrads: NamedTensorMap = {};\n varList.forEach((v, i) => {\n if (grads[i] != null) {\n namedGrads[v.name] = grads[i];\n }\n });\n if (specifiedNonTrainable != null) {\n // If varList is explicitly provided and contains non-trainable values,\n // add them to the returned gradients with `null` values.\n specifiedNonTrainable.forEach(v => namedGrads[v.name] = null);\n }\n return {value, grads: namedGrads};\n}\n\n/**\n * Overrides the gradient computation of a function `f`.\n *\n * Takes a function\n * `f(...inputs, save) => {value: Tensor, gradFunc: (dy, saved) => Tensor[]}`\n * and returns another function

`g(...inputs)` which takes the same inputs as\n * `f`. When called, `g` returns `f().value`. In backward mode, custom gradients\n * with respect to each input of `f` are computed using `f().gradFunc`.\n *\n * The `save` function passsed to `f` should be used for saving tensors needed\n * in the gradient. And the `saved` passed to the `gradFunc` is a\n * `NamedTensorMap`, which contains those saved tensor.\n *\n * ```js\n * const customOp = tf.customGrad((x, save) => {\n *   // Save x to make sure it's available later for the gradient.\n *   save([x]);\n *   // Override gradient of our custom x ^ 2 op to be dy * abs(x);\n *   return {\n *   value: x.square(),\n *   // Note `saved.x` which points to the `x` we saved earlier.\n *   gradFunc: (dy, saved) => [dy.mul(saved[0].abs())]\n *   };\n * });\n *\n * const x = tf.tensor1d([-1, -2, 3]);\n * const dx = tf.grad(x => customOp(x));\n *\n * console.log(`f(x):`);\n * customOp(x).print();\n * console.log(`f'(x):`);\n * dx(x).print();\n * ```\n *\n * @param f The function to evaluate in forward mode, which should return\n *   `{value: Tensor, gradFunc: (dy, saved) => Tensor[]}`, where `gradFunc`\n *   returns the custom gradients of `f` with respect to its inputs.\n *\n * @doc {heading: 'Training', subheading: 'Gradients'}\n */\nfunction customGrad<T extends Tensor>(f: CustomGradientFunc<T>):\n   (...args: Tensor[]) => T {\n return ENGINE.customGrad(f);\n}\n\nfunction checkGrads(grads: Tensor[]) {\n const numNullGradients = grads.filter(g => g == null).length;\n if (numNullGradients > 0) {\n   throw new Error(\n   `Cannot compute gradient of y=f(x) with respect to x. Make sure that\n    the f you passed encloses all operations that lead from x to y.`);\n }\n}\n\nexport {\n customGrad,\n variableGrads,\n valueAndGrad,\n valueAndGrads,\n grad,\n grads,\n};\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {ENGINE} from '../engine';\nimport {Neg, NegInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes `-1 * x` element-wise.\n *\n * ```js\n * const x = tf.tensor2d([1, 2, -2, 0], [2, 2]);\n *\n * x.neg().print(); // or tf.neg(x)\n * ```\n *\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction neg_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'neg');\n\n const inputs: NegInputs = {x: $x};\n return ENGINE.runKernel(Neg, inputs as {} as NamedTensorMap);\n}\nexport const neg = op({neg_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed
 under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {ENGINE} from '../engine';\nimport {Softplus, SoftplusInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes softplus of the input `tf.Tensor` element-wise: `log(exp(x) + 1)`\n *\n * ```js\n * const x = tf.tensor1d([0, 1, -1, .7]);\n *\n * x.softplus().print(); // or tf.softplus(x)\n * ```\n *\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction softplus_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'softplus');\n\n const inputs: SoftplusInputs = {x: $x};\n return ENGINE.runKernel(Softplus, inputs as {} as NamedTensorMap);\n}\nexport const softplus =

op({softplus_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {customGrad} from '../gradients';\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {mul} from './mul';\nimport {neg} from './neg';\nimport {op} from './operation';\nimport {sigmoid} from './sigmoid';\nimport {softplus} from './softplus';\n\n/**\n * Computes log sigmoid of the input `tf.Tensor` element-wise:\n * `logSigmoid(x)`. For numerical stability, we use `-tf.softplus(-x)`.\n *\n * ```js\n * const x = tf.tensor1d([0, 1, -1, .7]);\n *\n * x.logSigmoid().print(); // or tf.logSigmoid(x)\n * ```\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction logSigmoid_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'logSigmoid');\n\n // Use a custom gradient to maintain previous implementation.\n // There is no LogSigmoid kernel in TF so we can't use engine.runKernel\n // directly\n const customOp = customGrad((x: Tensor) => {\n   // TODO(yassogba) we can remove the chained softplus call here only\n   // after backends have modualrized softplus at which point we can call\n   // engine runKernel(..., Sotfplus, ...) directly.\n   const value = neg(softplus(neg(x)));\n\n   const gradFunc = (dy: T) => {\n   const derX = mul(dy, sigmoid(neg(x)));\n   return derX;\n   };\n   return {value, gradFunc};\n });\n\n return customOp($x) as T;\n}\nexport const logSigmoid = op({logSigmoid_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {ENGINE} from '../engine';\nimport {Max, MaxAttrs, MaxInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes the maximum of elements across dimensions of a `tf.Tensor`.\n *\n * Reduces the input along the dimensions given in `axes`. Unless `keepDims`\n * is true, the rank of the `tf.Tensor` is reduced by 1 for each entry in\n * `axes`. If `keepDims` is true, the reduced dimensions are retained with\n * length 1. If `axes` has no entries, all dimensions are reduced, and an\n * `tf.Tensor` with a single element is returned.\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3]);\n *\n * x.max().print(); // or tf.max(x)\n * ```\n *\n * ```js\n * const x = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n *\n * const axis = 1;\n * x.max(axis).print(); // or tf.max(x, axis)\n * ```\n *\n * @param x The input tensor.\n * @param axis The dimension(s) to reduce. By default it reduces\n *   all dimensions.\n * @param keepDims If true, retains reduced dimensions with size 1.\n *\n * @doc {heading: 'Operations', subheading: 'Reduction'}\n */\nfunction max_<T extends Tensor>(\n   x: Tensor|TensorLike, axis: number|number[] = null, keepDims = false): T {\n const $x = convertToTensor(x, 'x', 'max');\n\n const inputs: MaxInputs = {x: $x};\n const attrs: MaxAttrs = {reductionIndices: axis, keepDims};\n\n return ENGINE.runKernel(\n   Max, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const max = op({max_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in

writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {ENGINE} from '../engine';\nimport {Sub, SubInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {makeTypesMatch} from '../tensor_util';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Subtracts two `tf.Tensor`s element-wise, A - B. Supports broadcasting.\n *\n * ```js\n * const a = tf.tensor1d([10, 20, 30, 40]);\n * const b = tf.tensor1d([1, 2, 3, 4]);\n *\n * a.sub(b).print(); // or tf.sub(a, b)\n * ```\n *\n * ```js\n * // Broadcast subtract a with b.\n * const a = tf.tensor1d([10, 20, 30, 40]);\n * const b = tf.scalar(5);\n *\n * a.sub(b).print(); // or tf.sub(a, b)\n * ```\n * @param a The first `tf.Tensor` to subtract from.\n * @param b The second `tf.Tensor` to be subtracted. Must have the same dtype as\n * `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Arithmetic'}\n */\nfunction sub_<T extends Tensor>(a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'sub');\n let $b = convertToTensor(b, 'b', 'sub');\n [$a, $b] = makeTypesMatch($a, $b);\n\n const inputs: SubInputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(Sub, inputs as {} as NamedTensorMap);\n}\n\nexport const sub = op({sub_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {ENGINE} from '../engine';\nimport {Sum, SumAttrs, SumInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {cast} from './cast';\nimport {op} from
'./operation';\n\n/**\n * Computes the sum of elements across dimensions of a `tf.Tensor`.\n *\n * Reduces the input along the dimensions given in `axes`. Unless `keepDims`\n * is true, the rank of the `tf.Tensor` is reduced by 1 for each entry in\n * `axes`. If `keepDims` is true, the reduced dimensions are retained with\n * length 1. If axes has no entries, all dimensions are reduced, and a\n * `tf.Tensor` with a single element is returned.\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3]);\n *\n * x.sum().print(); // or tf.sum(x)\n * ```\n *\n * ```js\n * const x = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n *\n * const axis = 1;\n * x.sum(axis).print(); // or tf.sum(x, axis)\n * ```\n *\n * @param x The input tensor to compute the sum over. If the dtype is `bool`\n * it will be converted to `int32` and the output dtype will be `int32`.\n * @param axis The dimension(s) to reduce. By default it reduces\n * all dimensions.\n * @param keepDims If true, retains reduced dimensions
with size 1.\n *\n * @doc {heading: 'Operations', subheading: 'Reduction'}\n */\nfunction sum_<T extends Tensor>(\n x: Tensor|TensorLike, axis: number|number[] = null, keepDims = false): T {\n let $x = convertToTensor(x, 'x', 'sum');\n if ($x.dtype === 'bool') {\n $x = cast($x, 'int32');\n }\n\n const inputs: SumInputs = {x: $x};\n const attrs: SumAttrs = {axis, keepDims};\n\n return ENGINE.runKernel(\n Sum, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const sum = op({sum_});\n","/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES

OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {customGrad} from '../gradients';\n\nimport {Tensor} from '../tensor';\nimport {GradSaveFunc} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {cast} from './cast';\nimport {exp} from './exp';\nimport {log} from './log';\nimport {max} from './max';\nimport {mul} from './mul';\nimport {op} from './operation';\nimport {sub} from './sub';\nimport {sum} from './sum';\n\n/**\n * Computes the log softmax.\n *\n * ```js\n * const a = tf.tensor1d([1, 2, 3]);\n *\n * a.logSoftmax().print(); // or tf.logSoftmax(a)\n * ```\n *\n * ```js\n * const a = tf.tensor2d([2, 4, 6, 1, 2, 3], [2, 3]);\n *\n * a.logSoftmax().print(); // or tf.logSoftmax(a)\n * ```\n *\n * @param logits The logits array.\n * @param axis The dimension softmax would be performed on. Defaults to `-1`\n *   which indicates the last dimension.\n *\n * @doc {heading: 'Operations', subheading: 'Normalization'}\n */\nfunction logSoftmax_<T extends Tensor>(logits: T|TensorLike, axis = -1): T {\n const $logits = convertToTensor(logits, 'logits', 'logSoftmax');\n\n if (axis === -1) {\n   axis = $logits.rank - 1;\n }\n if (axis !== $logits.rank - 1) {\n   throw Error(\n   'Log Softmax along a non-last dimension is not yet supported. ' +\n   `Logits was rank ${$logits.rank} and axis was ${axis}`);\n }\n\n // const forward: ForwardFunc<Tensor> = (backend, save) => {\n //   const keepDims = true;\n //   const xMax = max(logits, axis, true);\n //   const shifted = sub(logits, xMax);\n //   const value =\n //   sub(cast(shifted, 'float32'), log(sum(exp(shifted), axis,\n // keepDims)));\n //   save([value]);\n //   return value;\n // };\n\n // Use a custom gradient for numerical stability.\n const customOp = customGrad((logits: Tensor, save: GradSaveFunc) => {\n   const keepDims = true;\n   const xMax = max(logits, axis, true);\n   const shifted = sub(logits, xMax);\n   const value =\n   sub(cast(shifted, 'float32'), log(sum(exp(shifted), axis, keepDims)));\n   save([value]);\n\n   const gradFunc = (dy: Tensor, saved: Tensor[]) => {\n   const [value] = saved;\n   const keepDims = true;\n   const softmax = exp(value);\n   return sub(dy, mul(sum(dy, axis, keepDims), softmax));\n   };\n   return {value, gradFunc};\n });\n\n return customOp($logits) as T;\n\n // TODO Use Engine.runKernel when CPU/WebGL/WASM backends implement this.\n // const inputs: LogSoftmaxInputs = {logits: $logits};\n // const attrs: LogSoftmaxAttrs = {axis};\n // return ENGINE.runKernel(\n //   LogSoftmax, inputs as {} as NamedTensorMap,\n //   attrs as {} as NamedAttrMap);\n}\n\nexport const logSoftmax = op({logSoftmax_});\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport * as util from '../util';\n\n/**\n * Returns true if the axis specifies the inner most dimensions of the\n * array.\n */\nexport function axesAreInnerMostDims(axes: number[], rank: number): boolean {\n for (let i = 0; i < axes.length; ++i) {\n   if (axes[axes.length - i - 1] !== rank - 1 - i) {\n   return false;\n   }\n }\n return true;\n}\n\nexport function combineLocations(\n   outputLoc: number[], reduceLoc: number[], axes: number[]): number[] {\n const rank = outputLoc.length + reduceLoc.length;\n const loc = [];\n let outIdx = 0;\n let reduceIdx = 0;\n for (let dim = 0; dim < rank; dim++) {\n   if (axes.indexOf(dim) === -1) {\n   loc.push(outputLoc[outIdx++]);\n   } else {\n   loc.push(reduceLoc[reduceIdx++]);\n   }\n }\n return loc;\n}\n\nexport function computeOutAndReduceShapes(\n aShape: number[], axes: number[]): [number[], number[]] {\n const outShape = [];\n const rank = aShape.length;\n for (let dim = 0; dim < rank; dim++) {\n   if (axes.indexOf(dim) === -1) {\n   outShape.push(aShape[dim]);\n   }\n }\n const reduceShape = axes.map(dim => aShape[dim]);\n return [outShape, reduceShape];\n}\n\nexport function expandShapeToKeepDim(\n   shape: number[], axes: number[]):

number[]
{\n const reduceSubShape = axes.map(x => 1);\n return combineLocations(shape, reduceSubShape, axes);\n}\n\nexport function assertAxesAreInnerMostDims(\n   msg: string, axes: number[], rank: number): void {\n util.assert(\n   axesAreInnerMostDims(axes, rank),\n   () => `${msg} supports only inner-most axes for now. ` +\n   `Got axes ${axes} and rank-${rank} input.`);\n}\n\n/**\n * Returns the axes permutation to be used with `tf.transpose`, if such\n * permutation is necessary. Otherwise it returns null. This method is used by\n * operations that operate only on inner-most axes.\n */\nexport function getAxesPermutation(axes: number[], rank: number): number[]|\n   null {\n if (axesAreInnerMostDims(axes, rank)) {\n   return null;\n }\n const result: number[] = [];\n for (let i = 0; i < rank; ++i) {\n   if (axes.indexOf(i) === -1) {\n   result.push(i);\n   }\n }\n axes.forEach(axis => result.push(axis));\n return result;\n}\n\n/** Returns the axes permutation
that undoes the original permutation. */\nexport function getUndoAxesPermutation(axes: number[]): number[] {\n return axes.map((axis, i) => [i, axis])\n   .sort((a, b) => a[1] - b[1])\n   .map(x => x[0]);\n}\n\nexport function getInnerMostAxes(numAxes: number, rank: number): number[] {\n const res: number[] = [];\n for (let i = rank - numAxes; i < rank; ++i) {\n   res.push(i);\n }\n return res;\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing
permissions and\n * limitations under the License.\n *
==\n */\n\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {parseAxisParam} from '../util';\n\nimport {add} from './add';\nimport {expandShapeToKeepDim} from './axis_util';\nimport {exp} from './exp';\nimport {log} from './log';\nimport {max} from './max';\nimport {op} from './operation';\nimport {reshape} from './reshape';\nimport {sub} from './sub';\nimport {sum} from './sum';\n\n/**\n * Computes the log(sum(exp(elements across the reduction dimensions)).\n *\n * Reduces the input along the dimensions given in `axis`. Unless `keepDims`\n * is true, the rank of the array is reduced by 1 for each entry in `axis`.\n * If `keepDims` is true, the reduced dimensions are retained with length 1.\n * If `axis` has no entries, all dimensions are reduced, and an array with a\n * single element is returned.\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3]);\n *\n * x.logSumExp().print(); // or tf.logSumExp(x)\n * ```\n *\n * ```js\n * const x = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n *\n * const axis = 1;\n * x.logSumExp(axis).print(); // or tf.logSumExp(a, axis)\n * ```\n * @param x The input tensor.\n * @param axis The dimension(s) to reduce. If null (the default),\n *   reduces all dimensions.\n * @param keepDims If true, retains reduced dimensions with length\n *   of 1. Defaults to false.\n *\n * @doc {heading: 'Operations', subheading: 'Reduction'}\n */\nfunction logSumExp_<T extends Tensor>(\n   x: Tensor|TensorLike, axis: number|number[] = null, keepDims = false): T {\n const $x = convertToTensor(x, 'x', 'logSumExp');\n\n const axes = parseAxisParam(axis, $x.shape);\n const xMax = max($x, axes, true /* keepDims */);\n const a = sub($x, xMax);\n const b = exp(a);\n const c = sum(b, axes);\n const d = log(c);\n const res = add(reshape(xMax, d.shape), d);\n\n if (keepDims) {\n   const newShape = expandShapeToKeepDim(res.shape, axes);\n   return reshape(res, newShape) as T;\n }\n return res as T;\n}\n\nexport const logSumExp = op({logSumExp_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport {ENGINE} from '../engine';\nimport {LogicalAnd, LogicalAndInputs}
from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from
'../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from
'../types';\n\nimport {assertAndGetBroadcastShape} from './broadcast_util';\nimport {op} from './operation';\n\n/**\n
* Returns the truth value of `a AND b` element-wise. Supports broadcasting.\n *\n * ```js\n * const a =
tf.tensor1d([false, false, true, true], 'bool');\n * const b = tf.tensor1d([false, true, false, true], 'bool');\n *\n *
a.logicalAnd(b).print();\n * ```\n *\n * @param a The first input tensor. Must be of dtype bool.\n * @param b The
second input tensor. Must be of dtype bool.\n *\n * @doc {heading: 'Operations', subheading: 'Logical'}\n
*/\nfunction logicalAnd_<T extends Tensor>(\n   a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n const $a =
convertToTensor(a, 'a', 'logicalAnd', 'bool');\n const $b = convertToTensor(b, 'b', 'logicalAnd', 'bool');\n
assertAndGetBroadcastShape($a.shape,
$b.shape);\n\n const inputs: LogicalAndInputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(LogicalAnd, inputs
as {} as NamedTensorMap);\n}\n\nexport const logicalAnd = op({logicalAnd_});\n","/**\n * @license\n *
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License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *
WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {ENGINE} from '../engine';\nimport {LogicalNot, LogicalNotInputs}
from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from
'../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport
{op} from './operation';\n\n/**\n * Returns the truth value of `NOT x` element-wise.\n *\n * ```js\n * const a =
tf.tensor1d([false, true], 'bool');\n *\n * a.logicalNot().print();\n * ```\n *\n * @param x The input tensor. Must be of
dtype 'bool'.\n *\n * @doc {heading: 'Operations', subheading: 'Logical'}\n */\nfunction logicalNot_<T extends
Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'logicalNot', 'bool');\n const inputs:
LogicalNotInputs = {x: $x};\n return ENGINE.runKernel(LogicalNot, inputs as {} as
NamedTensorMap);\n}\n\nexport const logicalNot = op({logicalNot_});\n","/**\n * @license\n * Copyright 2020
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {ENGINE} from '../engine';\nimport {LogicalOr, LogicalOrInputs} from '../kernel_names';\nimport
{Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from
'../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {assertAndGetBroadcastShape} from
'./broadcast_util';\nimport {op} from './operation';\n\n/**\n * Returns the truth value of `a OR b` element-wise.
Supports broadcasting.\n
*\n * ```js\n * const a = tf.tensor1d([false, false, true, true], 'bool');\n * const b = tf.tensor1d([false, true, false, true],
'bool');\n *\n * a.logicalOr(b).print();\n * ```\n * @param a The first input tensor. Must be of dtype bool.\n *
@param b The second input tensor. Must be of dtype bool.\n *\n * @doc {heading: 'Operations', subheading:
'Logical'}\n */\nfunction logicalOr_<T extends Tensor>(\n   a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n
const $a = convertToTensor(a, 'a', 'logicalOr', 'bool');\n const $b = convertToTensor(b, 'b', 'logicalOr', 'bool');\n
assertAndGetBroadcastShape($a.shape, $b.shape);\n\n const inputs: LogicalOrInputs = {a: $a, b: $b};\n return

ENGINE.runKernel(LogicalOr, inputs as {} as NamedTensorMap);\n}\nexport const logicalOr = op({logicalOr_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {assertAndGetBroadcastShape} from './broadcast_util';\nimport {logicalAnd} from './logical_and';\nimport {logicalNot} from './logical_not';\nimport {logicalOr} from './logical_or';\nimport {op} from './operation';\n\n/**\n * Returns the truth value of `a XOR b` element-wise. Supports broadcasting.\n *\n * ```js\n * const a = tf.tensor1d([false, false, true, true], 'bool');\n * const b = tf.tensor1d([false, true, false, true], 'bool');\n *\n * a.logicalXor(b).print();\n * ```\n *\n * @param a The first input tensor. Must be of dtype bool.\n * @param b The second input tensor. Must be of dtype bool.\n *\n * @doc {heading: 'Operations', subheading: 'Logical'}\n */\nfunction logicalXor_<T extends Tensor>(\n a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n const $a = convertToTensor(a, 'a', 'logicalXor', 'bool');\n const $b = convertToTensor(b, 'b', 'logicalXor', 'bool');\n assertAndGetBroadcastShape($a.shape, $b.shape);\n\n // x ^ y = (x | y) & ~(x & y)\n return logicalAnd(logicalOr(a, b), logicalNot(logicalAnd(a, b)));\n}\n\nexport const logicalXor = op({logicalXor_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {ENGINE} from '../engine';\nimport {MaxPool, MaxPoolAttrs, MaxPoolInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor3D, Tensor4D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport * as conv_util from './conv_util';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Computes the 2D max pooling of an image.\n *\n * @param x The input tensor, of rank 4 or rank 3 of shape\n * `[batch, height, width, inChannels]`. If rank 3, batch of 1 is assumed.\n * @param filterSize The filter size: `[filterHeight, filterWidth]`. If\n * `filterSize` is a single number, then `filterHeight == filterWidth`.\n * @param strides The strides of the pooling: `[strideHeight, strideWidth]`. If\n * `strides` is a single number, then `strideHeight == strideWidth`.\n * @param dilations The dilation rates: `[dilationHeight, dilationWidth]`\n * in which we sample input values across the height and width dimensions\n * in dilated pooling. Defaults to `[1, 1]`. If `dilations` is a single\n * number, then `dilationHeight == dilationWidth`. If it is greater than\n * 1, then all values of `strides` must be 1.\n * @param pad The type of padding algorithm.\n * - `same` and stride 1: output will be of same size as input,\n * regardless of filter size.\n * - `valid`:
output will be smaller than input if filter is larger\n * than 1x1.\n * - For more info, see this guide:\n * [https://www.tensorflow.org/api_guides/python/nn#Convolution](\n * https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dimRoundingMode A string from: 'ceil', 'round', 'floor'. If none is\n * provided, it will default to truncate.\n */\nfunction maxPool_<T extends Tensor3D|Tensor4D>(\n x: T|TensorLike, filterSize: [number, number]|number,\n strides: [number, number]|number, pad: 'valid'|'same'|number,\n dimRoundingMode?: 'floor'|'round'|'ceil'): T {\n const $x =

convertToTensor(x, 'x', 'maxPool');\n const dilations = 1;\n\n let x4D = $x as Tensor4D;\n let reshapedTo4D = false;\n if ($x.rank === 3) {\n   reshapedTo4D = true;\n   x4D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2]]);\n }\n\n util.assert(\n   x4D.rank === 4,\n   () => `Error in maxPool: input must be rank 4 but got rank ${x4D.rank}.`);\n
  util.assert(\n   conv_util.eitherStridesOrDilationsAreOne(strides, dilations),\n   () => 'Error in maxPool: Either strides or dilations must be 1. ' +\n   `Got strides ${strides} and dilations '${dilations}'`);\n if (dimRoundingMode != null) {\n   util.assert(\n   util.isInt(pad as number),\n   () => `Error in maxPool: pad must be an integer when using, ` +\n   `dimRoundingMode ${dimRoundingMode} but got pad ${pad}.`);\n }\n\n const inputs: MaxPoolInputs = {x: x4D};\n\n const attrs: MaxPoolAttrs = {filterSize, strides, pad, dimRoundingMode};\n\n // tslint:disable-next-line: no-unnecessary-type-assertion\n const res = ENGINE.runKernel(\n   MaxPool, inputs as {} as NamedTensorMap,\n   attrs as {} as NamedAttrMap) as T;\n\n if (reshapedTo4D) {\n   return reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as T;\n }\n return res;\n}\n\nexport const maxPool = op({maxPool_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {ENGINE} from '../engine';\nimport {MaxPool3D, MaxPool3DAttrs, MaxPool3DInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor4D, Tensor5D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Computes the 3D max pooling.\n *\n * ```js\n * const x = tf.tensor5d([1, 2, 3, 4, 5, 6, 7, 8], [1, 2, 2, 2, 1]);\n * const result = tf.maxPool3d(x, 2, 1, 'valid');\n * result.print();\n * ```\n *\n * @param x The input tensor, of rank 5 or rank 4 of shape\n *   `[batch, depth, height, width, inChannels]`.\n * @param filterSize The filter size:\n *   `[filterDepth, filterHeight, filterWidth]`.\n *   If `filterSize` is a single number,\n *   then `filterDepth == filterHeight == filterWidth`.\n * @param strides The strides of the pooling:\n *   `[strideDepth, strideHeight, strideWidth]`.\n *   If `strides` is a single number,\n *   then `strideDepth == strideHeight == strideWidth`.\n * @param pad The type of padding algorithm.\n *   - `same` and stride 1: output will be of same size as input,\n *   regardless of filter size.\n *   - `valid`: output will be smaller than input if filter is larger\n *   than 1*1x1.\n *   - For more info, see this guide:\n *   [https://www.tensorflow.org/api_guides/python/nn#Convolution](\n *   https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dimRoundingMode A string from: 'ceil', 'round', 'floor'. If none is\n *   provided, it will default to truncate.\n * @param dataFormat An optional string from: \"NDHWC\", \"NCDHW\". Defaults to\n *   \"NDHWC\". Specify the data format of the input and output data. With the\n *   default format \"NDHWC\", the data is stored in the order of: [batch,\n *   depth, height, width, channels]. Only \"NDHWC\" is currently supported.\n * @doc {heading: 'Operations', subheading: 'Convolution'}\n */\nfunction maxPool3d_<T extends Tensor4D|Tensor5D>(\n   x: T|TensorLike, filterSize: [number, number, number]|number = [1, 1, 1],\n   strides: [number, number, number]|number, pad: 'valid'|'same'|number,\n   dimRoundingMode?: 'floor'|'round'|'ceil',\n   dataFormat: 'NDHWC'|'NCDHW' = 'NDHWC'): T {\n const $x = convertToTensor(x, 'x', 'maxPool3d');\n\n let x5D = $x as Tensor5D;\n let reshapedTo5D = false;\n if ($x.rank === 4) {\n   reshapedTo5D = true;\n   x5D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2], $x.shape[3]]);\n }\n\n util.assert(\n   x5D.rank === 5,\n   () => `Error in maxPool3d: x must be rank 5 but got rank ${x5D.rank}.`);\n util.assert(\n   dataFormat === 'NDHWC',\n   () => `Error in maxPool3d: Only NDHWC

is currently supported, ` +\n `but got dataFormat of ${dataFormat}`);\n if (dimRoundingMode != null) {\n util.assert(\n util.isInt(pad as number),\n () => `Error in maxPool3d: pad must be an integer when using, ` +\n `dimRoundingMode ${dimRoundingMode} but got pad ${pad}.`);\n }\n\n const inputs: MaxPool3DInputs = {x: x5D};\n\n const attrs:\n MaxPool3DAttrs = {filterSize, strides, pad, dimRoundingMode, dataFormat};\n\n // tslint:disable-next-line: no-unnecessary-type-assertion\n const res = ENGINE.runKernel(\n MaxPool3D, inputs as {} as NamedTensorMap,\n attrs as {} as NamedAttrMap) as T;\n\n if (reshapedTo5D) {\n return reshape(\n res, [res.shape[1], res.shape[2], res.shape[3], res.shape[4]]) as\n T;\n }\n\n return res;\n}\n\nexport const maxPool3d = op({maxPool3d_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ENGINE} from '../engine';\nimport {MaxPoolWithArgmax, MaxPoolWithArgmaxAttrs, MaxPoolWithArgmaxInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor, Tensor4D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes the 2D max pooling of an image with Argmax index.\n * The indices in argmax are flattened, so that a maximum value at position `[b,\n * y, x, c]` becomes flattened index: `(y * width + x) * channels + c` if\n * include_batch_in_index is False; `((b * height + y) * width + x) * channels\n * +c` if include_batch_in_index is True.\n *\n * The indices returned are always in `[0, height) x [0, width)` before\n * flattening.\n *\n * @param x The input tensor, of rank 4 or rank 3 of shape\n * `[batch, height, width, inChannels]`. If rank 3, batch of 1 is assumed.\n * @param filterSize The filter size: `[filterHeight, filterWidth]`. If\n * `filterSize` is a single number, then `filterHeight == filterWidth`.\n * @param strides The strides of the pooling: `[strideHeight, strideWidth]`. If\n * `strides` is a single number, then `strideHeight == strideWidth`.\n * @param dataFormat An optional string from: \"NDHWC\", \"NCDHW\". Defaults to\n * \"NDHWC\". Specify the data format of the input and output data. With the\n * default format \"NDHWC\", the data is stored in the order of: [batch,\n * depth, height, width, channels]. Only \"NDHWC\" is currently supported.\n * @param pad The type of padding algorithm.\n * - `same` and stride 1: output will be of same size as input,\n * regardless of filter size.\n * - `valid`: output will be smaller than input if filter is larger\n * than 1x1.\n * - For more info, see this guide:\n * [https://www.tensorflow.org/api_guides/python/nn#Convolution](\n * https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param includeBatchIndex Defaults to False. Whether to include batch\n * dimension in flattened index of argmax.\n *\n * @doc {heading: 'Operations', subheading: 'Convolution'}\n */\nfunction maxPoolWithArgmax_<T extends Tensor4D>(\n x: T|TensorLike, filterSize: [number, number]|number,\n strides: [number, number]|number, pad: 'valid'|'same'|number,\n includeBatchInIndex = false): NamedTensorMap {\n const $x = convertToTensor(x, 'x', 'maxPoolWithArgmax');\n\n const inputs: MaxPoolWithArgmaxInputs = {x: $x};\n const attrs:\n MaxPoolWithArgmaxAttrs = {filterSize, strides, pad, includeBatchInIndex};\n\n // tslint:disable-next-line: no-unnecessary-type-assertion\n const result = ENGINE.runKernel(\n MaxPoolWithArgmax, inputs as {} as NamedTensorMap,\n attrs as {} as NamedAttrMap) as Tensor[];\n\n return {result: result[0], indexes: result[1]};\n}\n\nexport const maxPoolWithArgmax = op({maxPoolWithArgmax_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable

law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Maximum, MaximumInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {makeTypesMatch} from '../tensor_util';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {assertAndGetBroadcastShape} from './broadcast_util';\nimport {cast} from './cast';\nimport {op} from './operation';\n\n/**\n * Returns the max of a and b (`a > b ? a : b`) element-wise.\n * Supports broadcasting.\n *\n * We also expose `tf.maximumStrict` which has the same signature as this op and\n * asserts that `a` and `b` are the same shape (does not broadcast).\n *\n * ```js\n * const a = tf.tensor1d([1, 4, 3, 16]);\n * const b = tf.tensor1d([1, 2, 9, 4]);\n *\n * a.maximum(b).print(); // or tf.maximum(a, b)\n * ```\n *\n * ```js\n * // Broadcast maximum a with b.\n * const a = tf.tensor1d([2, 4, 6, 8]);\n * const b = tf.scalar(5);\n *\n * a.maximum(b).print(); // or tf.maximum(a, b)\n * ```\n *\n * @param a The first tensor.\n * @param b The second tensor. Must have the same type as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Arithmetic'}\n */\nfunction maximum_<T extends Tensor>(\n   a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'maximum');\n let $b = convertToTensor(b, 'b', 'maximum');\n [$a, $b] = makeTypesMatch($a, $b);\n\n if ($a.dtype === 'bool') {\n $a = cast($a, 'int32');\n $b = cast($b, 'int32');\n }\n assertAndGetBroadcastShape($a.shape, $b.shape);\n\n const inputs: MaximumInputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(Maximum, inputs as {} as NamedTensorMap);\n}\n\nexport const maximum = op({maximum_});\n","/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Mean, MeanAttrs, MeanInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes the mean of elements across dimensions of a `tf.Tensor`.\n *\n * Reduces `x` along the dimensions given in `axis`. Unless `keepDims` is\n * true, the rank of the `tf.Tensor` is reduced by 1 for each entry in `axis`.\n * If `keepDims` is true, the reduced dimensions are retained with length 1.\n * If `axis` has no entries, all dimensions are reduced, and a `tf.Tensor` with\n * a single element is returned.\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3]);\n *\n * x.mean().print(); // or tf.mean(a)\n * ```\n *\n * ```js\n * const x = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n *\n * const axis = 1;\n * x.mean(axis).print(); // or tf.mean(x, axis)\n * ```\n *\n * @param x The input tensor.\n * @param axis The dimension(s) to reduce. By default it reduces\n *   all dimensions.\n * @param keepDims If true, retains reduced dimensions with size 1.\n *\n * @doc {heading: 'Operations', subheading: 'Reduction'}\n */\nfunction mean_<T extends Tensor>(\n   x: Tensor|TensorLike, axis: number|number[] = null, keepDims = false): T {\n const $x = convertToTensor(x, 'x', 'mean');\n\n const inputs: MeanInputs = {x: $x};\n const attrs: MeanAttrs = {axis, keepDims};\n\n return ENGINE.runKernel(\n   Mean, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const mean = op({mean_});\n","/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *

WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\nimport {ENGINE} from '../engine';\nimport {Min, MinAttrs, MinInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes the minimum value from the input.\n *\n * Reduces the input along the dimensions given in `axes`. Unless `keepDims`\n * is true, the rank of the array is reduced by 1 for each entry in `axes`.\n * If `keepDims` is true, the reduced dimensions are retained with length 1.\n * If `axes` has no entries, all dimensions are reduced, and an array with a\n * single element is returned.\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3]);\n *\n * x.min().print(); // or tf.min(x)\n * ```\n *\n * ```js\n * const x = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n *\n * const axis = 1;\n * x.min(axis).print(); // or tf.min(x, axis)\n * ```\n *\n * @param x The input Tensor.\n * @param axis The dimension(s) to reduce. By default it reduces\n *   all dimensions.\n * @param keepDims If true, retains reduced dimensions with size 1.\n *\n * @doc {heading: 'Operations', subheading: 'Reduction'}\n */\nfunction min_<T extends Tensor>(\n   x: Tensor|TensorLike, axis: number|number[] = null, keepDims = false): T {\n const $x = convertToTensor(x, 'x', 'min');\n\n const inputs: MinInputs = {x: $x};\n const attrs: MinAttrs = {axis, keepDims};\n\n // tslint:disable-next-line: no-unnecessary-type-assertion\n return ENGINE.runKernel(\n   Min, inputs as {} as NamedTensorMap,\n   attrs as {} as NamedAttrMap) as T;\n}\n\nexport const min = op({min_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Minimum, MinimumInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {makeTypesMatch} from '../tensor_util';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {assertAndGetBroadcastShape} from './broadcast_util';\nimport {cast} from './cast';\nimport {op} from './operation';\n\n/**\n * Returns the min of a and b (`a < b ? a : b`) element-wise.\n * Supports broadcasting.\n *\n * We also expose `minimumStrict` which has the same signature as this op and\n * asserts that `a` and `b` are the same shape (does not broadcast).\n *\n * ```js\n * const a = tf.tensor1d([1, 4, 3, 16]);\n * const b = tf.tensor1d([1, 2, 9, 4]);\n *\n * a.minimum(b).print(); // or tf.minimum(a, b)\n * ```\n *\n * ```js\n * // Broadcast minimum a with b.\n * const a = tf.tensor1d([2, 4, 6, 8]);\n * const b = tf.scalar(5);\n *\n * a.minimum(b).print(); // or tf.minimum(a, b)\n * ```\n *\n * @param a The first tensor.\n * @param b The second tensor. Must have the same type as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Arithmetic'}\n */\nfunction minimum_<T extends Tensor>(\n   a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'minimum');\n let $b = convertToTensor(b, 'b', 'minimum');\n [$a, $b] = makeTypesMatch($a, $b);\n\n if ($a.dtype === 'bool') {\n $a = cast($a, 'int32');\n $b = cast($b, 'int32');\n }\n\n assertAndGetBroadcastShape($a.shape, $b.shape);\n\n const inputs: MinimumInputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(Minimum, inputs as {} as NamedTensorMap);\n}\n\nexport const minimum = op({minimum_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES

OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {MirrorPad, MirrorPadAttrs, MirrorPadInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {op} from './operation';\n\n/**\n * Pads a `tf.Tensor` using mirror padding.\n *\n * This operation implements the `REFLECT` and `SYMMETRIC` modes of pad.\n *\n * ```js\n * const x = tf.range(0, 9).reshape([1, 1, 3, 3]);\n * x.mirrorPad([[0, 0], [0, 0], [2, 2], [2, 2]], 'reflect').print();\n * ```\n * @param x The tensor to pad.\n * @param paddings An array of length `R` (the rank of the tensor), where\n * each element is a length-2 tuple of ints `[padBefore, padAfter]`,\n * specifying how much to pad along each dimension of the tensor.\n * In \"reflect\" mode, the padded regions do not include the borders,\n * while in \"symmetric\" mode the padded regions do include the borders.\n * For example, if the input is `[1, 2, 3]` and paddings is `[0, 2]`,\n * then the output is `[1, 2, 3, 2, 1]` in \"reflect\" mode, and\n * `[1, 2, 3, 3, 2]` in \"symmetric\" mode.\n * If `mode` is \"reflect\" then both `paddings[D, 0]` and `paddings[D, 1]`\n * must be no greater than `x.shape[D] - 1`. If mode is \"symmetric\"\n * then both `paddings[D, 0]` and `paddings[D, 1]` must be no greater than\n * `x.shape[D]`\n * @param mode String to specify padding mode. Can be `'reflect' | 'symmetric'`\n */\n/** @doc {heading: 'Tensors', subheading: 'Transformations'} */\nfunction mirrorPad_<T extends Tensor>(\n x: T|TensorLike, paddings: Array<[number, number]>,\n mode: 'reflect'|'symmetric'): T {\n util.assert(\n mode === 'reflect' || mode === 'symmetric',\n () => `Invalid mode. Mode must be either reflect or symmetric. ` +\n `Got ${mode}.`);\n\n const $x = convertToTensor(x, 'x', 'mirrorPad');\n if ($x.rank === 0) {\n throw new Error(\n 'mirrorPad(scalar) is not defined. ' +\n 'Pass non-scalar to mirrorPad');\n }\n util.assert(\n paddings.length === $x.rank,\n () => `Padding doesn't match input. Must be ${$x.rank}. ` +\n `Got ${paddings.length}.`);\n const shapeOffset = mode === 'reflect' ? 1 : 0;\n for (let i = 0; i < $x.rank; i++) {\n util.assert(\n paddings[i].length === 2,\n () => `Invalid number of paddings. Must be length of 2 each.`);\n util.assert(\n paddings[i][0] >= 0 && paddings[i][0] <= $x.shape[i] - shapeOffset &&\n paddings[i][1] >= 0 && paddings[i][1] <= $x.shape[i] - shapeOffset,\n () => `Padding in dimension ${i} cannot be greater than or equal ` +\n `to ${$x.shape[i] - shapeOffset} or less than 0 for input of ` +\n `shape ${$x.shape}`);\n }\n\n const attrs: MirrorPadAttrs = {paddings, mode};\n const inputs: MirrorPadInputs = {x: $x};\n return ENGINE.runKernel(\n MirrorPad, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const mirrorPad = op({mirrorPad_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Mod, ModInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {makeTypesMatch} from '../tensor_util';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Returns the mod of a and b element-wise.\n * `floor(x / y) * y + mod(x, y) = x`\n * Supports broadcasting.\n *\n * We also expose `tf.modStrict` which has the same signature as this op and\n * asserts that `a` and `b` are the same shape (does not broadcast).\n *\n * ```js\n * const a = tf.tensor1d([1, 4, 3, 16]);\n * const b = tf.tensor1d([1, 2, 9, 4]);\n *\n * a.mod(b).print(); // or tf.mod(a, b)\n * ```\n *\n * ```js\n * // Broadcast a mod b.\n * const a = tf.tensor1d([2, 4, 6, 8]);\n * const b = tf.scalar(5);\n *\n * a.mod(b).print(); // or tf.mod(a, b)\n * ```\n *\n * @param a The first tensor.\n

* @param b The second tensor. Must have the same type as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Arithmetic'}\n */\nfunction mod_<T extends Tensor>(a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'mod');\n let $b = convertToTensor(b, 'b', 'mod');\n [$a, $b] = makeTypesMatch($a, $b);\n\n const inputs: ModInputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(Mod, inputs as {} as NamedTensorMap);\n}\n\nexport const mod = op({mod_});\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {ENGINE} from '../engine';\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {op} from './operation';\n\n/**\n * Computes square of `x` element-wise: `x ^ 2`\n *\n * ```js\n * const x = tf.tensor1d([1, 2, Math.sqrt(2), -1]);\n *\n * x.square().print(); // or tf.square(x)\n * ```\n * @param x The input Tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction square_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'square');\n const attrs = {};\n return ENGINE.runKernel('Square', {x: $x}, attrs);\n}\n\nexport const square = op({square_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {parseAxisParam} from '../util';\n\nimport {expandShapeToKeepDim} from './axis_util';\nimport {cast} from './cast';\nimport {mean} from './mean';\nimport {op} from './operation';\nimport {reshape} from './reshape';\nimport {square} from './square';\nimport {sub} from './sub';\n\n/**\n * Calculates the mean and variance of `x`. The mean and variance are\n * calculated by aggregating the contents of `x` across `axes`. If `x` is\n * 1-D and `axes = [0]` this is just the mean and variance of a vector.\n *\n * @param x The input tensor.\n * @param axis The dimension(s) along with to compute mean and\n *   variance. By default it reduces all dimensions.\n * @param keepDims If true, the moments have the same dimensionality as the\n * input.\n * @return An object with two keys: `mean` and `variance`.\n *\n * @doc {heading: 'Operations', subheading: 'Normalization'}\n */\nfunction moments_(\n   x: Tensor|TensorLike, axis: number|number[] = null,\n keepDims = false): {mean: Tensor, variance: Tensor} {\n x = convertToTensor(x, 'x', 'moments');\n const axes = parseAxisParam(axis, x.shape);\n const xMean = mean(x, axes, keepDims);\n let keepDimsShape = xMean.shape;\n if (!keepDims) {\n   keepDimsShape = expandShapeToKeepDim(xMean.shape, axes);\n }\n const devSquared =\n   square(sub(cast(x, 'float32'), reshape(xMean, keepDimsShape)));\n const variance = mean(devSquared, axes, keepDims);\n return {mean: xMean, variance};\n}\n\nexport const moments = op({moments_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific

language governing permissions and\n * limitations under the License.\n *
==========\n
*/\nimport {Tensor2D} from '../tensor';\nimport {convertToTensor, convertToTensorArray} from
'../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {op} from './operation';\n\n/**\n * @docalias
(data: Tensor2D, c: Tensor2D, h: Tensor2D): [Tensor2D, Tensor2D]\n */\nexport type LSTMCellFunc = {\n (data:
Tensor2D, c: Tensor2D, h: Tensor2D): [Tensor2D, Tensor2D];\n};\n\n/**\n * Computes the next
 states and outputs of a stack of LSTMCells.\n *\n * Each cell output is used as input to the next cell.\n *\n * Returns
`[cellState, cellOutput]`.\n *\n * Derived from tf.contrib.rn.MultiRNNCell.\n *\n * @param lstmCells Array of
LSTMCell functions.\n * @param data The input to the cell.\n * @param c Array of previous cell states.\n *
@param h Array of previous cell outputs.\n *\n * @doc {heading: 'Operations', subheading: 'RNN'}\n */\nfunction
multiRNNCell_(\n   lstmCells: LSTMCellFunc[], data: Tensor2D|TensorLike,\n   c:
Array<Tensor2D|TensorLike>,\n   h: Array<Tensor2D|TensorLike>): [Tensor2D[], Tensor2D[]] {\n const $data =
convertToTensor(data, 'data', 'multiRNNCell');\n const $c = convertToTensorArray(c, 'c', 'multiRNNCell');\n const
$h = convertToTensorArray(h, 'h', 'multiRNNCell');\n\n let input = $data;\n const newStates = [];\n for (let i = 0; i
< lstmCells.length; i++) {\n   const output = lstmCells[i](input, $c[i], $h[i]);\n   newStates.push(output[0]);\n
newStates.push(output[1]);\n
    input = output[1];\n }\n const newC: Tensor2D[] = [];\n const newH: Tensor2D[] = [];\n for (let i = 0; i <
newStates.length; i += 2) {\n   newC.push(newStates[i]);\n   newH.push(newStates[i + 1]);\n }\n return [newC,
newH];\n}\nexport const multiRNNCell = op({multiRNNCell_});\n","/**\n * @license\n * Copyright 2020 Google
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use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==========\n
 */\n\nimport {ENGINE} from '../engine';\nimport {Multinomial, MultinomialAttrs, MultinomialInputs} from
'../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor1D, Tensor2D} from
'../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from
'../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\nimport {reshape} from
'./reshape';\n\n/**\n * Creates a `tf.Tensor` with values drawn from a multinomial distribution.\n *\n * ```js\n * const
probs = tf.tensor([.75, .25]);\n * tf.multinomial(probs, 3).print();\n * ```\n *\n * @param logits 1D array with
unnormalized log-probabilities, or\n *   2D array of shape `[batchSize, numOutcomes]`. See the `normalized`\n *
parameter.\n * @param numSamples Number of samples to draw for each row slice.\n * @param seed The seed
number.\n * @param normalized Whether the provided `logits` are normalized true\n *   probabilities
 (sum to 1). Defaults to false.\n * @return 1D array of shape `[numSamples]`, or 2D array of shape\n *
`[batchSize, numSamples]`, depending on the rank of the input.\n *\n * @doc {heading: 'Tensors', subheading:
'Random'}\n */\nfunction multinomial_(\n   logits: Tensor1D|Tensor2D|TensorLike, numSamples: number, seed?:
number,\n   normalized = false): Tensor1D|Tensor2D {\n const $logits = convertToTensor(logits, 'logits',
'multinomial');\n const numOutcomes = $logits.size;\n const origRank = $logits.rank;\n if (numOutcomes < 2) {\n
 throw new Error(\n   `Error in multinomial: you need at least 2 outcomes, but got ` +\n
`${numOutcomes}.`);\n }\n if (origRank > 2) {\n   throw new Error(`Rank of probabilities must be 1 or 2, but is
${origRank}`);\n }\n // TODO(lina128): Investigate correct seed behavior. The code seems not allow\n // setting
see to 0.\n seed = seed || Math.random();\n\n // The kernel only accepts (and returns) rank 2 tensors.\n const
 logits2D: Tensor2D =\n   origRank === 1 ? reshape($logits, [1, -1]) : $logits as Tensor2D;\n\n const inputs:
MultinomialInputs = {logits: logits2D};\n const attrs: MultinomialAttrs = {numSamples, seed, normalized};\n\n //
tslint:disable-next-line: no-unnecessary-type-assertion\n const res = ENGINE.runKernel(\n   Multinomial,
inputs as {} as NamedTensorMap,\n   attrs as {} as NamedAttrMap) as Tensor2D;\n\n // tslint:disable-

next-line:no-unnecessary-type-assertion\n return origRank === 1 ? reshape(res, [res.size]) as Tensor1D : res;\n}\n\nexport const multinomial = op({multinomial_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport {ENGINE} from '../engine';\nimport {NotEqual, NotEqualInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {makeTypesMatch} from '../tensor_util';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {assertAndGetBroadcastShape} from './broadcast_util';\nimport {op} from './operation';\n\n/**\n * Returns the truth value of (a != b) element-wise. Supports broadcasting.\n *\n * ```js\n * const a = tf.tensor1d([1, 2, 3]);\n * const b = tf.tensor1d([0, 2, 3]);\n *\n * a.notEqual(b).print();\n * ```\n * @param a
 The first input tensor.\n * @param b The second input tensor. Must have the same dtype as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Logical'}\n */\nfunction notEqual_<T extends Tensor>(\n   a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'notEqual');\n let $b = convertToTensor(b, 'b', 'notEqual');\n [$a, $b] = makeTypesMatch($a, $b);\n\n assertAndGetBroadcastShape($a.shape, $b.shape);\n\n const inputs: NotEqualInputs = {a: $a, b: $b};\n\n return ENGINE.runKernel(NotEqual, inputs as {} as NamedTensorMap);\n}\n\nexport const notEqual = op({notEqual_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n *
 distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {ENGINE} from '../engine';\nimport {Tensor} from '../tensor';\nimport {DataType, Rank, ShapeMap} from '../types';\nimport {makeZerosTypedArray, sizeFromShape} from '../util';\n\nimport {complex} from './complex';\n\n/**\n * Creates a `tf.Tensor` with all elements set to 0.\n *\n * ```js\n * tf.zeros([2, 2]).print();\n * ```\n *\n * @param shape An array of integers defining the output tensor shape.\n * @param dtype The type of an element in the resulting tensor. Can\n *   be 'float32', 'int32' or 'bool'. Defaults to 'float'.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function zeros<R extends Rank>(\n   shape: ShapeMap[R],
 dtype: DataType = 'float32'): Tensor<R> {\n if (dtype === 'complex64') {\n   const real = zeros(shape, 'float32');\n   const imag = zeros(shape, 'float32');\n   return complex(real, imag);\n }\n const values = makeZerosTypedArray(sizeFromShape(shape), dtype);\n return ENGINE.makeTensor(values, shape, dtype) as Tensor<R>;\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {ENGINE} from '../engine';\nimport {Tensor} from '../tensor';\nimport {DataType, Rank, ShapeMap} from '../types';\nimport {makeOnesTypedArray, sizeFromShape} from '../util';\n\nimport {complex} from '../ops/complex';\n\n/**\n * Creates a `tf.Tensor` with all elements set to 1.\n *\n * ```js\n * tf.ones([2, 2]).print();\n * ```\n *\n * @param shape An array of integers defining the output tensor shape.\n * @param dtype The type of an element in the resulting tensor. Defaults to\n *   'float'.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function ones<R extends Rank>(\n   shape: ShapeMap[R], dtype: DataType = 'float32'): Tensor<R> {\n if (dtype === 'complex64') {\n   const real = ones(shape, 'float32');\n   const imag = ones(shape, 'float32');\n   return complex(real, imag);\n }\n const values = makeOnesTypedArray(sizeFromShape(shape), dtype);\n return ENGINE.makeTensor(values, shape, dtype) as Tensor<R>;\n}\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {ENGINE} from '../engine';\nimport {Tensor} from '../tensor';\nimport {DataType, Rank, ShapeMap} from '../types';\nimport {sizeFromShape} from '../util';\n\n/**\n * Creates a new variable with the provided initial value.\n * ```js\n * const x = tf.variable([1, 2, 3]);\n * x.assign([4, 5, 6]);\n *\n * x.print();\n * ```\n *\n * @param initialValue Initial value for the tensor.\n * @param trainable If true, optimizers are allowed to update it.\n * @param name Name of the variable. Defaults to a unique id.\n * @param dtype If set, initialValue will be converted to the given type.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function variable<R extends Rank>(\n   initialValue: Tensor<R>, trainable = true, name?: string,\n   dtype?: DataType): Variable<R> {\n return ENGINE.makeVariable(initialValue, trainable, name, dtype) as Variable<R>;\n}\n\n/**\n * Creates a `tf.Tensor` with values sampled from a normal distribution.\n *\n * ```js\n * tf.randomNormal([2, 2]).print();\n * ```\n *\n * @param shape An array of integers defining the output tensor shape.\n * @param mean The mean of the normal distribution.\n * @param stdDev The standard deviation of the normal distribution.\n * @param dtype The type of the output.\n * @param seed The seed for the random number generator.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function randomNormal<R extends Rank>(\n   shape: ShapeMap[R], mean = 0, stdDev = 1, dtype?: DataType,\n   seed?: number): Tensor<R> {\n if (dtype != null && dtype === 'bool') {\n   throw new Error(`Unsupported data type $

'./complex';\nimport {zeros} from './zeros';\n\n/**\n * Creates a `tf.Tensor` with all elements set to 1.\n *\n * ```js\n * tf.ones([2, 2]).print();\n * ```\n *\n * @param shape An array of integers defining the output tensor shape.\n * @param dtype The type of an element in the resulting tensor. Defaults to\n * 'float'.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function ones<R extends Rank>(\n shape: ShapeMap[R], dtype: DataType = 'float32'): Tensor<R> {\n if (dtype === 'complex64') {\n const real = ones(shape, 'float32');\n const imag = zeros(shape, 'float32');\n return complex(real, imag);\n }\n const values = makeOnesTypedArray(sizeFromShape(shape), dtype);\n return ENGINE.makeTensor(values, shape, dtype) as Tensor<R>;\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {ENGINE} from '../engine';\nimport {OnesLike, OnesLikeInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Creates a `tf.Tensor` with all elements set to 1 with the same shape as the\n * given tensor.\n *\n * ```js\n * const x = tf.tensor([1, 2]);\n * tf.onesLike(x).print();\n * ```\n * @param x A tensor.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nfunction onesLike_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'onesLike');\n\n const inputs: OnesLikeInputs = {x: $x};\n return ENGINE.runKernel(OnesLike, inputs as {} as NamedTensorMap);\n}\n\nexport const onesLike = op({onesLike_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport {Tensor1D, Tensor2D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {matMul} from './mat_mul';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Computes the outer product of two vectors, `v1` and `v2`.\n *\n * ```js\n * const a = tf.tensor1d([1, 2, 3]);\n * const b = tf.tensor1d([3, 4, 5]);\n *\n * tf.outerProduct(a, b).print();\n * ```\n * @param v1 The first vector in the outer product operation.\n * @param v2 The second vector in the outer product operation.\n *\n * @doc {heading: 'Operations', subheading: 'Matrices'}\n */\nfunction outerProduct_(\n v1: Tensor1D|TensorLike, v2: Tensor1D|TensorLike): Tensor2D {\n const $v1 = convertToTensor(v1, 'v1', 'outerProduct');\n const $v2 = convertToTensor(v2, 'v2', 'outerProduct');\n\n util.assert(\n $v1.rank === 1 && $v2.rank === 1,\n () => `Error in outerProduct: inputs must be rank 1, but got ranks ` +\n `${$v1.rank} and ${$v2.rank}.`);\n\n const v12D = reshape($v1, [-1, 1]);\n const v22D = reshape($v2, [1, -1]);\n return matMul(v12D, v22D);\n}\n\nexport const outerProduct = op({outerProduct_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under

the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {PadV2, PadV2Attrs, PadV2Inputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Pads a `tf.Tensor` with a given value and paddings.\n *\n * This operation implements `CONSTANT` mode. For `REFLECT` and `SYMMETRIC`,\n * refer to `tf.mirrorPad`\n *\n * Also available are stricter rank-specific methods with the same signature\n * as this method that assert that `paddings` is of given
length.\n * - `tf.pad1d`\n * - `tf.pad2d`\n * - `tf.pad3d`\n * - `tf.pad4d`\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3, 4]);\n * x.pad([[1, 2]]).print();\n * ```\n * @param x The tensor to pad.\n * @param paddings An array of length `R` (the rank of the tensor), where\n * each element is a length-2 tuple of ints `[padBefore, padAfter]`,\n * specifying how much to pad along each dimension of the tensor.\n * @param constantValue The pad value to use. Defaults to 0.\n *\n * @doc {heading: 'Tensors', subheading: 'Transformations'}\n */\nfunction pad_<T extends Tensor>(\n   x: T|TensorLike, paddings: Array<[number, number]>, constantValue = 0): T {\n const $x = convertToTensor(x, 'x', 'pad');\n if ($x.rank === 0) {\n   throw new Error('pad(scalar) is not defined. Pass non-scalar to pad');\n }\n\n const attrs: PadV2Attrs = {paddings, constantValue};\n const inputs: PadV2Inputs = {x: $x};\n return ENGINE.runKernel(\n   PadV2, inputs as unknown as NamedTensorMap,\n
attrs as unknown as NamedAttrMap);\n}\n\nexport const pad = op({pad_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {Tensor1D} from '../tensor';\nimport {TensorLike} from '../types';\nimport {assert} from '../util';\nimport {op} from './operation';\nimport {pad} from './pad';\n\n/**\n * Pads a `tf.Tensor1D`
with a given value and paddings. See `pad` for details.\n */\nfunction pad1d_(\n   x: Tensor1D|TensorLike, paddings: [number, number],\n   constantValue = 0): Tensor1D {\n assert(\n   paddings.length === 2,\n   () => 'Invalid number of paddings. Must be length of 2.');\n return pad(x, [paddings], constantValue);\n}\n\nexport const pad1d = op({pad1d_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n
* ==========\n */\nimport {Tensor2D} from '../tensor';\nimport {TensorLike} from '../types';\nimport {assert} from '../util';\nimport {op} from './operation';\nimport {pad} from './pad';\n\n/**\n * Pads a `tf.Tensor2D` with a given value and paddings. See `pad` for details.\n */\nfunction pad2d_(\n   x: Tensor2D|TensorLike, paddings: [[number, number], [number, number]],\n   constantValue = 0): Tensor2D {\n assert(\n   paddings.length === 2 && paddings[0].length === 2 &&\n   paddings[1].length === 2,\n   () => 'Invalid number of paddings. Must be length of 2 each.');\n return pad(x, paddings, constantValue);\n}\n\nexport const pad2d = op({pad2d_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version

2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License
at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {Tensor3D} from '../tensor';\nimport {TensorLike} from '../types';\nimport {assert} from '../util';\nimport {op} from './operation';\nimport {pad} from './pad';\n\n/**\n * Pads a `tf.Tensor3D` with a given value and paddings. See `pad` for details.\n */\nfunction pad3d_(\n x: Tensor3D|TensorLike,\n paddings: [[number, number], [number, number], [number, number]],\n constantValue = 0): Tensor3D {\n assert(\n paddings.length === 3 && paddings[0].length === 2 &&\n paddings[1].length === 2 &&
paddings[2].length === 2,\n () => 'Invalid number of paddings. Must be length of 2 each.');\n return pad(x, paddings, constantValue);\n}\n\nexport const pad3d = op({pad3d_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {Tensor4D} from '../tensor';\nimport {TensorLike} from '../types';\nimport {assert}
from '../util';\nimport {op} from './operation';\nimport {pad} from './pad';\n\n/**\n * Pads a `tf.Tensor4D` with a given value and paddings. See `pad` for details.\n */\nfunction pad4d_(\n x: Tensor4D|TensorLike,\n paddings:\n [\n [number, number], [number, number], [number, number], [number, number]\n],\n constantValue = 0): Tensor4D {\n assert(\n paddings.length === 4 && paddings[0].length === 2 &&\n paddings[1].length === 2 && paddings[2].length === 2 &&\n paddings[3].length === 2,\n () => 'Invalid number of paddings. Must be length of 2 each.');\n return pad(x, paddings, constantValue);\n}\n\nexport const pad4d = op({pad4d_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {SpaceToBatchND, SpaceToBatchNDAttrs, SpaceToBatchNDInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {op} from './operation';\n\n/**\n * This operation divides \"spatial\" dimensions `[1, ..., M]` of the input into\n * a grid of blocks of shape `blockShape`, and interleaves
these blocks with\n * the \"batch\" dimension (0) such that in the output, the spatial\n * dimensions `[1, ..., M]` correspond to the position within the grid,\n * and the batch dimension combines both the position within a spatial block\n * and the original batch position. Prior to division into blocks,\n * the spatial dimensions of the input are optionally zero padded\n * according to `paddings`. See below for a precise description.\n *\n * ```js\n * const x = tf.tensor4d([1, 2, 3, 4], [1, 2, 2, 1]);\n * const blockShape = [2, 2];\n * const paddings = [[0, 0], [0, 0]];\n *\n * x.spaceToBatchND(blockShape, paddings).print();\n * ```\n *\n * @param x A `tf.Tensor`. N-D with `x.shape` =

`[batch] + spatialShape +\n * remainingShape`, where spatialShape has `M` dimensions.\n * @param blockShape A 1-D array. Must have shape `[M]`, all values must\n * be >= 1.\n * @param paddings A 2-D array. Must have shape `[M, 2]`, all values must be >=\n * 0. `paddings[i] = [padStart, padEnd]` specifies
the amount to zero-pad\n * from input dimension `i + 1`, which corresponds to spatial dimension `i`. It\n * is required that\n * `(inputShape[i + 1] + padStart + padEnd) % blockShape[i] === 0`\n *\n * This operation is equivalent to the following steps:\n *\n * 1. Zero-pad the start and end of dimensions `[1, ..., M]` of the input\n * according to `paddings` to produce `padded` of shape paddedShape.\n *\n * 2. Reshape `padded` to `reshapedPadded` of shape:\n * `[batch] + [paddedShape[1] / blockShape[0], blockShape[0], ...,\n * paddedShape[M] / blockShape[M-1], blockShape[M-1]] + remainingShape`\n *\n * 3. Permute dimensions of `reshapedPadded` to produce `permutedReshapedPadded`\n * of shape: `blockShape + [batch] + [paddedShape[1] / blockShape[0], ...,\n * paddedShape[M] / blockShape[M-1]] + remainingShape`\n *\n * 4. Reshape `permutedReshapedPadded` to flatten `blockShape` into the\n * batch dimension, producing an output tensor of shape:\n * `[batch * prod(blockShape)] + [paddedShape[1]
/ blockShape[0], ...,\n * paddedShape[M] / blockShape[M-1]] + remainingShape`\n *\n * @doc {heading: 'Tensors', subheading: 'Transformations'}\n */\nfunction spaceToBatchND_<T extends Tensor>(\n x: T|TensorLike, blockShape: number[], paddings: number[][]): T {\n const $x = convertToTensor(x, 'x', 'spaceToBatchND');\n\n util.assert(\n $x.rank >= 1 + blockShape.length,\n () => `input rank ${$x.rank} should be > than [blockShape] ${\n blockShape.length}`);\n\n util.assert(\n paddings.length === blockShape.length,\n () => `paddings.shape[0] ${\n paddings.length} must be equal to [blockShape] ${blockShape.length}`);\n\n util.assert(\n $x.shape.reduce(\n (a, b, i) => {\n if (i > 0 && i <= blockShape.length) {\n return a &&\n ((b + paddings[i - 1][0] + paddings[i - 1][1]) %\n blockShape[i - 1] ===\n 0);\n }\n return a;\n
},\n true),\n () => `input spatial dimensions ${$x.shape.slice(1)} with paddings ${\n paddings.toString()} must be divisible by blockShapes ${\n blockShape.toString()}`);\n\n const inputs: SpaceToBatchNDInputs = {x: $x};\n const attrs: SpaceToBatchNDAttrs = {blockShape, paddings};\n\n return ENGINE.runKernel(\n SpaceToBatchND, inputs as {} as NamedTensorMap,\n attrs as {} as NamedAttrMap);\n}\n\nexport const spaceToBatchND = op({spaceToBatchND_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF
ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {Tensor3D, Tensor4D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {avgPool} from './avg_pool';\nimport {batchToSpaceND} from './batch_to_space_nd';\nimport * as conv_util from './conv_util';\nimport {maxPool} from './max_pool';\nimport {op} from './operation';\nimport {reshape} from './reshape';\nimport {spaceToBatchND} from './space_to_batch_nd';\n\n/**\n * Performs an N-D pooling operation\n *\n * @param input The input tensor, of rank 4 or rank 3 of shape\n * `[batch, height, width, inChannels]`. If rank 3, batch of 1 is assumed.\n * @param windowShape The filter size: `[filterHeight, filterWidth]`. If\n * `filterSize` is a single number,
then `filterHeight == filterWidth`.\n * @param poolingType The type of pooling, either 'max' or 'avg'.\n * @param pad The type of padding algorithm:\n * - `same` and stride 1: output will be of same size as input,\n * regardless of filter size.\n * - `valid`: output will be smaller than input if filter is larger\n * than 1x1.\n * - For more info, see this guide:\n * [https://www.tensorflow.org/api_guides/python/nn#Convolution](\n * https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dilations The dilation rates: `[dilationHeight, dilationWidth]`\n * in which we sample input values across the height and width dimensions\n *

in dilated pooling. Defaults to `[1, 1]`. If `dilationRate` is a single\n * number, then `dilationHeight == dilationWidth`. If it is greater than\n * 1, then all values of `strides` must be 1.\n * @param strides The strides of the pooling: `[strideHeight, strideWidth]`. If\n * `strides` is
a single number, then `strideHeight == strideWidth`.\n *\n * @doc {heading: 'Operations', subheading: 'Convolution'}\n */\nfunction pool_<T extends Tensor3D|Tensor4D>(\n input: T|TensorLike, windowShape: [number, number]|number,\n poolingType: 'avg'|'max', pad: 'valid'|'same'|number,\n dilations?: [number, number]|number, strides?: [number, number]|number) {\n if (dilations == null) {\n dilations = [1, 1];\n }\n if (strides == null) {\n strides = 1;\n }\n if (pad === 0) {\n pad = 'valid';\n }\n\n const $x = convertToTensor(input, 'x', 'maxPool');\n let x4D = $x as Tensor4D;\n let reshapedTo4D = false;\n\n if ($x.rank === 3) {\n reshapedTo4D = true;\n x4D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2]]);\n }\n\n util.assert(\n conv_util.eitherStridesOrDilationsAreOne(strides, dilations),\n () => 'Error in pool: Either strides or dilations must be 1. ' +\n `Got strides ${strides} and dilations '${dilations}'`);\n\n const
convInfo = conv_util.computePool2DInfo(\n x4D.shape, windowShape, strides, dilations, pad);\n const dilation: [number, number] =\n [convInfo.dilationHeight, convInfo.dilationWidth];\n\n // The following implementation does batchToSpace(pool(spaceToBatch(x)))\n // whenever dilation > 1 since the TF kernels do not support dilation > 1.\n // tslint:disable-next-line:max-line-length\n // https://github.com/tensorflow/tensorflow/blob/50f6bb67dc98c9b74630b6047aae7a4f8a40fd02/tensorflow/python/ops/nn_ops.py#L1037\n\n let basePadding: number[][];\n if (pad === 'same') {\n basePadding = withSpaceToBatchBasePaddings(\n [convInfo.filterHeight, convInfo.filterWidth], dilation);\n } else {\n basePadding = [[0, 0], [0, 0]];\n }\n\n const isDilationOne = dilation[0] === 1 && dilation[1] === 1;\n const [adjustedPadding, adjustedCrops] = requiredSpaceToBatchPaddings(\n [convInfo.inHeight, convInfo.inWidth], dilation, basePadding);\n const convertedPad = isDilationOne
? pad : 'valid';\n const convertedX =\n isDilationOne ? x4D : spaceToBatchND(x4D, dilation, adjustedPadding);\n\n const forwardOp = poolingType === 'avg' ?\n () => avgPool(convertedX, windowShape, strides, convertedPad) :\n () => maxPool(convertedX, windowShape, strides, convertedPad);\n const y = forwardOp();\n\n const res = isDilationOne ? y : batchToSpaceND(y, dilation, adjustedCrops);\n\n if (reshapedTo4D) {\n return reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as T;\n }\n\n return res as T;\n}\n\n// Helper function to compute crops and paddings for pool with dilation > 1.\n// tslint:disable-next-line:max-line-length\n// https://github.com/tensorflow/tensorflow/blob/50f6bb67dc98c9b74630b6047aae7a4f8a40fd02/tensorflow/python/ops/array_ops.py#L2184\nfunction requiredSpaceToBatchPaddings(\n inputShape: [number, number], blockShape: [number, number],\n basePadding: number[][]) {\n const padStart = basePadding.map(b => b[0]);\n const origPadEnd
= basePadding.map(b => b[1]);\n const fullInputShape = inputShape.concat(padStart, origPadEnd);\n const padEndExtra = blockShape.map((b, i) => (b - fullInputShape[i] % b) % b);\n const padEnd = origPadEnd.map((s, i) => s + padEndExtra[i]);\n const paddings = blockShape.map((_, i) => [padStart[i], padEnd[i]]);\n const crops = blockShape.map((_, i) => [0, padEndExtra[i]]);\n return [paddings, crops];\n}\n\n// Helper function to compute base paddings for pool with dilation > 1.\n// tslint:disable-next-line:max-line-length\n// https://github.com/tensorflow/tensorflow/blob/50f6bb67dc98c9b74630b6047aae7a4f8a40fd02/tensorflow/python/ops/nn_ops.py#L524\nfunction withSpaceToBatchBasePaddings(\n filterShape: [number, number], dilation: [number, number]) {\n // Spatial dimensions of the filters and the upsampled filters in which we\n // introduce (rate - 1) zeros between consecutive filter values.\n const dilatedFilterShape = filterShape.map((s, i) => {\n return s + (s - 1)
* (dilation[i] - 1);\n });\n const padExtraShape = dilatedFilterShape.map(s => s - 1);\n\n // When padding is odd, we pad more at end, following the same\n // convention as conv2d.\n const padExtraStart = padExtraShape.map(s => Math.floor(s / 2));\n const padExtraEnd = padExtraShape.map((s, i) => s - padExtraStart[i]);\n return padExtraShape.map((_, i) => {\n return [padExtraStart[i], padExtraEnd[i]];\n });\n}\n\nexport const pool = op({pool_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the

Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See
the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\nimport {ENGINE} from '../engine';\nimport {Pow, PowInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {makeTypesMatch} from '../tensor_util';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes the power of one `tf.Tensor` to another. Supports broadcasting.\n *\n * Given a `tf.Tensor` x and a `tf.Tensor` y, this operation computes x^y for\n * corresponding elements in x and y. The result's dtype will be the upcasted\n * type of the `base` and `exp` dtypes.\n *\n * ```js\n * const a = tf.tensor([[2, 3], [4, 5]])\n * const b = tf.tensor([[1, 2], [3, 0]]).toInt();\n *\n * a.pow(b).print(); // or tf.pow(a, b)\n * ```\n *\n * ```js\n * const
a = tf.tensor([[1, 2], [3, 4]])\n * const b = tf.tensor(2).toInt();\n *\n * a.pow(b).print(); // or tf.pow(a, b)\n * ```\n * We also expose `powStrict` which has the same signature as this op and\n * asserts that `base` and `exp` are the same shape (does not broadcast).\n *\n * @param base The base `tf.Tensor` to pow element-wise.\n * @param exp The exponent `tf.Tensor` to pow element-wise.\n *\n * @doc {heading: 'Operations', subheading: 'Arithmetic'}\n */\nfunction pow_<T extends Tensor>(\n   base: Tensor|TensorLike, exp: Tensor|TensorLike): T {\n let $base = convertToTensor(base, 'base', 'pow');\n let $exp = convertToTensor(exp, 'exp', 'pow');\n [$base, $exp] = makeTypesMatch($base, $exp);\n\n const inputs: PowInputs = {a: $base, b: $exp};\n\n return ENGINE.runKernel(Pow, inputs as {} as NamedTensorMap);\n}\n\nexport const pow = op({pow_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n
* you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {ENGINE} from '../engine';\nimport {Prelu, PreluInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes leaky rectified linear element-wise with parametric alphas.\n *\n * `x < 0 ? alpha * x :
f(x) = x`\n *\n * ```js\n * const x = tf.tensor1d([-1, 2, -3, 4]);\n * const alpha = tf.scalar(0.1);\n *\n * x.prelu(alpha).print(); // or tf.prelu(x, alpha)\n * ```\n * @param x The input tensor.\n * @param alpha Scaling factor for negative values.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction prelu_<T extends Tensor>(x: T|TensorLike, alpha: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'prelu');\n const $alpha = convertToTensor(alpha, 'alpha', 'prelu');\n\n const inputs: PreluInputs = {x: $x, alpha: $alpha};\n return ENGINE.runKernel(Prelu, inputs as {} as NamedTensorMap);\n}\n\nexport const prelu = op({prelu_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {ENGINE} from '../engine';\nimport {Prod, ProdAttrs, ProdInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {cast} from './cast';\nimport {op} from './operation';\n\n/**\n * Computes the product of elements across dimensions of a `tf.Tensor`.\n *\n * Reduces the input along the dimensions given in `axes`. Unless `keepDims`\n * is true, the rank of the `tf.Tensor` is reduced by 1 for each entry in\n * `axes`. If `keepDims` is true, the reduced dimensions are retained with\n * length 1. If `axes` has no entries, all dimensions are reduced, and a\n * `tf.Tensor` with a single element is returned.\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3]);\n *\n * x.prod().print(); // or tf.prod(x)\n * ```\n *\n * ```js\n * const x = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n *\n * const axis = 1;\n * x.prod(axis).print(); // or tf.prod(x, axis)\n * ```\n *\n * @param x The input tensor to compute the product over. If the dtype is `bool`\n *   it will be converted to `int32` and the output dtype will be `int32`.\n * @param axis The dimension(s) to reduce. By default it reduces\n *   all dimensions.\n * @param keepDims If true, retains reduced dimensions with size 1.\n *\n * @doc {heading: 'Operations', subheading: 'Reduction'}\n */\nfunction prod_<T extends Tensor>(\n   x: Tensor|TensorLike, axis: number|number[] = null, keepDims = false): T {\n let $x = convertToTensor(x, 'x', 'prod');\n\n if ($x.dtype === 'bool') {\n   // bool is not an allowed type for the underlying kernel.\n $x = cast($x, 'int32');\n }\n\n const inputs: ProdInputs = {x: $x};\n const attrs: ProdAttrs = {axis, keepDims};\n\n return ENGINE.runKernel(\n   Prod, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const prod = op({prod_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {ENGINE} from '../engine';\nimport {Tensor} from '../tensor';\nimport {DataType, Rank, ShapeMap} from '../types';\nimport {sizeFromShape} from '../util';\n\nimport {op} from './operation';\n\n/**\n * Creates a `tf.Tensor` with values sampled from a random number generator\n * function defined by the user.\n *\n * @param shape An array of integers defining the output tensor shape.\n * @param randFunction A random number generator function which is called\n * for each element in the output tensor.\n * @param dtype The data type of the output tensor. Defaults to 'float32'.\n */\nfunction rand_<R extends Rank>(\n   shape: ShapeMap[R], randFunction: () => number,\n   dtype?: DataType): Tensor<R> {\n const size = sizeFromShape(shape);\n let values = null;\n if (dtype == null || dtype === 'float32') {\n   values = new Float32Array(size);\n } else if (dtype === 'int32') {\n   values = new Int32Array(size);\n } else if (dtype === 'bool') {\n   values = new Uint8Array(size);\n } else {\n   throw new Error(`Unknown data type ${dtype}`);\n }\n for (let i = 0; i < size; i++) {\n   values[i] = randFunction();\n }\n return ENGINE.makeTensor(values, shape, dtype) as Tensor<R>;\n}\n\nexport const rand = op({rand_});\n","// A port of an algorithm by Johannes Baagøe <baagoe@baagoe.com>, 2010\n// http://baagoe.com/en/RandomMusings/javascript/\n// https://github.com/nquinlan/better-random-numbers-for-javascript-mirror\n// Original work is under MIT license -\n\n// Copyright (C) 2010 by Johannes Baagøe <baagoe@baagoe.org>\n//\n// Permission is hereby granted, free of charge, to any person obtaining a copy\n// of this software and associated documentation files (the \"Software\"), to deal\n// in the Software without restriction, including without limitation the rights\n// to use, copy, modify, merge, publish, distribute, sublicense, and/or sell\n// copies of the Software, and to permit persons to whom the Software is\n// furnished to do so, subject to the following conditions:\n// \n// The above copyright notice and this permission notice shall be included in\n// all copies or substantial portions of the Software.\n// \n// THE SOFTWARE IS PROVIDED \"AS IS\", WITHOUT

WARRANTY OF ANY KIND, EXPRESS OR\n// IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY,\n// FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE\n// AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER\n// LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM,\n// OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN\n// THE SOFTWARE.\n\n\n\n(function(global, module, define) {\n\nfunction Alea(seed) {\n var me = this, mash = Mash();\n\n me.next = function() {\n   var t = 2091639 * me.s0 + me.c * 2.3283064365386963e-10; // 2^-32\n   me.s0 = me.s1;\n   me.s1 = me.s2;\n
    return me.s2 = t - (me.c = t | 0);\n };\n\n // Apply the seeding algorithm from Baagoe.\n me.c = 1;\n me.s0 = mash(' ');\n me.s1 = mash(' ');\n me.s2 = mash(' ');\n me.s0 -= mash(seed);\n if (me.s0 < 0) { me.s0 += 1; }\n me.s1 -= mash(seed);\n if (me.s1 < 0) { me.s1 += 1; }\n me.s2 -= mash(seed);\n if (me.s2 < 0) { me.s2 += 1; }\n mash = null;\n}\n\nfunction copy(f, t) {\n t.c = f.c;\n t.s0 = f.s0;\n t.s1 = f.s1;\n t.s2 = f.s2;\n return t;\n}\n\nfunction impl(seed, opts) {\n var xg = new Alea(seed),\n   state = opts && opts.state,\n   prng = xg.next;\n prng.int32 = function() { return (xg.next() * 0x100000000) | 0; }\n prng.double = function() {\n   return prng() + (prng() * 0x200000 | 0) * 1.1102230246251565e-16; // 2^-53\n };\n prng.quick = prng;\n if (state) {\n   if (typeof(state) == 'object') copy(state, xg);\n   prng.state = function() { return copy(xg, {}); }\n }\n return prng;\n}\n\nfunction Mash() {\n var n = 0xefc8249d;\n\n var mash = function(data)
  {\n   data = data.toString();\n   for (var i = 0; i < data.length; i++) {\n   n += data.charCodeAt(i);\n   var h = 0.02519603282416938 * n;\n   n = h >>> 0;\n   h -= n;\n   h *= n;\n   n = h >>> 0;\n   h -= n;\n   n += h * 0x100000000; // 2^32\n   }\n   return (n >>> 0) * 2.3283064365386963e-10; // 2^-32\n };\n\n return mash;\n}\n\n\nif (module && module.exports) {\n module.exports = impl;\n} else if (define && define.amd) {\n define(function() { return impl; });\n} else {\n this.alea = impl;\n}\n\n})(\n this,\n (typeof module) == 'object' && module,   // present in node.js\n (typeof define) == 'function' && define   // present with an AMD loader\n);\n\n\n","// A Javascript implementaion of the \"xor128\" prng algorithm by\n// George Marsaglia. See http://www.jstatsoft.org/v08/i14/paper\n\n(function(global, module, define) {\n\nfunction XorGen(seed) {\n var me = this, strseed = '';\n\n me.x = 0;\n me.y = 0;\n me.z = 0;\n me.w = 0;\n\n
  // Set up generator function.\n me.next = function() {\n   var t = me.x ^ (me.x << 11);\n   me.x = me.y;\n   me.y = me.z;\n   me.z = me.w;\n   return me.w ^= (me.w >>> 19) ^ t ^ (t >>> 8);\n };\n\n if (seed === (seed | 0)) {\n   // Integer seed.\n   me.x = seed;\n } else {\n   // String seed.\n   strseed += seed;\n }\n\n // Mix in string seed, then discard an initial batch of 64 values.\n for (var k = 0; k < strseed.length + 64; k++) {\n   me.x ^= strseed.charCodeAt(k) | 0;\n   me.next();\n }\n}\n\nfunction copy(f, t) {\n t.x = f.x;\n t.y = f.y;\n t.z = f.z;\n t.w = f.w;\n return t;\n}\n\nfunction impl(seed, opts) {\n var xg = new XorGen(seed),\n   state = opts && opts.state,\n   prng = function() { return (xg.next() >>> 0) / 0x100000000; };\n prng.double = function() {\n   do {\n   var top = xg.next() >>> 11,\n   bot = (xg.next() >>> 0) / 0x100000000,\n   result = (top + bot) / (1 << 21);\n   } while (result === 0);\n   return
  result;\n };\n prng.int32 = xg.next;\n prng.quick = prng;\n if (state) {\n   if (typeof(state) == 'object') copy(state, xg);\n   prng.state = function() { return copy(xg, {}); }\n }\n return prng;\n}\n\nif (module && module.exports) {\n module.exports = impl;\n} else if (define && define.amd) {\n define(function() { return impl; });\n} else {\n this.xor128 = impl;\n}\n\n})(\n this,\n (typeof module) == 'object' && module,   // present in node.js\n (typeof define) == 'function' && define   // present with an AMD loader\n);\n\n\n","// A Javascript implementaion of the \"xorwow\" prng algorithm by\n// George Marsaglia. See http://www.jstatsoft.org/v08/i14/paper\n\n(function(global, module, define) {\n\nfunction XorGen(seed) {\n var me = this, strseed = '';\n\n // Set up generator function.\n me.next = function() {\n   var t = (me.x ^ (me.x >>> 2));\n   me.x = me.y; me.y = me.z; me.z = me.w; me.w = me.v;\n   return (me.d = (me.d + 362437 | 0)) +\n   (me.v = (me.v
  ^ (me.v << 4)) ^ (t ^ (t << 1))) | 0;\n };\n\n me.x = 0;\n me.y = 0;\n me.z = 0;\n me.w = 0;\n me.v = 0;\n\n if (seed === (seed | 0)) {\n   // Integer seed.\n   me.x = seed;\n } else {\n   // String seed.\n   strseed += seed;\n }\n\n // Mix in string seed, then discard an initial batch of 64 values.\n for (var k = 0; k < strseed.length + 64; k++) {\n

me.x ^= strseed.charCodeAt(k) | 0;\n if (k == strseed.length) {\n me.d = me.x << 10 ^ me.x >>> 4;\n }\n me.next();\n }\n}\n\nfunction copy(f, t) {\n t.x = f.x;\n t.y = f.y;\n t.z = f.z;\n t.w = f.w;\n t.v = f.v;\n t.d = f.d;\n return t;\n}\n\nfunction impl(seed, opts) {\n var xg = new XorGen(seed),\n state = opts && opts.state,\n prng = function() { return (xg.next() >>> 0) / 0x100000000; };\n prng.double = function() {\n do {\n var top = xg.next() >>> 11,\n bot = (xg.next() >>> 0) / 0x100000000,\n result = (top + bot) / (1 << 21);\n } while (result === 0);\n
  return result;\n };\n prng.int32 = xg.next;\n prng.quick = prng;\n if (state) {\n if (typeof(state) == 'object') copy(state, xg);\n prng.state = function() { return copy(xg, {}); }\n }\n return prng;\n}\n\nif (module && module.exports) {\n module.exports = impl;\n} else if (define && define.amd) {\n define(function() { return impl; });\n} else {\n this.xorwow = impl;\n}\n\n})(\n this,\n (typeof module) == 'object' && module, // present in node.js\n (typeof define) == 'function' && define // present with an AMD loader\n);\n\n\n","// A Javascript implementaion of the \"xorshift7\" algorithm by\n// François Panneton and Pierre L'ecuyer:\n// \"On the Xorgshift Random Number Generators\"\n// http://saluc.engr.uconn.edu/refs/crypto/rng/panneton05onthexorshift.pdf\n\n(function(global, module, define) {\n\nfunction XorGen(seed) {\n var me = this;\n\n // Set up generator function.\n me.next = function() {\n // Update xor generator.\n var X = me.x, i = me.i, t,
 v, w;\n t = X[i]; t ^= (t >>> 7); v = t ^ (t << 24);\n t = X[(i + 1) & 7]; v ^= t ^ (t >>> 10);\n t = X[(i + 3) & 7]; v ^= t ^ (t >>> 3);\n t = X[(i + 4) & 7]; v ^= t ^ (t << 7);\n t = X[(i + 7) & 7]; t = t ^ (t << 13); v ^= t ^ (t << 9);\n X[i] = v;\n me.i = (i + 1) & 7;\n return v;\n };\n\n function init(me, seed) {\n var j, w, X = [];\n\n if (seed === (seed | 0)) {\n // Seed state array using a 32-bit integer.\n w = X[0] = seed;\n } else {\n // Seed state using a string.\n seed = '' + seed;\n for (j = 0; j < seed.length; ++j) {\n X[j & 7] = (X[j & 7] << 15) ^\n (seed.charCodeAt(j) + X[(j + 1) & 7] << 13);\n }\n }\n // Enforce an array length of 8, not all zeroes.\n while (X.length < 8) X.push(0);\n for (j = 0; j < 8 && X[j] === 0; ++j);\n if (j == 8) w = X[7] = -1; else w = X[j];\n\n me.x = X;\n me.i = 0;\n\n // Discard an initial 256 values.\n for (j = 256; j > 0; --j) {\n
  me.next();\n }\n }\n\n init(me, seed);\n}\n\nfunction copy(f, t) {\n t.x = f.x.slice();\n t.i = f.i;\n return t;\n}\n\nfunction impl(seed, opts) {\n if (seed == null) seed = +(new Date);\n var xg = new XorGen(seed),\n state = opts && opts.state,\n prng = function() { return (xg.next() >>> 0) / 0x100000000; };\n prng.double = function() {\n do {\n var top = xg.next() >>> 11,\n bot = (xg.next() >>> 0) / 0x100000000,\n result = (top + bot) / (1 << 21);\n } while (result === 0);\n return result;\n };\n prng.int32 = xg.next;\n prng.quick = prng;\n if (state) {\n if (state.x) copy(state, xg);\n prng.state = function() { return copy(xg, {}); }\n }\n return prng;\n}\n\nif (module && module.exports) {\n module.exports = impl;\n} else if (define && define.amd) {\n define(function() { return impl; });\n} else {\n this.xorshift7 = impl;\n}\n\n})(\n this,\n (typeof module) == 'object' && module, // present in node.js\n
  (typeof define) == 'function' && define // present with an AMD loader\n);\n\n\n","// A Javascript implementaion of Richard Brent's Xorgens xor4096 algorithm.\n//\n// This fast non-cryptographic random number generator is designed for\n// use in Monte-Carlo algorithms. It combines a long-period xorshift\n// generator with a Weyl generator, and it passes all common batteries\n// of stasticial tests for randomness while consuming only a few nanoseconds\n// for each prng generated. For background on the generator, see Brent's\n// paper: \"Some long-period random number generators using shifts and xors.\"\n// http://arxiv.org/pdf/1004.3115v1.pdf\n//\n// Usage:\n//\n// var xor4096 = require('xor4096');\n// random = xor4096(1);   // Seed with int32 or string.\n// assert.equal(random(), 0.1520436450538547); // (0, 1) range, 53 bits.\n// assert.equal(random.int32(), 1806534897);   // signed int32, 32 bits.\n//\n// For nonzero numeric keys, this impelementation provides a
 sequence\n// identical to that by Brent's xorgens 3 implementaion in C. This\n// implementation also provides for initalizing the generator with\n// string seeds, or for saving and restoring the state of the generator.\n//\n// On Chrome, this prng benchmarks about 2.1 times slower than\n// Javascript's built-in Math.random().\n\n(function(global, module, define) {\n\nfunction XorGen(seed) {\n var me = this;\n\n // Set up generator function.\n me.next = function() {\n var w = me.w,\n X = me.X, i = me.i, t, v;\n // Update Weyl generator.\n me.w = w = (w + 0x61c88647) | 0;\n // Update xor generator.\n v = X[(i + 34) & 127];\n t = X[i

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= ((i + 1) & 127)];\n    v ^= v << 13;\n    t ^= t << 17;\n    v ^= v >>> 15;\n    t ^= t >>> 12;\n    // Update Xor generator array state.\n    v = X[i] = v ^ t;\n    me.i = i;\n    // Result is the combination.\n    return (v + (w ^ (w >>> 16))) | 0;\n  };\n\n  function init(me, seed) {\n    var t, v, i, j, w, X = [], limit = 128;\n    if (seed === (seed | 0)) {\n      // Numeric seeds initialize v, which is used to generates X.\n      v = seed;\n      seed = null;\n    } else {\n      // String seeds are mixed into v and X one character at a time.\n      seed = seed + '\\0';\n      v = 0;\n      limit = Math.max(limit, seed.length);\n    }\n    // Initialize circular array and weyl value.\n    for (i = 0, j = -32; j < limit; ++j) {\n      // Put the unicode characters into the array, and shuffle them.\n      if (seed) v ^= seed.charCodeAt((j + 32) % seed.length);\n      // After 32 shuffles, take v as the starting w value.\n      if (j === 0) w = v;\n      v ^= v << 10;\n      v ^= v >>> 15;\n      v ^= v << 4;\n      v ^= v >>> 13;\n      if (j >= 0) {\n        w = (w + 0x61c88647) | 0;     // Weyl.\n        t = (X[j & 127] ^= (v + w));  // Combine xor and weyl to init array.\n        i = (0 == t) ? i + 1 : 0;     // Count zeroes.\n      }\n    }\n    // We have detected all zeroes; make the key nonzero.\n    if (i >= 128) {\n      X[(seed && seed.length || 0) & 127] = -1;\n    }\n    // Run the generator 512 times to further mix the state before using it.\n    // Factoring this as a function slows the main generator, so it is just\n    // unrolled here.  The weyl generator is not advanced while warming up.\n    i = 127;\n    for (j = 4 * 128; j > 0; --j) {\n      v = X[(i + 34) & 127];\n      t = X[i = ((i + 1) & 127)];\n      v ^= v << 13;\n      t ^= t << 17;\n      v ^= v >>> 15;\n      t ^= t >>> 12;\n      X[i] = v ^ t;\n    }\n    // Storing state as object members is faster than using closure variables.\n    me.w = w;\n    me.X = X;\n    me.i = i;\n  }\n\n  init(me, seed);\n}\n\nfunction copy(f, t) {\n  t.i = f.i;\n  t.w = f.w;\n  t.X = f.X.slice();\n  return t;\n};\n\nfunction impl(seed, opts) {\n  if (seed == null) seed = +(new Date);\n  var xg = new XorGen(seed),\n      state = opts && opts.state,\n      prng = function() { return (xg.next() >>> 0) / 0x100000000; };\n  prng.double = function() {\n    do {\n      var top = xg.next() >>> 11,\n          bot = (xg.next() >>> 0) / 0x100000000,\n          result = (top + bot) / (1 << 21);\n    } while (result === 0);\n    return result;\n  };\n  prng.int32 = xg.next;\n  prng.quick = prng;\n  if (state) {\n    if (state.X) copy(state, xg);\n    prng.state = function() { return copy(xg, {}); }\n  }\n  return prng;\n}\n\nif (module && module.exports) {\n  module.exports = impl;\n} else if (define && define.amd) {\n  define(function() { return impl; });\n} else {\n  this.xor4096 = impl;\n}\n\n})(\n  this,
          // window object or global\n  (typeof module) == 'object' && module,    // present in node.js\n  (typeof define) == 'function' && define   // present with an AMD loader\n);\n","// A Javascript implementaion of the \"Tyche-i\" prng algorithm by\n// Samuel Neves and Filipe Araujo.\n// See https://eden.dei.uc.pt/~sneves/pubs/2011-snfa2.pdf\n\n(function(global, module, define) {\n\nfunction XorGen(seed) {\n  var me = this, strseed = '';\n\n  // Set up generator function.\n  me.next = function() {\n    var b = me.b, c = me.c, d = me.d, a = me.a;\n    b = (b << 25) ^ (b >>> 7) ^ c;\n    c = (c - d) | 0;\n    d = (d << 24) ^ (d >>> 8) ^ a;\n    a = (a - b) | 0;\n    me.b = b = (b << 20) ^ (b >>> 12) ^ c;\n    me.c = c = (c - d) | 0;\n    me.d = (d << 16) ^ (c >>> 16) ^ a;\n    return me.a = (a - b) | 0;\n  };\n\n  /* The following is non-inverted tyche, which has better internal\n   * bit diffusion, but which is about 25% slower than tyche-i in JS.\n  me.next = function() {\n    var a = me.a, b = me.b, c = me.c, d = me.d;\n    a = (me.a + me.b | 0) >>> 0;\n    d = me.d ^ a; d = d << 16 ^ d >>> 16;\n    c = me.c + d | 0;\n    b = me.b ^ c; b = b << 12 ^ d >>> 20;\n    me.a = a = a + b | 0;\n    d = d ^ a; me.d = d = d << 8 ^ d >>> 24;\n    me.c = c = c + d | 0;\n    b = b ^ c;\n    return me.b = (b << 7 ^ b >>> 25);\n  }\n  */\n\n  me.a = 0;\n  me.b = 0;\n  me.c = 2654435769 | 0;\n  me.d = 1367130551;\n\n  if (seed === Math.floor(seed)) {\n    // Integer seed.\n    me.a = (seed / 0x100000000) | 0;\n    me.b = seed | 0;\n  } else {\n    // String seed.\n    strseed += seed;\n  }\n\n  // Mix in string seed, then discard an initial batch of 64 values.\n  for (var k = 0; k < strseed.length + 20; k++) {\n    me.b ^= strseed.charCodeAt(k) | 0;\n    me.next();\n  }\n}\n\nfunction copy(f, t) {\n  t.a = f.a;\n  t.b = f.b;\n  t.c = f.c;\n  t.d = f.d;\n  return t;\n};\n\nfunction impl(seed, opts) {\n  var xg = new XorGen(seed),\n      state = opts && opts.state,\n      prng = function() { return (xg.next() >>> 0) / 0x100000000; };\n  prng.double = function() {\n    do {\n      var top = xg.next() >>> 11,\n          bot = (xg.next() >>> 0) / 0x100000000,\n          result = (top + bot) / (1 << 21);\n    } while (result === 0);\n    return result;\n  };\n  prng.int32 = xg.next;\n  prng.quick = prng;\n  if (state) {\n    if (typeof(state) == 'object') copy(state,
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xg);\n prng.state = function() { return copy(xg, {}); }\n }\n return prng;\n}\n\nif (module && module.exports) {\n module.exports = impl;\n} else if (define && define.amd) {\n define(function() { return impl; });\n} else {\n this.tychei = impl;\n}\n\n})(\n this,\n (typeof module) == 'object' && module, // present in node.js\n (typeof define) == 'function' && define // present with an AMD loader\n);\n\n\n","/*\nCopyright 2014 David Bau.\n\nPermission is hereby granted, free of charge, to any person obtaining\na copy of this software and associated documentation files (the\n\"Software\"), to deal in the Software without restriction, including\nwithout limitation the rights to use, copy, modify, merge, publish,\ndistribute, sublicense, and/or sell copies of the Software, and to\npermit persons to whom the Software is furnished to do so, subject to\nthe following conditions:\n\nThe above copyright notice and this permission notice shall be\nincluded in all copies or substantial portions of the Software.\n\nTHE SOFTWARE IS PROVIDED \"AS IS\", WITHOUT WARRANTY OF ANY KIND,\nEXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF\nMERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT.\nIN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY\nCLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT,\nTORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE\nSOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.\n\n*/\n\n(function (pool, math) {\n//\n// The following constants are related to IEEE 754 limits.\n//\nvar global = this,\n width = 256, // each RC4 output is 0 <= x < 256\n chunks = 6, // at least six RC4 outputs for each double\n digits = 52, // there are 52 significant digits in a double\n rngname = 'random', // rngname: name for Math.random and Math.seedrandom\n startdenom = math.pow(width, chunks),\n significance = math.pow(2, digits),\n overflow = significance * 2,\n mask = width - 1,\n nodecrypto; // node.js crypto module, initialized at the bottom.\n\n//\n// seedrandom()\n// This is the seedrandom function described above.\n//\nfunction seedrandom(seed, options, callback) {\n var key = [];\n options = (options == true) ? { entropy: true } : (options || {});\n\n // Flatten the seed string or build one from local entropy if needed.\n var shortseed = mixkey(flatten(\n options.entropy ? [seed, tostring(pool)] :\n (seed == null) ? autoseed() : seed, 3), key);\n\n // Use the seed to initialize an ARC4 generator.\n var arc4 = new ARC4(key);\n\n // This function returns a random double in [0, 1) that contains\n // randomness in every bit of the mantissa of the IEEE 754 value.\n var prng = function() {\n var n = arc4.g(chunks), // Start with a numerator n < 2 ^ 48\n d = startdenom, // and denominator d = 2 ^ 48.\n x = 0; // and no 'extra last byte'.\n while (n < significance) { // Fill up all significant digits by\n n = (n + x) * width; // shifting numerator and\n d *= width; // denominator and generating a\n x = arc4.g(1); // new least-significant-byte.\n }\n while (n >= overflow) { // To avoid rounding up, before adding\n n /= 2; // last byte, shift everything\n d /= 2; // right using integer math until\n x >>>= 1; // we have exactly the desired bits.\n }\n return (n + x) / d; // Form the number within [0, 1).\n };\n\n prng.int32 = function() { return arc4.g(4) | 0; }\n prng.quick = function() { return arc4.g(4) / 0x100000000; }\n prng.double = prng;\n\n // Mix the randomness into accumulated entropy.\n mixkey(tostring(arc4.S), pool);\n\n // Calling convention: what to return as a function of prng, seed, is_math.\n return (options.pass || callback ||\n function(prng, seed, is_math_call, state) {\n if (state) {\n // Load the arc4 state from the given state if it has an S array.\n if (state.S) { copy(state, arc4); }\n // Only provide the .state method if requested via options.state.\n prng.state = function() { return copy(arc4, {}); }\n }\n\n // If called as a method of Math (Math.seedrandom()), mutate\n // Math.random because that is how seedrandom.js has worked since v1.0.\n if (is_math_call) { math[rngname] = prng; return seed; }\n\n // Otherwise, it is a newer calling convention, so return the\n // prng directly.\n else return prng;\n })(\n prng,\n shortseed,\n 'global' in options ? options.global : (this == math),\n options.state);\n}\nmath['seed' + rngname] = seedrandom;\n\n//\n// ARC4\n//\n// An ARC4 implementation. The constructor takes a key in the\n// form of\n// an array of at most (width) integers that should be 0 <= x < (width).\n//\n// The g(count) method returns a pseudorandom integer that concatenates\n// the next (count) outputs from ARC4. Its return value is a number x\n//

that is in the range 0 <= x < (width ^ count).\n//\nfunction ARC4(key) {\n var t, keylen = key.length,\n   me = this, i = 0, j = me.i = me.j = 0, s = me.S = [];\n\n // The empty key [] is treated as [0].\n if (!keylen) { key = [keylen++]; }\n\n // Set up S using the standard key scheduling algorithm.\n while (i < width) {\n   s[i] = i++;\n }\n for (i = 0; i < width; i++) {\n   s[i] = s[j = mask & (j + key[i % keylen] + (t = s[i]))];\n   s[j] = t;\n }\n\n // The \"g\" method returns the next (count) outputs as one number.\n (me.g = function(count) {\n   // Using instance members instead of closure state nearly doubles speed.\n   var t, r = 0,\n   i = me.i, j = me.j, s = me.S;\n   while (count--) {\n   t = s[i = mask & (i + 1)];\n   r = r * width + s[mask & ((s[i] = s[j = mask & (j + t)]) + (s[j] = t))];\n   }\n   me.i = i; me.j = j;\n   return r;\n   // For robust unpredictability, the function call below automatically\n   // discards an initial batch of values. This is called RC4-drop[256].\n   // See http://google.com/search?q=rsa+fluhrer+response&btnI\n })(width);\n}\n\n//\n// copy()\n// Copies internal state of ARC4 to or from a plain object.\n//\nfunction copy(f, t) {\n t.i = f.i;\n t.j = f.j;\n t.S = f.S.slice();\n return t;\n};\n\n//\n// flatten()\n// Converts an object tree to nested arrays of strings.\n//\nfunction flatten(obj, depth) {\n var result = [], typ = (typeof obj), prop;\n if (depth && typ == 'object') {\n   for (prop in obj) {\n   try { result.push(flatten(obj[prop], depth - 1)); } catch (e) {}\n   }\n }\n return (result.length ? result : typ == 'string' ? obj : obj + '\\0');\n}\n\n//\n// mixkey()\n// Mixes a string seed into a key that is an array of integers, and\n// returns a shortened string seed that is equivalent to the result key.\n//\nfunction mixkey(seed, key) {\n var stringseed = seed + '', smear, j = 0;\n while (j < stringseed.length) {\n   key[mask & j] =\n   mask & ((smear ^= key[mask & j] * 19) + stringseed.charCodeAt(j++));\n }\n return tostring(key);\n}\n\n//\n// autoseed()\n// Returns an object for autoseeding, using window.crypto and Node crypto\n// module if available.\n//\nfunction autoseed() {\n try {\n   var out;\n   if (nodecrypto && (out = nodecrypto.randomBytes)) {\n   // The use of 'out' to remember randomBytes makes tight minified code.\n   out = out(width);\n   } else {\n   out = new Uint8Array(width);\n   (global.crypto || global.msCrypto).getRandomValues(out);\n   }\n   return tostring(out);\n } catch (e) {\n   var browser = global.navigator,\n   plugins = browser && browser.plugins;\n   return [+new Date, global, plugins, global.screen, tostring(pool)];\n }\n}\n\n//\n// tostring()\n//
 Converts an array of charcodes to a string\n//\nfunction tostring(a) {\n return String.fromCharCode.apply(0, a);\n}\n\n//\n// When seedrandom.js is loaded, we immediately mix a few bits\n// from the built-in RNG into the entropy pool. Because we do\n// not want to interfere with deterministic PRNG state later,\n// seedrandom will not call math.random on its own again after\n// initialization.\n//\nmixkey(math.random(), pool);\n\n//\n// Nodejs and AMD support: export the implementation as a module using\n// either convention.\n//\nif ((typeof module) == 'object' && module.exports) {\n module.exports = seedrandom;\n // When in node.js, try using crypto package for autoseeding.\n try {\n   nodecrypto = require('crypto');\n } catch (ex) {}\n} else if ((typeof define) == 'function' && define.amd) {\n define(function() { return seedrandom; });\n}\n\n// End anonymous scope, and pass initial values.\n})(\n [],   // pool: entropy pool starts empty\n Math   // math: package containing
 random, pow, and seedrandom\n);\n","// A library of seedable RNGs implemented in Javascript.\n//\n// Usage:\n//\n// var seedrandom = require('seedrandom');\n// var random = seedrandom(1); // or any seed.\n// var x = random();   // 0 <= x < 1. Every bit is random.\n// var x = random.quick(); // 0 <= x < 1. 32 bits of randomness.\n\n// alea, a 53-bit multiply-with-carry generator by Johannes Baagøe.\n// Period: ~2^116\n// Reported to pass all BigCrush tests.\nvar alea = require('./lib/alea');\n\n// xor128, a pure xor-shift generator by George Marsaglia.\n// Period: 2^128-1.\n// Reported to fail: MatrixRank and LinearComp.\nvar xor128 = require('./lib/xor128');\n\n// xorwow, George Marsaglia's 160-bit xor-shift combined plus weyl.\n// Period: 2^192-2^32\n// Reported to fail: CollisionOver, SimpPoker, and LinearComp.\nvar xorwow = require('./lib/xorwow');\n\n// xorshift7, by François Panneton and Pierre L'ecuyer, takes\n// a different approach: it adds robustness by allowing more
 shifts\n// than Marsaglia's original three. It is a 7-shift generator\n// with 256 bits, that passes BigCrush with no systmatic failures.\n// Period 2^256-1.\n// No systematic BigCrush failures reported.\nvar xorshift7 = require('./lib/xorshift7');\n\n// xor4096, by Richard Brent, is a 4096-bit xor-shift with a\n// very long period that also adds a Weyl generator. It also passes\n// BigCrush with no systematic failures. Its long period may\n// be useful if you have many generators and need to avoid\n// collisions.\n// Period: 2^4128-2^32.\n// No systematic BigCrush

failures reported.\nvar xor4096 = require('./lib/xor4096');\n\n// Tyche-i, by Samuel Neves and Filipe Araujo, is a bit-shifting random\n// number generator derived from ChaCha, a modern stream cipher.\n// https://eden.dei.uc.pt/~sneves/pubs/2011-snfa2.pdf\n// Period: ~2^127\n// No systematic BigCrush failures reported.\nvar tychei = require('./lib/tychei');\n\n// The original ARC4-based prng included in this library.\n// Period: ~2^1600\nvar sr = require('./seedrandom');\n\nsr.alea = alea;\nsr.xor128 = xor128;\nsr.xorwow = xorwow;\nsr.xorshift7 = xorshift7;\nsr.xor4096 = xor4096;\nsr.tychei = tychei;\n\nmodule.exports = sr;\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport * as seedrandom from 'seedrandom';\n\nimport {expectNumbersClose, testEpsilon} from '../test_util';\nimport {TypedArray} from '../types';\n\nexport interface RandomBase {\n nextValue(): number;\n}\n\nexport interface RandomGamma {\n nextValue(): number;\n}\n\nexport interface RandNormalDataTypes {\n float32: Float32Array;\n int32: Int32Array;\n}\n\nexport interface RandGammaDataTypes {\n float32: Float32Array;\n int32: Int32Array;\n}\n\n// https://en.wikipedia.org/wiki/Marsaglia_polar_method\nexport class MPRandGauss implements RandomBase {\n private mean: number;\n private stdDev: number;\n private nextVal: number;\n private dtype?: keyof RandNormalDataTypes;\n private truncated?: boolean;\n private upper?: number;\n private lower?: number;\n private random: seedrandom.prng;\n\n constructor(\n mean: number, stdDeviation: number, dtype?: keyof RandNormalDataTypes,\n truncated?: boolean, seed?: number) {\n this.mean = mean;\n this.stdDev = stdDeviation;\n this.dtype = dtype;\n this.nextVal = NaN;\n this.truncated = truncated;\n if (this.truncated) {\n this.upper = this.mean + this.stdDev * 2;\n this.lower = this.mean - this.stdDev * 2;\n }\n const seedValue = seed ? seed : Math.random();\n this.random = seedrandom.alea(seedValue.toString());\n }\n\n /** Returns next sample from a Gaussian distribution. */\n public nextValue(): number {\n if (!isNaN(this.nextVal)) {\n const value = this.nextVal;\n this.nextVal = NaN;\n return value;\n }\n\n let resultX: number, resultY: number;\n let isValid = false;\n while (!isValid) {\n let v1: number, v2: number, s: number;\n do {\n v1 = 2 * this.random() - 1;\n v2 = 2 * this.random() - 1;\n s = v1 * v1 + v2 * v2;\n } while (s >= 1 || s === 0);\n\n const mul = Math.sqrt(-2.0 * Math.log(s) / s);\n resultX = this.mean + this.stdDev * v1 * mul;\n resultY = this.mean + this.stdDev * v2 * mul;\n\n if (!this.truncated || this.isValidTruncated(resultX)) {\n isValid = true;\n }\n }\n\n if (!this.truncated || this.isValidTruncated(resultY)) {\n this.nextVal = this.convertValue(resultY);\n }\n return this.convertValue(resultX);\n }\n\n /** Handles proper rounding for non-floating-point numbers. */\n private convertValue(value: number): number {\n if (this.dtype == null || this.dtype === 'float32') {\n return value;\n }\n return Math.round(value);\n }\n\n /** Returns true if less than 2-standard-deviations from the mean. */\n private isValidTruncated(value: number): boolean {\n return value <= this.upper && value >= this.lower;\n }\n}\n\n// Marsaglia, George, and Wai Wan Tsang. 2000. \"A Simple Method for Generating\n// Gamma Variables.\"\nexport class RandGamma implements RandomGamma {\n private alpha: number;\n private beta: number;\n private d: number;\n private c: number;\n private dtype?: keyof RandGammaDataTypes;\n private randu: seedrandom.prng;\n private randn: MPRandGauss;\n\n constructor(\n alpha: number, beta: number, dtype: keyof RandGammaDataTypes,\n seed?: number) {\n this.alpha = alpha;\n this.beta = 1 / beta; // convert rate to scale parameter\n this.dtype = dtype;\n\n const seedValue = seed ? seed : Math.random();\n this.randu = seedrandom.alea(seedValue.toString());\n this.randn = new MPRandGauss(0, 1, dtype, false, this.randu());\n\n if (alpha < 1) {\n this.d = alpha + (2 / 3);\n } else {\n this.d = alpha - (1 / 3);\n }\n this.c = 1 / Math.sqrt(9 * this.d);\n }\n\n /** Returns next sample from a gamma distribution. */\n public nextValue(): number {\n let x2:

number, v0: number, v1: number, x: number, u: number, v: number;\n while (true) {\n do {\n x = this.randn.nextValue();\n v = 1 + (this.c * x);\n } while (v <= 0);\n v *= v * v;\n x2 = x * x;\n v0 = 1 - (0.331 * x2 * x2);\n v1 = (0.5 * x2) + (this.d * (1 - v + Math.log(v)));\n u = this.randu();\n if (u < v0 || Math.log(u) < v1) {\n break;\n }\n }\n v = (1 / this.beta) * this.d * v;\n if (this.alpha < 1) {\n v *= Math.pow(this.randu(), 1 / this.alpha);\n }\n return this.convertValue(v);\n }\n /** Handles proper rounding for non-floating-point numbers. */\n private convertValue(value: number): number {\n if (this.dtype === 'float32') {\n return value;\n }\n return Math.round(value);\n }\n}\n\nexport class UniformRandom implements RandomBase {\n private min: number;\n private range: number;\n private random: seedrandom.prng;\n private dtype?: keyof RandNormalDataTypes;\n\n constructor(\n min = 0, max = 1, dtype?: keyof RandNormalDataTypes,\n seed?: string|number) {\n this.min = min;\n this.range = max - min;\n this.dtype = dtype;\n if (seed == null) {\n seed = Math.random();\n }\n if (typeof seed === 'number') {\n seed = seed.toString();\n }\n\n if (!this.canReturnFloat()\n && this.range <= 1) {\n throw new Error(\n `The difference between ${min} - ${max} <= 1 and dtype is not float`);\n }\n this.random = seedrandom.alea(seed);\n }\n\n /** Handles proper rounding for non floating point numbers. */\n private canReturnFloat = () =>\n (this.dtype == null || this.dtype === 'float32');\n\n private convertValue(value: number): number {\n if (this.canReturnFloat()) {\n return value;\n }\n return Math.round(value);\n }\n\n nextValue() {\n return this.convertValue(this.min + this.range * this.random());\n }\n}\n\nexport function jarqueBeraNormalityTest(values: TypedArray|number[]) {\n // https://en.wikipedia.org/wiki/Jarque%E2%80%93Bera_test\n const n = values.length;\n const s = skewness(values);\n const k = kurtosis(values);\n const jb = n / 6 * (Math.pow(s, 2) + 0.25 * Math.pow(k - 3, 2));\n // JB test requires 2-degress of freedom from Chi-Square @ 0.95:\n // http://www.itl.nist.gov/div898/handbook/eda/section3/eda3674.htm\n const CHI_SQUARE_2DEG = 5.991;\n if (jb > CHI_SQUARE_2DEG) {\n throw new Error(`Invalid p-value for JB: ${jb}`);\n }\n}\n\nexport function expectArrayInMeanStdRange(\n actual: TypedArray|number[], expectedMean: number, expectedStdDev: number,\n epsilon?: number) {\n if (epsilon == null) {\n epsilon = testEpsilon();\n }\n const actualMean = mean(actual);\n expectNumbersClose(actualMean, expectedMean, epsilon);\n expectNumbersClose(\n standardDeviation(actual, actualMean), expectedStdDev, epsilon);\n}\n\nfunction mean(values: TypedArray|number[]) {\n let sum = 0;\n for (let i = 0; i < values.length; i++) {\n sum += values[i];\n }\n return sum / values.length;\n}\n\nfunction standardDeviation(values: TypedArray|number[], mean: number) {\n let squareDiffSum = 0;\n for (let i = 0; i < values.length; i++) {\n const diff = values[i] - mean;\n squareDiffSum += diff * diff;\n }\n return Math.sqrt(squareDiffSum / values.length);\n}\n\nfunction kurtosis(values: TypedArray|number[]) {\n // https://en.wikipedia.org/wiki/Kurtosis\n const valuesMean = mean(values);\n const n = values.length;\n let sum2 = 0;\n let sum4 = 0;\n for (let i = 0; i < n; i++) {\n const v = values[i] - valuesMean;\n sum2 += Math.pow(v, 2);\n sum4 += Math.pow(v, 4);\n }\n return (1 / n) * sum4 / Math.pow((1 / n) * sum2, 2);\n}\n\nfunction skewness(values: TypedArray|number[]) {\n // https://en.wikipedia.org/wiki/Skewness\n const valuesMean = mean(values);\n const n = values.length;\n let sum2 = 0;\n let sum3 = 0;\n for (let i = 0; i < n; i++) {\n const v = values[i] - valuesMean;\n sum2 += Math.pow(v, 2);\n sum3 += Math.pow(v, 3);\n }\n return (1 / n) * sum3 / Math.pow((1 / (n - 1)) * sum2, 3 / 2);\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {Tensor} from '../tensor';\nimport {Rank, ShapeMap} from '../types';\n\nimport {buffer} from

'./buffer';\nimport {op} from './operation';\nimport {RandGamma} from './rand_util';\n\n/**\n * Creates a `tf.Tensor` with values sampled from a gamma distribution.\n *\n * ```js\n * tf.randomGamma([2, 2], 1).print();\n * ```\n *\n * @param shape An array of integers defining the output tensor shape.\n * @param alpha The shape parameter of the gamma distribution.\n
 * @param beta The inverse scale parameter of the gamma distribution. Defaults\n * to 1.\n * @param dtype The data type of the output. Defaults to float32.\n * @param seed The seed for the random number generator.\n *\n * @doc {heading: 'Tensors', subheading: 'Random'}\n */\nfunction randomGamma_<R extends Rank>(\n shape: ShapeMap[R], alpha: number, beta = 1,\n dtype: 'float32'|'int32' = 'float32', seed?: number): Tensor<R> {\n if (beta == null) {\n beta = 1;\n }\n if (dtype == null) {\n dtype = 'float32';\n }\n if (dtype !== 'float32' && dtype !== 'int32') {\n throw new Error(`Unsupported data type ${dtype}`);\n }\n const rgamma = new RandGamma(alpha, beta, dtype, seed);\n const res = buffer(shape, dtype);\n for (let i = 0; i < res.values.length; i++) {\n res.values[i] = rgamma.nextValue();\n }\n return res.toTensor();\n}\n\nexport const randomGamma = op({randomGamma_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
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*/\n\nimport {Tensor} from '../tensor';\nimport {DataType, Rank, ShapeMap} from '../types';\n\nimport {buffer} from './buffer';\nimport {op} from './operation';\nimport {MPRandGauss} from './rand_util';\n\n/**\n * Creates a `tf.Tensor` with values sampled from a normal distribution.\n *\n * ```js\n * tf.randomNormal([2, 2]).print();\n * ```\n *\n * @param
 shape An array of integers defining the output tensor shape.\n * @param mean The mean of the normal distribution.\n * @param stdDev The standard deviation of the normal distribution.\n * @param dtype The data type of the output.\n * @param seed The seed for the random number generator.\n *\n * @doc {heading: 'Tensors', subheading: 'Random'}\n */\nfunction randomNormal_<R extends Rank>(\n shape: ShapeMap[R], mean = 0, stdDev = 1, dtype?: 'float32'|'int32',\n seed?: number): Tensor<R> {\n if (dtype != null && (dtype as DataType) === 'bool') {\n throw new Error(`Unsupported data type ${dtype}`);\n }\n const randGauss =\n new MPRandGauss(mean, stdDev, dtype, false /* truncated */, seed);\n const res = buffer(shape, dtype);\n for (let i = 0; i < res.values.length; i++) {\n res.values[i] = randGauss.nextValue();\n }\n return res.toTensor();\n}\n\nexport const randomNormal = op({randomNormal_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n
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==\n
*/\n\nimport {Tensor} from '../tensor';\nimport {DataType, Rank, ShapeMap} from '../types';\n\nimport {buffer} from './buffer';\nimport {op} from './operation';\nimport {UniformRandom} from './rand_util';\n\n/**\n * Creates a `tf.Tensor` with values sampled from a uniform distribution.\n *\n * The generated values follow a uniform distribution in
 the range [minval,\n * maxval). The lower bound minval is included in the range, while the upper\n * bound maxval is excluded.\n *\n * ```js\n * tf.randomUniform([2, 2]).print();\n * ```\n *\n * @param shape An array of integers defining the output tensor shape.\n * @param minval The lower bound on the range of random values to generate.\n

* Defaults to 0.\n * @param maxval The upper bound on the range of random values to generate.\n * Defaults to 1.\n * @param dtype The data type of the output tensor. Defaults to 'float32'.\n *\n * @doc {heading: 'Tensors', subheading: 'Random'}\n */\nfunction randomUniform_<R extends Rank>(\n shape: ShapeMap[R], minval = 0, maxval = 1, dtype: DataType = 'float32',\n seed?: number|string): Tensor<R> {\n const res = buffer(shape, dtype);\n const random = new UniformRandom(minval, maxval, null, seed);\n for (let i = 0; i < res.values.length; i++) {\n res.values[i] = random.nextValue();\n }\n return res.toTensor();\n}\n\nexport const randomUniform = op({randomUniform_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Range, RangeAttrs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor1D} from '../tensor';\n\n/**\n * Creates a new `tf.Tensor1D` filled with the numbers
in the range provided.\n *\n * The tensor is a is half-open interval meaning it includes start, but\n * excludes stop. Decrementing ranges and negative step values are also\n * supported.sv\n *\n *\n * ```js\n * tf.range(0, 9, 2).print();\n * ```\n *\n * @param start An integer start value\n * @param stop An integer stop value\n * @param step An integer increment (will default to 1 or -1)\n * @param dtype The data type of the output tensor. Defaults to 'float32'.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function range(\n start: number, stop: number, step = 1,\n dtype: 'float32'|'int32' = 'float32'): Tensor1D {\n if (step === 0) {\n throw new Error('Cannot have a step of zero');\n }\n\n const attrs: RangeAttrs = {start, stop, step, dtype};\n\n return ENGINE.runKernel(Range, {} /* inputs */, attrs as {} as NamedAttrMap);\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Real, RealInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {op} from './operation';\n\n/**\n * Returns the real part of a complex (or real) tensor.\n *\n * Given a tensor input, this
operation returns a tensor of type float that is\n * the real part of each element in input considered as a complex number.\n *\n * If the input is real, it simply makes a clone.\n *\n * ```js\n * const x = tf.complex([-2.25, 3.25], [4.75, 5.75]);\n * tf.real(x).print();\n * ```\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nfunction real_<T extends Tensor>(input: T|TensorLike): T {\n const $input = convertToTensor(input, 'input', 'real');\n\n const inputs: RealInputs = {input: $input};\n return ENGINE.runKernel(Real, inputs as {} as NamedTensorMap);\n}\n\nexport const real = op({real_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n
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*/\n\nimport {ENGINE} from '../engine';\nimport {Reciprocal, ReciprocalInputs} from '../kernel_names';\nimport
{Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from
'../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes
reciprocal of x element-wise: `1 / x`\n *\n * ```js\n * const x = tf.tensor1d([0, 1, 2]);\n *\n * x.reciprocal().print(); //
or tf.reciprocal(x)\n * ```\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic
math'}\n */\nfunction reciprocal_<T extends Tensor>(x: T|TensorLike): T {\n const $x
= convertToTensor(x, 'x', 'reciprocal');\n\n const inputs: ReciprocalInputs = {x: $x};\n return
ENGINE.runKernel(Reciprocal, inputs as {} as NamedTensorMap);\n}\nexport const reciprocal =
op({reciprocal_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
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License.\n *
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*/\n\nimport {ENGINE} from '../engine';\nimport {Relu, ReluInputs} from
'../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport
{convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from
'./operation';\n\n/**\n * Computes rectified linear element-wise: `max(x, 0)`.\n *\n * ```js\n * const x = tf.tensor1d([-
1, 2, -3, 4]);\n *\n * x.relu().print(); // or tf.relu(x)\n * ```\n * @param x The input tensor. If the dtype is `bool`, the
output dtype will be\n *   `int32'.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction
relu_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'relu');\n\n const inputs:
ReluInputs = {x: $x};\n\n return ENGINE.runKernel(Relu, inputs as {} as NamedTensorMap);\n}\n\nexport const
relu = op({relu_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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*/\n\nimport {ENGINE} from '../engine';\nimport {Relu6, Relu6Inputs} from '../kernel_names';\nimport {Tensor}
from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from
'../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes
rectified linear 6 element-wise: `min(max(x, 0), 6)`.\n *\n * ```js\n * const x = tf.tensor1d([-1, 2, -3, 8]);\n *\n *
x.relu6().print();
  // or tf.relu6(x)\n * ```\n * @param x The input tensor. If the dtype is `bool`, the output dtype will be\n *
`int32'.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction relu6_<T extends Tensor>(x:
T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'relu6');\n\n const inputs: Relu6Inputs = {x: $x};\n\n
return ENGINE.runKernel(Relu6, inputs as {} as NamedTensorMap);\n}\n\nexport const relu6 =
op({relu6_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or

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for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {ENGINE} from '../engine';\nimport {Reverse, ReverseAttrs, ReverseInputs} from
'../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport
{NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport
{TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Reverses a `tf.Tensor` along a specified
axis.\n *\n * Also available are stricter rank-specific methods that assert that `x` is\n * of the given rank:\n *
- `tf.reverse1d`\n * - `tf.reverse2d`\n * - `tf.reverse3d`\n * - `tf.reverse4d`\n *\n * Except `tf.reverse1d` (which
does not have axis param), all methods have\n * same signature as this method.\n *\n * ```js\n * const x =
tf.tensor1d([1, 2, 3, 4]);\n *\n * x.reverse().print();\n
* ```\n *\n * ```js\n * const x = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n *\n * const axis = 1;\n * x.reverse(axis).print();\n *
```\n * @param x The input tensor to be reversed.\n * @param axis The set of dimensions to reverse. Must be in
the\n * range [-rank(x), rank(x)). Defaults to all axes.\n *\n * @doc {heading: 'Tensors', subheading: 'Slicing and
Joining'}\n */\nfunction reverse_<T extends Tensor>(\n x: T|TensorLike, axis?: number|number[]): T {\n const $x
= convertToTensor(x, 'x', 'reverse');\n\n const inputs: ReverseInputs = {x: $x};\n const attrs: ReverseAttrs = {dims:
axis};\n\n return ENGINE.runKernel(\n Reverse, inputs as {} as NamedTensorMap, attrs as {} as
NamedAttrMap);\n}\n\nexport const reverse = op({reverse_});\n","/**\n * @license\n * Copyright 2020 Google
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==========\n
*/\n\nimport {Tensor1D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport
{TensorLike} from '../types';\nimport * as util from '../util';\nimport {op} from './operation';\nimport {reverse} from
'./reverse';\n\n/**\n * Reverses a `tf.Tensor1D`.\n *\n * @param x The input tensor.\n */\nfunction reverse1d_(x:
Tensor1D|TensorLike): Tensor1D {\n const $x = convertToTensor(x, 'x', 'reverse');\n util.assert(\n $x.rank ===
1,\n () => `Error in reverse1D: x must be rank 1 but got rank
${$x.rank}.`);\n return reverse($x, 0);\n}\n\nexport const reverse1d = op({reverse1d_});\n","/**\n * @license\n *
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==========\n
*/\n\nimport {Tensor2D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport
{TensorLike} from '../types';\nimport * as util from '../util';\nimport {op} from
'./operation';\nimport {reverse} from './reverse';\n\n/**\n * Reverses a `tf.Tensor2D` along a specified axis.\n *\n *
@param x The input tensor.\n * @param axis The set of dimensions to reverse. Must be in the\n * range [-
rank(x), rank(x)). Defaults to all axes.\n */\nfunction reverse2d_(x: Tensor2D|TensorLike, axis?: number|number[]):
Tensor2D {\n const $x = convertToTensor(x, 'x', 'reverse');\n util.assert(\n $x.rank === 2,\n () => `Error in
reverse2D: x must be rank 2 but got rank ${$x.rank}.`);\n return reverse($x, axis);\n}\n\nexport const reverse2d =
op({reverse2d_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
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under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {Tensor3D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\nimport {op} from './operation';\nimport {reverse} from './reverse';\n\n/**\n * Reverses a `tf.Tensor3D` along a specified axis.\n *\n * @param x The input tensor.\n * @param axis The set of dimensions to reverse. Must be in the\n * range [-rank(x), rank(x)). Defaults to all axes.\n */\nfunction reverse3d_(x: Tensor3D|TensorLike, axis?: number|number[]): Tensor3D {\n const $x = convertToTensor(x, 'x', 'reverse');\n util.assert(\n $x.rank === 3,\n () => `Error in reverse3D: x must be rank 3 but got rank ${$x.rank}.`);\n return reverse($x, axis);\n}\n\nexport const reverse3d = op({reverse3d_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {Tensor4D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\nimport
{op} from './operation';\nimport {reverse} from './reverse';\n\n/**\n * Reverses a `tf.Tensor4D` along a specified axis.\n *\n * @param x The input tensor.\n * @param axis The set of dimensions to reverse. Must be in the\n * range [-rank(x), rank(x)). Defaults to all axes.\n */\nfunction reverse4d_(x: Tensor4D|TensorLike, axis?: number|number[]): Tensor4D {\n const $x = convertToTensor(x, 'x', 'reverse');\n util.assert(\n $x.rank === 4,\n () => `Error in reverse4D: x must be rank 4 but got rank ${$x.rank}.`);\n return reverse($x, axis);\n}\n\nexport const reverse4d = op({reverse4d_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n
* distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {ENGINE} from '../engine';\nimport {Round, RoundInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes round of input `tf.Tensor` element-wise: `round(x)`.\n * It implements banker's rounding.\n *\n * ```js\n * const x = tf.tensor1d([.6, 1.1, -3.3]);\n *\n * x.round().print(); // or tf.round(x)\n * ```\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction round_<T extends Tensor>(x:
T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'round');\n const inputs: RoundInputs = {x: $x};\n\n return ENGINE.runKernel(Round, inputs as {} as NamedTensorMap);\n}\n\nexport const round = op({round_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or

implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Rsqrt, RsqrtInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes reciprocal of square root of the input `tf.Tensor` element-wise:\n * `y = 1 / sqrt(x)`\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 4, -1]);\n *\n * x.rsqrt().print(); // or tf.rsqrt(x)\n * ```\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction rsqrt_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'rsqrt');\n\n const inputs: RsqrtInputs = {x: $x};\n\n return ENGINE.runKernel(Rsqrt, inputs as {} as NamedTensorMap);\n}\nexport const rsqrt = op({rsqrt_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {Scalar} from '../tensor';\nimport {DataType} from '../types';\nimport {isTypedArray} from '../util';\nimport {makeTensor} from './tensor_ops_util';\n\n/**\n * Creates rank-0 `tf.Tensor` (scalar) with the provided value and dtype.\n *\n * The same functionality can be achieved with `tf.tensor`, but in general\n * we recommend using `tf.scalar` as it makes the code more readable.\n *\n * ```js\n * tf.scalar(3.14).print();\n * ```\n *\n * @param value The value of the scalar.\n * @param dtype The data type.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function scalar(\n   value: number|boolean|string|Uint8Array, dtype?: DataType): Scalar {\n if (((isTypedArray(value) && dtype !== 'string') || Array.isArray(value)) &&\n   dtype !== 'complex64') {\n   throw new Error(\n   'Error creating a new Scalar: value must be a primitive ' +\n   '(number|boolean|string)');\n }\n if (dtype === 'string' && isTypedArray(value) &&\n   !(value instanceof Uint8Array)) {\n   throw new Error(\n   'When making a scalar from encoded string, ' +\n   'the value must be `Uint8Array`.');\n }\n const shape: number[] = [];\n const inferredShape: number[] = [];\n return makeTensor(value, shape, inferredShape, dtype) as Scalar;\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Selu, SeluInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes scaled exponential linear element-wise.\n *\n * `x < 0 ? scale * alpha * (exp(x) - 1) : x`\n *\n * ```js\n * const x = tf.tensor1d([-1, 2, -3, 4]);\n *\n * x.selu().print(); // or tf.selu(x)\n * ```\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction selu_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'selu');\n\n const inputs: SeluInputs = {x: $x};\n\n return ENGINE.runKernel(Selu, inputs

as {} as NamedTensorMap);\n}\n\nexport const selu = op({selu_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\nimport {Tensor3D, Tensor4D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {conv2d} from './conv2d';\nimport {depthwiseConv2d} from './depthwise_conv2d';\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * 2-D convolution with separable filters.\n *\n * Performs a depthwise convolution that acts separately on channels followed\n * by a pointwise convolution that mixes channels. Note that this is\n * separability between dimensions [1, 2] and 3, not spatial separability\n * between dimensions 1 and 2.\n *\n * See\n * [https://www.tensorflow.org/api_docs/python/tf/nn/separable_conv2d](\n * https://www.tensorflow.org/api_docs/python/tf/nn/separable_conv2d)\n * for more details.\n *\n * @param x The input tensor, of rank 4 or rank 3, of shape\n *   `[batch, height, width, inChannels]`. If rank 3, batch of 1 is\n * assumed.\n * @param depthwiseFilter The depthwise filter tensor, rank 4, of shape\n *   `[filterHeight, filterWidth, inChannels, channelMultiplier]`. This is\n *   the filter used in the first step.\n * @param pointwiseFilter The pointwise filter tensor, rank 4, of shape\n *   `[1, 1, inChannels * channelMultiplier, outChannels]`. This is\n * the filter used in the second step.\n * @param strides The strides of the convolution: `[strideHeight,\n * strideWidth]`. If strides is a single number, then `strideHeight ==\n * strideWidth`.\n * @param pad The type of padding algorithm.\n *   - `same` and stride 1: output will be of same size as input,\n *   regardless of filter size.\n *   - `valid`: output will be smaller than input if filter is larger\n *   than 1x1.\n *   - For more info, see this guide:\n *   [https://www.tensorflow.org/api_guides/python/nn#Convolution](\n *   https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dilations The dilation rates: `[dilationHeight, dilationWidth]`\n *   in which we sample input values across the height and width dimensions\n *   in atrous convolution. Defaults to `[1, 1]`. If `rate` is a single\n *   number, then `dilationHeight == dilationWidth`. If it is greater than\n *   1, then all values of `strides` must be 1.\n * @param dataFormat: An optional string from: \"NHWC\", \"NCHW\". Defaults to\n *   \"NHWC\". Specify the data format of the input and output data. With the\n *   default format \"NHWC\", the data is stored in the order of: [batch,\n *   height, width, channels]. Only \"NHWC\" is currently supported.\n *\n * @doc {heading: 'Operations', subheading: 'Convolution'}\n */\nfunction separableConv2d_<T extends Tensor3D|Tensor4D>(\n   x: T|TensorLike, depthwiseFilter: Tensor4D|TensorLike,\n   pointwiseFilter: Tensor4D|TensorLike, strides: [number, number]|number,\n   pad: 'valid'|'same', dilation: [number, number]|number = [1, 1],\n   dataFormat: 'NHWC'|'NCHW' = 'NHWC'): T {\n const $x = convertToTensor(x, 'x', 'separableConv2d');\n const $depthwiseFilter =\n   convertToTensor(depthwiseFilter, 'depthwiseFilter', 'separableConv2d');\n const $pointwiseFilter =\n   convertToTensor(pointwiseFilter, 'pointwiseFilter', 'separableConv2d');\n\n let x4D = $x as Tensor4D;\n let reshapedTo4D = false;\n if ($x.rank === 3) {\n   reshapedTo4D = true;\n   x4D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2]]);\n }\n\n if (dataFormat === 'NCHW') {\n   throw new Error(\n   'separableConv2d currently does not support dataFormat NCHW; only ' +\n   'NHWC is supported');\n }\n\n util.assert(\n   x4D.rank === 4,\n   () => `Error in separableConv2d: input must be rank 4, but got ` +\n   `rank ${x4D.rank}.`);\n util.assert(\n $depthwiseFilter.rank === 4,\n   () => `Error in separableConv2d: depthwise filter must be rank 4, but ` +\n   `got rank ${$depthwiseFilter.rank}.`);\n util.assert(\n $pointwiseFilter.rank === 4,\n   () => `Error in separableConv2d: pointwise filter must be rank 4, but ` +\n   `got rank ${$depthwiseFilter.rank}.`);\n util.assert(\n $pointwiseFilter.shape[0] === 1,\n   () =>\n   `Error in

separableConv2d: the first dimension of pointwise filter ` +\n ` must be 1, but got ${$pointwiseFilter.shape[0]}.`);\n util.assert(\n $pointwiseFilter.shape[1] === 1,\n () => `Error in separableConv2d: the second dimension of pointwise ` +\n `filter must be 1, but got ${$pointwiseFilter.shape[1]}.`);\n\n const inChannels = $depthwiseFilter.shape[2];\n const channelMultiplier = $depthwiseFilter.shape[3];\n util.assert(\n $pointwiseFilter.shape[2] === inChannels * channelMultiplier,\n () =>\n `Error in separableConv2d: the third dimension of pointwise filter ` +\n `must be ${inChannels * channelMultiplier}, ` +\n `but got ${$pointwiseFilter.shape[2]}.`);\n\n const depthwise = depthwiseConv2d(\n x4D, $depthwiseFilter, strides, pad, dataFormat, dilation);\n const pointwiseStride = 1;\n const res =\n conv2d(depthwise, $pointwiseFilter, pointwiseStride, 'valid', dataFormat);\n\n if (reshapedTo4D) {\n return reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as T;\n }\n return res as T;\n}\n\nexport const separableConv2d = op({separableConv2d_});\n","/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS
OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\nimport {Tensor, TensorBuffer} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\n/**\n * Computes the difference between two lists of numbers.\n *\n * Given a Tensor `x` and a Tensor `y`, this operation returns a Tensor `out`\n * that represents all values that are in `x` but not in `y`. The returned\n * Tensor `out` is sorted in the same order that the numbers appear in `x`\n * (duplicates are preserved). This operation also returns a Tensor indices that\n * represents the position of each out element in `x`. In other words:\n *\n * `out[i] = x[idx[i]] for i in [0, 1, ..., out.length - 1]`\n *\n * ```js\n * const x = [1, 2, 3, 4, 5, 6];\n * const y = [1, 3,
5];\n *\n * const [out, indices] = await tf.setdiff1dAsync(x, y);\n * out.print(); // [2, 4, 6]\n * indices.print(); // [1, 3, 5]\n * ```\n *\n * @param x 1-D Tensor. Values to keep.\n * @param y 1-D Tensor. Must have the same type as x. Values to exclude in the\n * output.\n * @returns Promise of Tensor tuple [out, indices].\n * out: Tensor with the same type as x.\n * indices: A Tensor of type int32.\n *\n * @doc {heading: 'Tensors', subheading: 'Transformations'}\n */\nasync function setdiff1dAsync_(\n x: Tensor|TensorLike, y: Tensor|TensorLike): Promise<[Tensor, Tensor]> {\n const $x = convertToTensor(x, 'x', 'setdiff1d');\n const $y = convertToTensor(y, 'y', 'setdiff1d');\n\n util.assert(\n $x.dtype === $y.dtype,\n () => `x and y should have the same dtype, but got x (${\n $x.dtype}) and y (${$y.dtype}).`);\n\n util.assert(\n $x.rank === 1, () => `x should be 1D tensor, but got x (${$x.shape}).`);\n\n util.assert(\n $y.rank === 1, () =>
`y should be 1D tensor, but got y (${$y.shape}).`);\n\n const xVals = await $x.data();\n const yVals = await $y.data();\n const ySet = new Set(yVals);\n\n let outputSize = 0;\n for (let i = 0; i < xVals.length; i++) {\n if (!ySet.has(xVals[i])) {\n outputSize++;\n }\n }\n\n const buffer = new TensorBuffer([outputSize], $x.dtype);\n const indices = new TensorBuffer([outputSize], 'int32');\n for (let i = 0, p = 0; i < xVals.length; i++) {\n if (!ySet.has(xVals[i])) {\n buffer.values[p] = xVals[i];\n indices.values[p] = i;\n p++;\n }\n }\n return [buffer.toTensor(), indices.toTensor()];\n}\nexport const setdiff1dAsync = setdiff1dAsync_;\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
==========================================================================\n
*/\n\nimport {ENGINE} from '../engine';\nimport {Sign, SignInputs} from '../kernel_names';\nimport {Tensor}
from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from
'../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Returns an
element-wise indication of the sign of a number.\n *\n * ```js\n * const x = tf.tensor1d([.6, 1.1, -3.3, NaN, 0]);\n *\n
* x.sign().print();  // or tf.sign(x)\n * ```\n * @param x The input Tensor.\n *\n * @doc {heading: 'Operations',
subheading: 'Basic math'}\n */\nfunction
 sign_<T extends Tensor>(x: T|TensorLike): T {\n  const $x = convertToTensor(x, 'x', 'sign');\n  const inputs:
SignInputs = {x: $x};\n  return ENGINE.runKernel(Sign, inputs as {} as NamedTensorMap);\n}\nexport const sign
= op({sign_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
==========================================================================\n
*/\n\nimport {ENGINE} from '../engine';\nimport
 {Sin, SinInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from
'../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from
'../types';\n\nimport {op} from './operation';\n\n/**\n * Computes sin of the input Tensor element-wise: `sin(x)`\n *\n
* ```js\n * const x = tf.tensor1d([0, Math.PI / 2, Math.PI * 3 / 4]);\n *\n * x.sin().print();  // or tf.sin(x)\n * ```\n *
@param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction sin_<T
extends Tensor>(x: T|TensorLike): T {\n  const $x = convertToTensor(x, 'x', 'sin');\n\n  const inputs: SinInputs = {x:
$x};\n\n  return ENGINE.runKernel(Sin, inputs as {} as NamedTensorMap);\n}\nexport const sin =
op({sin_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
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License.\n *
==========================================================================\n
*/\n\nimport {ENGINE} from '../engine';\nimport {Sinh, SinhInputs} from '../kernel_names';\nimport {Tensor}
from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from
'../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes
hyperbolic sin of the input `tf.Tensor` element-wise: `sinh(x)`\n *\n * ```js\n * const x = tf.tensor1d([0, 1, -1, .7]);\n
*\n * x.sinh().print();  // or tf.sinh(x)\n
 * ```\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction
sinh_<T extends Tensor>(x: T|TensorLike): T {\n  const $x = convertToTensor(x, 'x', 'sinh');\n  const inputs:
SinhInputs = {x: $x};\n\n  return ENGINE.runKernel(Sinh, inputs as {} as NamedTensorMap);\n}\nexport const
sinh = op({sinh_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under
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License.\n
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 * ============================================================================\n
*/\n\nimport {Tensor1D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport
{TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {op} from './operation';\nimport {slice} from
'./slice';\n\n/**\n * Extracts a 1D slice from 1D array starting at coordinates `begin` and is\n * of length `size`. See
`slice` for details.\n */\nfunction slice1d_(\n    x: Tensor1D|TensorLike, begin: number, size: number): Tensor1D {\n
const $x = convertToTensor(x, 'x', 'slice1d');\n  util.assert(\n      $x.rank === 1,\n      () =>\n          `slice1d expects a
rank-1 tensor, but got a rank-${$x.rank} tensor`);\n  return slice($x, [begin], [size]);\n}\nexport const slice1d =
op({slice1d_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
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distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either
express or implied.\n * See the License for the specific language governing permissions and\n * limitations under
the License.\n *
============================================================================\n
*/\n\nimport {Tensor2D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport
{TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {op} from './operation';\nimport {slice} from
'./slice';\n\n/**\n * Extracts a 2D slice from a 2D array starting at coordinates `begin` and\n * is of size `size`. See
`slice` for details.\n */\nfunction slice2d_(\n    x: Tensor2D|TensorLike, begin: [number, number],\n    size: [number,
number]):
 Tensor2D {\n  const $x = convertToTensor(x, 'x', 'slice2d');\n  util.assert(\n      $x.rank === 2,\n      () =>\n
`slice2d expects a rank-2 tensor, but got a rank-${$x.rank} tensor`);\n  return slice($x, begin, size);\n}\nexport const
slice2d = op({slice2d_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed
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on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
============================================================================\n
*/\n\nimport
 {Tensor3D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from
'../types';\nimport * as util from '../util';\n\nimport {op} from './operation';\nimport {slice} from './slice';\n\n/**\n *
Extracts a 3D slice from a 3D array starting at coordinates `begin` and\n * is of size `size`. See `slice` for details.\n
*/\nfunction slice3d_(\n    x: Tensor3D|TensorLike, begin: [number, number, number],\n    size: [number, number,
number]): Tensor3D {\n  const $x = convertToTensor(x, 'x', 'slice3d');\n  util.assert(\n      $x.rank === 3,\n      ()
=>\n          `slice3d expects a rank-3 tensor, but got a rank-${$x.rank} tensor`);\n  return slice($x, begin,
size);\n}\nexport const slice3d = op({slice3d_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights
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the specific language governing permissions and\n * limitations under the License.\n *
============================================================================\n
*/\n\nimport {Tensor4D} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport
{TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {op} from './operation';\nimport {slice} from
'./slice';\n\n/**\n * Extracts a 4D slice from a 4D array starting at coordinates `begin` and\n * is of size `size`. See
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`slice` for details.\n */\nfunction slice4d_(\n   x: Tensor4D|TensorLike, begin: [number, number, number, number],\n   size: [number, number, number, number]): Tensor4D {\n const $x = convertToTensor(x, 'x', 'slice4d');\n util.assert(\n $x.rank === 4,\n   () =>\n   `slice4d expects a rank-4 tensor, but got a rank-${$x.rank} tensor`);\n return slice($x, begin, size);\n}\nexport const slice4d = op({slice4d_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==\n */\n\nimport {ENGINE}
 from '../engine';\nimport {Softmax, SoftmaxAttrs, SoftmaxInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes the softmax normalized vector given the logits.\n *\n * ```js\n * const a = tf.tensor1d([1, 2, 3]);\n *\n * a.softmax().print(); // or tf.softmax(a)\n * ```\n *\n * ```js\n * const a = tf.tensor2d([2, 4, 6, 1, 2, 3], [2, 3]);\n *\n * a.softmax().print(); // or tf.softmax(a)\n * ```\n *\n * @param logits The logits array.\n * @param dim The dimension softmax would be performed on. Defaults to `-1`\n * which indicates the last dimension.\n *\n * @doc {heading: 'Operations', subheading: 'Normalization'}\n */\nfunction softmax_<T extends Tensor>(logits: T|TensorLike, dim = -1): T {\n const $logits = convertToTensor(logits,
 'logits', 'softmax', 'float32');\n\n if (dim === -1) {\n   dim = $logits.rank - 1;\n }\n if (dim !== $logits.rank - 1) {\n
 throw Error(\n   'Softmax along a non-last dimension is not yet supported. ' +\n   `Logits was rank ${$logits.rank} and dim was ${dim}`);\n }\n\n const inputs: SoftmaxInputs = {logits: $logits};\n const attrs: SoftmaxAttrs = {dim};\n\n return ENGINE.runKernel(\n   Softmax, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const softmax = op({softmax_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT
 WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==\n */\n\nimport {ENGINE} from '../../engine';\nimport {FFT, FFTInputs} from '../../kernel_names';\nimport {Tensor} from '../../tensor';\nimport {NamedTensorMap} from '../../tensor_types';\nimport {assert} from '../../util';\nimport {op} from '../operation';\n\n/**\n * Fast Fourier transform.\n *\n * Computes the 1-dimensional discrete Fourier transform over the inner-most\n * dimension of input.\n *\n * ```js\n * const real = tf.tensor1d([1, 2, 3]);\n * const imag = tf.tensor1d([1, 2, 3]);\n * const x = tf.complex(real, imag);\n *\n * x.fft().print(); // tf.spectral.fft(x).print();\n * ```\n * @param input The complex input to compute an fft over.\n *\n * @doc {heading: 'Operations', subheading: 'Spectral', namespace: 'spectral'}\n */\nfunction
 fft_(input: Tensor): Tensor {\n assert(\n   input.dtype === 'complex64',\n   () => `The dtype for tf.spectral.fft() must be complex64 ` +\n   `but got ${input.dtype}.`);\n\n const inputs: FFTInputs = {input};\n\n return ENGINE.runKernel(FFT, inputs as {} as NamedTensorMap);\n}\n\nexport const fft = op({fft_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable

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law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ENGINE} from '../../engine';\nimport {IFFT, IFFTInputs} from '../../kernel_names';\nimport {Tensor} from '../../tensor';\nimport {NamedTensorMap} from '../../tensor_types';\nimport {assert} from '../../util';\nimport {op} from '../operation';\n\n/**\n * Inverse fast Fourier transform.\n *\n * Computes the inverse 1-dimensional discrete Fourier transform over the\n * inner-most dimension of input.\n *\n * ```js\n * const real = tf.tensor1d([1, 2, 3]);\n * const imag = tf.tensor1d([1, 2, 3]);\n * const x = tf.complex(real, imag);\n *\n * x.ifft().print();  // tf.spectral.ifft(x).print();\n * ```\n * @param input The complex input to compute an ifft over.\n *\n * @doc {heading: 'Operations', subheading: 'Spectral', namespace: 'spectral'}\n */\nfunction ifft_(input: Tensor): Tensor {\n  assert(\n      input.dtype === 'complex64',\n      () => `The dtype for tf.spectral.ifft() must be complex64 ` +\n          `but got ${input.dtype}.`);\n\n  const inputs: IFFTInputs = {input};\n\n  return ENGINE.runKernel(IFFT, inputs as {} as NamedTensorMap);\n}\n\nexport const ifft = op({ifft_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {Tensor, Tensor2D} from '../../tensor';\nimport {complex} from '../complex';\nimport {concat} from '../concat';\nimport {imag} from '../imag';\nimport {mul} from '../mul';\nimport {op} from '../operation';\nimport {real} from '../real';\nimport {reshape} from '../reshape';\nimport {reverse} from '../reverse';\nimport {scalar} from '../scalar';\nimport {slice} from '../slice';\n\nimport {ifft} from './ifft';\n\n/**\n * Inversed real value input fast Fourier transform.\n *\n * Computes the 1-dimensional inversed discrete Fourier transform over the\n * inner-most dimension of the real input.\n *\n * ```js\n * const real = tf.tensor1d([1, 2, 3]);\n * const imag = tf.tensor1d([0, 0, 0]);\n * const x = tf.complex(real, imag);\n *\n * x.irfft().print();\n * ```\n * @param input The real value input to compute an irfft over.\n *\n * @doc {heading: 'Operations', subheading: 'Spectral', namespace: 'spectral'}\n */\nfunction irfft_(input: Tensor): Tensor {\n  const innerDimensionSize = input.shape[input.shape.length - 1];\n  const batch = input.size / innerDimensionSize;\n  let ret: Tensor;\n  if (innerDimensionSize <= 2) {\n    const complexInput = reshape(input, [batch, innerDimensionSize]);\n    ret = ifft(complexInput);\n  } else {\n    // The length of unique components of the DFT of a real-valued signal\n    // is 2 * (input_len - 1)\n    const outputShape = [batch, 2 * (innerDimensionSize - 1)];\n    const realInput = reshape(real(input), [batch, innerDimensionSize]);\n    const imagInput = reshape(imag(input), [batch, innerDimensionSize]);\n\n    const realConjugate =\n        reverse(slice(realInput, [0, 1], [batch, innerDimensionSize - 2]), 1);\n    const imagConjugate: Tensor2D = mul(\n        reverse(slice(imagInput, [0, 1], [batch, innerDimensionSize - 2]), 1),\n        scalar(-1));\n\n    const r = concat([realInput, realConjugate], 1);\n    const i = concat([imagInput, imagConjugate], 1);\n    const complexInput =\n        reshape(complex(r, i), [outputShape[0], outputShape[1]]);\n    ret = ifft(complexInput);\n  }\n  ret = real(ret);\n  // reshape the result if the input is 3D tensor.\n  if (input.rank === 3 && input.shape[0] !== 0) {\n    const temp = ret;\n    const batch = input.shape[0];\n    ret = reshape(ret, [batch, ret.shape[0] / batch, ret.shape[1]]);\n    temp.dispose();\n  }\n  return ret;\n}\n\nexport const irfft = op({irfft_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
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==========\n */\nimport {ENGINE} from '../engine';\nimport {SplitV, SplitVAttrs, SplitVInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Splits a `tf.Tensor` into sub tensors.\n *\n * If `numOrSizeSplits` is a number, splits `x` along dimension `axis`\n * into `numOrSizeSplits` smaller tensors.\n * Requires that `numOrSizeSplits` evenly divides `x.shape[axis]`.\n *\n * If `numOrSizeSplits` is a number array, splits `x` into\n * `numOrSizeSplits.length` pieces. The shape of the `i`-th piece has the\n * same size as `x` except along dimension `axis` where the size is\n * `numOrSizeSplits[i]`.\n *\n * ```js\n * const x = tf.tensor2d([1, 2, 3, 4, 5, 6, 7, 8], [2, 4]);\n * const [a, b] = tf.split(x, 2, 1);\n * a.print();\n * b.print();\n *\n * const [c, d, e] = tf.split(x, [1, 2, 1], 1);\n * c.print();\n * d.print();\n * e.print();\n * ```\n *\n * @param x The input tensor to split.\n * @param numOrSizeSplits Either an integer indicating the number of\n * splits along the axis or an array of integers containing the sizes of\n * each output tensor along the axis. If a number then it must evenly divide\n * `x.shape[axis]`; otherwise the sum of sizes must match `x.shape[axis]`.\n * Can contain one -1 indicating that dimension is to be inferred.\n * @param axis The dimension along which to split. Defaults to 0 (the first\n * dim).\n *\n * @doc {heading: 'Tensors', subheading: 'Slicing and Joining'}\n */\nfunction split_<T extends Tensor>(\n x: Tensor|TensorLike, numOrSizeSplits: number[]|number, axis = 0): T[] {\n const $x = convertToTensor(x, 'x', 'split');\n\n const inputs: SplitVInputs = {x: $x};\n const attr: SplitVAttrs = {numOrSizeSplits, axis};\n\n return ENGINE.runKernel(\n SplitV, inputs as {} as NamedTensorMap,\n attr as {} as NamedAttrMap) as {} as T[];\n}\n\nexport const split = op({split_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {Tensor} from '../../tensor';\nimport {assert} from '../../util';\nimport {complex} from '../complex';\nimport {concat} from '../concat';\nimport {imag} from '../imag';\nimport {op} from '../operation';\nimport {real} from '../real';\nimport {reshape} from '../reshape';\nimport {slice} from '../slice';\nimport {split} from '../split';\nimport {zeros} from '../zeros';\nimport {zerosLike} from '../zeros_like';\n\nimport {fft} from './fft';\n\n/**\n * Real value input fast Fourier transform.\n *\n * Computes the 1-dimensional discrete Fourier transform over the\n * inner-most dimension of the real input.\n *\n * ```js\n * const real = tf.tensor1d([1, 2, 3]);\n *\n * real.rfft().print();\n * ```\n * @param input The real value input to compute an rfft over.\n *\n * @doc {heading: 'Operations', subheading: 'Spectral', namespace: 'spectral'}\n */\nfunction rfft_(input: Tensor, fftLength?: number): Tensor {\n assert(\n input.dtype === 'float32',\n () => `The dtype for rfft() must be real value but got ${input.dtype}`);\n\n let innerDimensionSize = input.shape[input.shape.length - 1];\n const batch = input.size / innerDimensionSize;\n\n let adjustedInput: Tensor;\n if (fftLength != null && fftLength < innerDimensionSize) {\n // Need to crop\n const begin = input.shape.map(v => 0);\n const size = input.shape.map(v => v);\n size[input.shape.length - 1] = fftLength;\n adjustedInput = slice(input, begin, size);\n innerDimensionSize = fftLength;\n } else if (fftLength != null && fftLength > innerDimensionSize) {\n // Need to pad with zeros\n const zerosShape = input.shape.map(v => v);\n zerosShape[input.shape.length - 1] = fftLength - innerDimensionSize;\n adjustedInput = concat([input, zeros(zerosShape)], input.shape.length - 1);\n innerDimensionSize = fftLength;\n } else {\n adjustedInput = input;\n }\n\n // Complement the input with zero imaginary numbers.\n const zerosInput

= zerosLike(adjustedInput);\n const complexInput =\n   reshape(complex(adjustedInput, zerosInput), [batch, innerDimensionSize]);\n\n const ret = fft(complexInput);\n\n // Exclude complex conjugations. These conjugations are put symmetrically.\n const half = Math.floor(innerDimensionSize / 2) + 1;\n const realValues = real(ret);\n const imagValues = imag(ret);\n const realComplexConjugate = split(\n   realValues, [half, innerDimensionSize - half],\n   realValues.shape.length - 1);\n const imagComplexConjugate = split(\n imagValues, [half, innerDimensionSize - half],\n   imagValues.shape.length - 1);\n\n const outputShape = adjustedInput.shape.slice();\n outputShape[adjustedInput.shape.length - 1] = half;\n\n return reshape(\n complex(realComplexConjugate[0], imagComplexConjugate[0]), outputShape);\n}\n\nexport const rfft = op({rfft_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ===\n */\n\nimport {ENGINE} from '../engine';\nimport {Sqrt, SqrtInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes square root of the input `tf.Tensor` element-wise: `y = sqrt(x)`\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 4, -1]);\n *\n * x.sqrt().print(); // or tf.sqrt(x)\n * ```\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction sqrt_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'sqrt');\n\n const inputs: SqrtInputs = {x: $x};\n\n return ENGINE.runKernel(Sqrt, inputs as {} as NamedTensorMap);\n}\nexport const sqrt = op({sqrt_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ===\n */\n\nimport {ENGINE} from '../engine';\nimport {SquaredDifference, SquaredDifferenceInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {makeTypesMatch} from '../tensor_util';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {assertAndGetBroadcastShape} from './broadcast_util';\nimport {op} from './operation';\n\n/**\n * Returns (a - b) * (a - b) element-wise.\n * Supports broadcasting.\n *\n * ```js\n * const a = tf.tensor1d([1, 4, 3, 16]);\n * const b = tf.tensor1d([1, 2, 9, 4]);\n *\n * a.squaredDifference(b).print(); // or tf.squaredDifference(a, b)\n * ```\n *\n * ```js\n * // Broadcast squared difference a with b.\n * const a = tf.tensor1d([2, 4, 6, 8]);\n * const b = tf.scalar(5);\n *\n * a.squaredDifference(b).print(); // or tf.squaredDifference(a, b)\n * ```\n *\n * @param a The first tensor.\n * @param b The second tensor. Must have the same type as `a`.\n *\n * @doc {heading: 'Operations', subheading: 'Arithmetic'}\n */\nfunction squaredDifference_<T extends Tensor>(\n   a: Tensor|TensorLike, b: Tensor|TensorLike): T {\n let $a = convertToTensor(a, 'a', 'squaredDifference');\n let $b = convertToTensor(b, 'b', 'squaredDifference');\n [$a, $b] = makeTypesMatch($a, $b);\n\n assertAndGetBroadcastShape($a.shape, $b.shape);\n\n const inputs: SquaredDifferenceInputs = {a: $a, b: $b};\n const attrs = {};\n\n return ENGINE.runKernel(\n   SquaredDifference, inputs as unknown as NamedTensorMap, attrs);\n}\n\nexport const squaredDifference = op({squaredDifference_});\n","/**\n * @license\n * Copyright 2020

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under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {squeezeShape} from '../util';\n\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\n/**\n * Removes dimensions of size 1 from the shape of a `tf.Tensor`.\n *\n * ```js\n * const x = tf.tensor([1, 2, 3, 4], [1, 1, 4]);\n * x.squeeze().print();\n * ```\n *\n * @param x The input tensor to be squeezed.\n * @param axis An optional list of numbers. If specified, only\n * squeezes the dimensions listed. The dimension index starts at 0. It\n * is an error to squeeze a dimension that is not 1.\n *\n * @doc {heading:
'Tensors', subheading: 'Transformations'}\n */\nfunction squeeze_<T extends Tensor>(x: Tensor|TensorLike, axis?: number[]): T {\n const $x = convertToTensor(x, 'x', 'squeeze');\n return reshape($x, squeezeShape($x.shape, axis).newShape) as T;\n}\n\nexport const squeeze = op({squeeze_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Pack, PackAttrs, PackInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensorArray} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {op} from './operation';\n\n/**\n * Stacks a list of rank-`R` `tf.Tensor`s into one rank-`(R+1)` `tf.Tensor`.\n *\n * ```js\n * const a = tf.tensor1d([1, 2]);\n * const b = tf.tensor1d([3, 4]);\n * const c = tf.tensor1d([5, 6]);\n * tf.stack([a, b, c]).print();\n * ```\n *\n * @param tensors A list of tensor objects with the same shape and dtype.\n * @param axis The axis to stack along. Defaults to 0 (the first dim).\n *\n * @doc {heading: 'Tensors', subheading: 'Slicing and Joining'}\n */\nfunction stack_<T extends Tensor>(\n   tensors: Array<T|TensorLike>, axis = 0): Tensor {\n const $tensors =\n   convertToTensorArray(tensors, 'tensors', 'stack', 'string_or_numeric');\n\n util.assert(\n $tensors.length >= 1,
() => 'Pass at least one tensor to tf.stack');\n\n if ($tensors.length > 0) {\n   util.assert(\n   axis <=
$tensors[0].rank, () => 'Axis must be <= rank of the tensor');\n }\n\n const inputs: PackInputs = $tensors;\n const attrs: PackAttrs = {axis};\n\n return ENGINE.runKernel(\n   Pack, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const stack = op({stack_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Step, StepAttrs, StepInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {from

'../types';\n\nimport {op} from './operation';\n\n/**\n * Computes step of the input `tf.Tensor` element-wise: `x > 0 ? 1 : alpha * x`\n *\n * ```js\n * const x = tf.tensor1d([0, 2, -1, -3]);\n *\n * x.step(.5).print(); // or tf.step(x, .5)\n * ```\n * @param x The input tensor.\n * @param alpha The gradient when input is negative.\n *\n * @doc {heading: 'Operations', subheading: 'Basic math'}\n */\nfunction step_<T extends Tensor>(x: T|TensorLike, alpha = 0.0): T {\n const $x = convertToTensor(x, 'x', 'step');\n\n const inputs: StepInputs = {x: $x};\n const attrs: StepAttrs = {alpha};\n\n return ENGINE.runKernel(\n   Step, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\nexport const step = op({step_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {ENGINE} from '../engine';\nimport {StridedSlice, StridedSliceAttrs, StridedSliceInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Extracts a strided slice of a tensor.\n *\n * Roughly speaking, this op extracts a slice of size (end-begin)/stride from\n * the given input tensor (x). Starting at the location specified by begin the\n * slice continues by adding stride to the index until all dimensions are not\n * less than end. Note that a stride can be negative, which causes a reverse\n * slice.\n *\n * ```js\n * const t = tf.tensor3d([1, 1, 1 ,2, 2, 2, 3, 3, 3, 4, 4, 4, 5, 5, 5, 6, 6, 6],\n *   [3, 2, 3]);\n * t.stridedSlice([1, 0, 0], [2, 1, 3], [1, 1, 1]).print() // [[[3, 3, 3]]]\n * t.stridedSlice([1, 0, 0], [2, 2, 3], [1, 1, 1]).print() // [[[3, 3, 3],\n *   // [4, 4, 4]]]\n * t.stridedSlice([1, -1, 0], [2, -3, 3], [1, -1, 1]).print() // [[[4, 4, 4],\n *   // [3, 3, 3]]]\n * ```\n *\n * @param x The tensor to stride slice.\n * @param begin The coordinates to start the slice from.\n * @param end: The coordinates to end the slice at.\n * @param strides: The size of the slice.\n * @param beginMask: If the ith bit of beginMask is set, begin[i] is ignored\n *   and the fullest possible range in that dimension is used instead.\n * @param endMask: If the ith bit of endMask is set, end[i] is ignored\n *   and the fullest possible range in that dimension is used instead.\n * @param shrinkAxisMask: a bitmask where bit i implies that\n * the ith specification should shrink the dimensionality. begin and end must\n * imply a slice of size 1 in the dimension.\n *\n * @doc {heading:
'Operations', subheading: 'Slicing and Joining'}\n */\nfunction stridedSlice_(\n   x: Tensor|TensorLike, begin: number[], end: number[], strides?: number[],\n   beginMask = 0, endMask = 0, ellipsisMask = 0, newAxisMask = 0,\n   shrinkAxisMask = 0): Tensor {\n const $x = convertToTensor(x, 'x', 'stridedSlice');\n\n const inputs: StridedSliceInputs = {x: $x};\n const attrs: StridedSliceAttrs = {\n   begin,\n   end,\n   strides,\n   beginMask,\n   endMask,\n   ellipsisMask,\n   newAxisMask,\n   shrinkAxisMask\n };\n\n return ENGINE.runKernel(\n   StridedSlice, inputs as {} as NamedTensorMap,\n   attrs as {} as NamedAttrMap);\n}\n\nexport const stridedSlice = op({stridedSlice_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {ENGINE} from '../engine';\nimport {Tan, TanInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from

'../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Computes tan of the input `tf.Tensor` element-wise, `tan(x)`\n *\n * ```js\n * const x = tf.tensor1d([0, Math.PI / 2, Math.PI * 3 / 4]);\n *\n * x.tan().print(); // or tf.tan(x)\n * ```\n * @param x The input tensor.\n *\n * @doc {heading: 'Operations', subheading:
'Basic math'}\n */\nfunction tan_<T extends Tensor>(x: T|TensorLike): T {\n const $x = convertToTensor(x, 'x', 'tan');\n\n const inputs: TanInputs = {x: $x};\n\n return ENGINE.runKernel(Tan, inputs as {} as NamedTensorMap);\n}\nexport const tan = op({tan_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport
{Tensor1D} from '../tensor';\nimport {inferShape} from '../tensor_util_env';\nimport {TensorLike1D} from '../types';\nimport {DataType} from '../types';\nimport {assertNonNull} from '../util';\nimport {makeTensor} from './tensor_ops_util';\n\n/**\n * Creates rank-1 `tf.Tensor` with the provided values, shape and dtype.\n *\n * The same functionality can be achieved with `tf.tensor`, but in general\n * we recommend using `tf.tensor1d` as it makes the code more readable.\n *\n * ```js\n * tf.tensor1d([1, 2, 3]).print();\n * ```\n *\n * @param values The values of the tensor. Can be array of numbers,\n *   or a `TypedArray`.\n * @param dtype The data type.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function tensor1d(values: TensorLike1D, dtype?: DataType): Tensor1D {\n assertNonNull(values);\n const inferredShape = inferShape(values, dtype);\n if (inferredShape.length !== 1) {\n   throw new Error('tensor1d() requires values to be a flat/TypedArray');\n }\n const shape: number[] = null;\n return makeTensor(values, shape, inferredShape, dtype) as Tensor1D;\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {Tensor2D} from '../tensor';\nimport {inferShape} from '../tensor_util_env';\nimport {TensorLike2D} from '../types';\nimport {DataType} from '../types';\nimport
{assertNonNull} from '../util';\nimport {makeTensor} from './tensor_ops_util';\n\n/**\n * Creates rank-2 `tf.Tensor` with the provided values, shape and dtype.\n *\n * The same functionality can be achieved with `tf.tensor`, but in general\n * we recommend using `tf.tensor2d` as it makes the code more readable.\n *\n * ```js\n * // Pass a nested array.\n * tf.tensor2d([[1, 2], [3, 4]]).print();\n * ```\n * ```js\n * // Pass a flat array and specify a shape.\n * tf.tensor2d([1, 2, 3, 4], [2, 2]).print();\n * ```\n *\n * @param values The values of the tensor. Can be nested array of numbers,\n *   or a flat array, or a `TypedArray`.\n * @param shape The shape of the tensor. If not provided, it is inferred from\n *   `values`.\n * @param dtype The data type.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function tensor2d(\n   values: TensorLike2D, shape?: [number, number],\n   dtype?: DataType): Tensor2D {\n assertNonNull(values);\n if (shape
!= null && shape.length !== 2) {\n   throw new Error('tensor2d() requires shape to have two numbers');\n }\n const inferredShape = inferShape(values, dtype);\n if (inferredShape.length !== 2 && inferredShape.length !== 1) {\n   throw new Error(\n   'tensor2d() requires values to be number[][] or flat/TypedArray');\n }\n if (inferredShape.length === 1 && shape == null) {\n   throw new Error(\n   'tensor2d() requires shape to be

provided when `values` ' +\n 'are a flat/TypedArray');\n }\n return makeTensor(values, shape, inferredShape, dtype) as Tensor2D;\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {Tensor4D} from '../tensor';\nimport {inferShape} from '../tensor_util_env';\nimport {TensorLike4D} from '../types';\nimport {DataType} from '../types';\nimport {assertNonNull} from '../util';\nimport {makeTensor} from './tensor_ops_util';\n\n/**\n * Creates rank-4 `tf.Tensor` with the provided values, shape and dtype.\n *\n * The same functionality can be achieved with `tf.tensor`, but in general\n * we recommend using `tf.tensor4d` as it makes the code more readable.\n *\n * ```js\n * // Pass a nested array.\n * tf.tensor4d([[[[1], [2]], [[3], [4]]]]).print();\n * ```\n * ```js\n * // Pass a flat array and specify a shape.\n * tf.tensor4d([1, 2, 3, 4], [1, 2, 2, 1]).print();\n * ```\n *\n * @param values The values of the tensor. Can be nested array of numbers,\n * or a flat array, or a `TypedArray`.\n * @param shape The shape of the tensor. Optional. If not provided,\n * it is inferred from `values`.\n * @param dtype The data type.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function tensor4d(\n values: TensorLike4D, shape?: [number, number, number, number],\n dtype?: DataType): Tensor4D {\n assertNonNull(values);\n if (shape != null && shape.length !== 4) {\n throw new Error('tensor4d() requires shape to have four numbers');\n }\n const inferredShape = inferShape(values, dtype);\n if (inferredShape.length !== 4 && inferredShape.length !== 1) {\n throw new Error(\n 'tensor4d() requires values to be number[][][][] or flat/TypedArray');\n }\n if (inferredShape.length === 1 && shape == null) {\n throw new Error(\n 'tensor4d() requires shape to be provided when `values` ' +\n 'are a flat array');\n }\n return makeTensor(values, shape, inferredShape, dtype) as Tensor4D;\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {Tensor5D} from '../tensor';\nimport {inferShape} from '../tensor_util_env';\nimport {TensorLike5D} from '../types';\nimport {DataType} from '../types';\nimport {assertNonNull} from '../util';\nimport {makeTensor} from './tensor_ops_util';\n\n/**\n * Creates rank-5 `tf.Tensor` with the provided values, shape and dtype.\n *\n * The same functionality can be achieved with `tf.tensor`, but in general\n * we recommend using `tf.tensor5d` as it makes the code more readable.\n *\n * ```js\n * // Pass a nested array.\n * tf.tensor5d([[[[[1],[2]],[[3],[4]]],[[[5],[6]],[[7],[8]]]]]).print();\n * ```\n * ```js\n * // Pass a flat array and specify a shape.\n * tf.tensor5d([1, 2, 3, 4, 5, 6, 7, 8], [1, 2, 2, 2, 1]).print();\n * ```\n *\n * @param values The values of the tensor. Can be nested array of numbers,\n * or a flat array, or a `TypedArray`.\n * @param shape The shape of the tensor. Optional. If not provided,\n * it is inferred from `values`.\n * @param dtype The data type.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function tensor5d(\n values: TensorLike5D, shape?: [number, number, number, number, number],\n dtype?: DataType): Tensor5D {\n assertNonNull(values);\n if (shape != null && shape.length !== 5) {\n throw new Error('tensor5d() requires shape to have five numbers');\n }\n const inferredShape = inferShape(values, dtype);\n if (inferredShape.length !== 5 && inferredShape.length !== 1) {\n throw new Error(\n 'tensor5d() requires values to be ' +\n 'number[][][][][] or flat/TypedArray');\n }\n if (inferredShape.length === 1 && shape == null) {\n throw new Error(\n 'tensor5d() requires shape to be provided when `values` ' +\n 'are a

flat array');\n }\n return makeTensor(values, shape, inferredShape, dtype) as Tensor5D;\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless
 required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {Tensor6D} from '../tensor';\nimport {inferShape} from '../tensor_util_env';\nimport {TensorLike6D} from '../types';\nimport {DataType} from '../types';\nimport {assertNonNull} from '../util';\nimport {makeTensor} from './tensor_ops_util';\n\n/**\n * Creates rank-6 `tf.Tensor` with the provided values, shape and dtype.\n *\n * The same functionality can be achieved with `tf.tensor`, but in general\n * we recommend using `tf.tensor6d` as it makes the code more readable.\n *\n * ```js\n * // Pass a nested array.\n *
tf.tensor6d([[[[[[1],[2]],[[3],[4]]],[[[5],[6]],[[7],[8]]]]]]).print();\n
 * ```\n * ```js\n * // Pass a flat array and specify a shape.\n * tf.tensor6d([1, 2, 3, 4, 5, 6, 7, 8], [1, 1, 2, 2, 2, 1]).print();\n * ```\n *\n * @param values The values of the tensor. Can be nested array of numbers,\n *   or a flat array, or a `TypedArray`.\n * @param shape The shape of the tensor. Optional. If not provided,\n *   it is inferred from `values`.\n * @param dtype The data type.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function tensor6d(\n   values: TensorLike6D,\n   shape?: [number, number, number, number, number, number],\n   dtype?: DataType): Tensor6D {\n assertNonNull(values);\n if (shape != null && shape.length !== 6) {\n   throw new Error('tensor6d() requires shape to have six numbers');\n }\n const inferredShape = inferShape(values, dtype);\n if (inferredShape.length !== 6 && inferredShape.length !== 1) {\n   throw new Error(\n   'tensor6d() requires values to be number[][][][][][] or ' +\n   'flat/TypedArray');\n }\n if (inferredShape.length === 1 && shape == null) {\n   throw new Error(\n   'tensor6d() requires shape to be provided when `values` ' +\n   'are a flat array');\n }\n shape = shape ||\n   inferredShape as [number, number, number, number, number, number];\n return makeTensor(values, shape, inferredShape, dtype) as Tensor6D;\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the
 License.\n *
==========\n */\n\nimport {ENGINE} from '../engine';\nimport {TopK, TopKAttrs, TopKInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Finds the values and indices of the `k` largest entries along the last\n * dimension.\n *\n * If the input is a vector (rank=1), finds the k largest entries in the vector\n * and outputs their values and indices as vectors. Thus values[j] is the j-th\n * largest entry in input, and its index is indices[j].\n * For higher rank inputs, computes the top k entries along the last dimension.\n *\n * If two elements are equal, the lower-index element appears first.\n *\n * ```js\n * const a = tf.tensor2d([[1, 5], [4, 3]]);\n * const {values,
 indices} = tf.topk(a);\n * values.print();\n * indices.print();\n * ```\n * @param x 1-D or higher `tf.Tensor` with last dimension being at least `k`.\n * @param k Number of top elements to look for along the last dimension.\n * @param sorted If true, the resulting `k` elements will be sorted by the\n *   values in descending order.\n *\n * @doc {heading: 'Operations', subheading: 'Evaluation'}\n */\nfunction topk_<T extends Tensor>(\n   x: T|TensorLike, k = 1, sorted = true): {values: T, indices: T} {\n const $x = convertToTensor(x, 'x', 'topk');\n if

($x.rank === 0) {\n throw new Error('topk() expects the input to be of rank 1 or higher');\n }\n const lastDim = $x.shape[$x.shape.length - 1];\n if (k > lastDim) {\n throw new Error(\n `'k' passed to topk() must be <= the last dimension (${lastDim}) ` +\n `but got ${k}`);\n }\n\n const inputs: TopKInputs = {x: $x};\n const attrs: TopKAttrs = {k, sorted};\n\n const [values, indices] = ENGINE.runKernel(\n TopK, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n\n return {values, indices} as {values: T, indices: T};\n}\n\nexport const topk = op({topk_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {Tensor} from '../tensor';\nimport {DataType, Rank, ShapeMap} from '../types';\n\nimport {buffer} from './buffer';\nimport {op} from './operation';\nimport {MPRandGauss} from './rand_util';\n\n/**\n * Creates a `tf.Tensor` with values sampled from a truncated normal\n * distribution.\n *\n * ```js\n * tf.truncatedNormal([2, 2]).print();\n * ```\n *\n * The generated values follow a normal distribution with specified mean and\n * standard deviation, except that values whose magnitude is more than 2\n * standard deviations from the mean are dropped and re-picked.\n *\n * @param shape An array of integers defining the output tensor shape.\n * @param mean The mean of the normal distribution.\n * @param stdDev The standard deviation of the normal distribution.\n * @param dtype The data type of the output tensor.\n * @param seed The seed for the random number generator.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nfunction truncatedNormal_<R extends Rank>(\n shape: ShapeMap[R], mean = 0, stdDev = 1, dtype?: 'float32'|'int32',\n seed?: number): Tensor<R>\n {\n if (dtype != null && (dtype as DataType) === 'bool') {\n throw new Error(`Unsupported data type $ { dtype }`);\n }\n const randGauss =\n new MPRandGauss(mean, stdDev, dtype, true /* truncated */, seed);\n const res = buffer(shape, dtype);\n for (let i = 0; i < res.values.length; i++) {\n res.values[i] = randGauss.nextValue();\n }\n return res.toTensor();\n}\n\nexport const truncatedNormal = op({truncatedNormal_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the\n specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {ENGINE} from '../engine';\nimport {Unique, UniqueAttrs, UniqueInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor, Tensor1D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {assert} from '../util';\n\nimport {op} from './operation';\n\n/**\n * Finds unique elements along an axis of a tensor.\n *\n * It returns a tensor `values` containing all of the unique elements along the\n * `axis` of the given tensor `x` in the same order that they occur along the\n * `axis` in `x`; `x` does not need to be sorted. It also returns a tensor\n * `indices` the same size as the number of the elements in `x` along the `axis`\n * dimension. It contains the index in the\n unique output `values`.\n *\n * ```js\n * // A 1-D tensor\n * const a = tf.tensor1d([1, 1, 2, 4, 4, 4, 7, 8, 8]);\n * const {values, indices} = tf.unique(a);\n * values.print(); // [1, 2, 4, 7, 8,]\n * indices.print(); // [0, 0, 1, 2, 2, 2, 3, 4, 4]\n * ```\n *\n * ```js\n * // A 2-D tensor with axis=0\n * //\n * // 'a' is: [[1, 0, 0],\n * //   [1, 0, 0],\n * //   [2, 0, 0]]\n * const a = tf.tensor2d([[1, 0, 0], [1, 0, 0], [2, 0, 0]]);\n * const {values, indices} = tf.unique(a, 0)\n *

values.print();   // [[1, 0, 0],\n *   // [2, 0, 0]]\n * indices.print(); // [0, 0, 1]\n * ```\n *\n * ```js\n * // A 2-D tensor with axis=1\n * //\n * // 'a' is: [[1, 0, 0],\n * //   [1, 0, 0],\n * //   [2, 0, 0]]\n * const a = tf.tensor2d([[1, 0, 0], [1, 0, 0], [2, 0, 0]]);\n * const {values, indices} = tf.unique(a, 1)\n * values.print();   // [[1, 0],\n *   // [1, 0],\n *   // [2, 0]]\n * indices.print(); // [0, 1, 1]\n
 * ```\n * @param x A tensor (int32, string, bool).\n * @param axis The axis of the tensor to find the unique elements.\n * @returns [uniqueElements, indices] (see above for details)\n *\n * @doc {heading: 'Operations', subheading: 'Evaluation'}\n */\nfunction unique_<T extends Tensor>(\n    x: T|TensorLike, axis = 0): {values: T, indices: Tensor1D} {\n  const $x = convertToTensor(x, 'x', 'unique', 'string_or_numeric');\n  assert($x.rank > 0, () => 'The input tensor must be at least 1D');\n\n  const inputs: UniqueInputs = {x: $x};\n  const attrs: UniqueAttrs = {axis};\n  const [values, indices] = ENGINE.runKernel(\n                                Unique, inputs as {} as NamedTensorMap,\n                                attrs as {} as NamedAttrMap) as [T, Tensor1D];\n  return {values, indices};\n}\n\nexport const unique = op({unique_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may
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*/\n\nimport {ENGINE} from '../engine';\nimport {UnsortedSegmentSum, UnsortedSegmentSumAttrs, UnsortedSegmentSumInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor, Tensor1D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {assert, isInt} from '../util';\n\nimport
 {op} from './operation';\n\n/**\n * Computes the sum along segments of a `tf.Tensor`.\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3, 4]);\n * const segmentIds = tf.tensor1d([1, 2, 0, 1], 'int32');\n * const numSegments = 3;\n *\n * x.unsortedSegmentSum(segmentIds, numSegments).print()\n * //or tf.unsortedSegmentSum(x, segmentIds, numSegments)\n * ```\n * @param x The `tf.Tensor` that will be summed along its segments.\n * @param segmentIds A `tf.Tensor1D` whose rank is equal to the rank of `x`'s\n * dimension along the `axis`. Maps each element of `x` to a segment.\n * @param numSegments The number of distinct `segmentIds`.\n *\n * @doc {heading: 'Operations', subheading: 'Segment'}\n */\nfunction unsortedSegmentSum_<T extends Tensor>(\n   x: T|TensorLike, segmentIds: Tensor1D|TensorLike, numSegments: number): T {\n const $x = convertToTensor(x, 'x', 'unsortedSegmentSum');\n const $segmentIds =\n   convertToTensor(segmentIds, 'segmentIds', 'unsortedSegmentSum', 'int32');\n assert(isInt(numSegments),
 () => 'numSegments must be of dtype int');\n\n const inputs: UnsortedSegmentSumInputs = {x: $x, segmentIds: $segmentIds};\n const attrs: UnsortedSegmentSumAttrs = {numSegments};\n\n return ENGINE.runKernel(\n   UnsortedSegmentSum, inputs as {} as NamedTensorMap,\n   attrs as {} as NamedAttrMap);\n}\n\nexport const unsortedSegmentSum = op({unsortedSegmentSum_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n
 * limitations under the License.\n *
==\n
*/\n\nimport {ENGINE} from '../engine';\nimport {Unpack, UnpackAttrs, UnpackInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport

{NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {op} from './operation';\n\n/**\n * Unstacks a `tf.Tensor` of rank-`R` into a list of rank-`(R-1)` `tf.Tensor`s.\n *\n * ```js\n * const a = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n *\n * tf.unstack(a).forEach(tensor => tensor.print());\n * ```\n *\n * @param x A tensor object.\n * @param axis The axis to unstack along. Defaults to 0 (the first dim).\n *\n * @doc {heading: 'Tensors', subheading: 'Slicing and Joining'}\n */\nfunction unstack_(x: Tensor|TensorLike, axis = 0): Tensor[] {\n const $x = convertToTensor(x, 'x', 'unstack', 'string_or_numeric');\n util.assert(\n   axis >= -$x.shape.length && axis < $x.shape.length,\n   () =>\n   `Axis = ${axis} is not in [-${$x.shape.length}, ${$x.shape.length})`);\n\n const inputs: UnpackInputs = {value: $x};\n const attrs: UnpackAttrs = {axis};\n\n return ENGINE.runKernel(\n   Unpack, inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap);\n}\n\nexport const unstack = op({unstack_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ENGINE} from '../engine';\nimport {Tensor, Variable} from '../tensor';\nimport {DataType, Rank} from '../types';\n\n/**\n * Creates a new variable with the provided initial value.\n * ```js\n * const x = tf.variable(tf.tensor([1, 2, 3]));\n * x.assign(tf.tensor([4, 5, 6]));\n *\n * x.print();\n * ```\n *\n * @param initialValue Initial value for the tensor.\n * @param trainable If true, optimizers are allowed to update it.\n * @param name Name of the variable. Defaults to a unique id.\n * @param dtype If set, initialValue will be converted to the given type.\n *\n * @doc {heading: 'Tensors', subheading: 'Creation'}\n */\nexport function variable<R extends Rank>(\n   initialValue: Tensor<R>, trainable = true, name?: string,\n   dtype?: DataType): Variable<R> {\n return ENGINE.makeVariable(initialValue,\n   trainable, name, dtype) as\n   Variable<R>;\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\n/** An implementation of the Where kernel shared between cpu and webgl */\n\nimport {buffer} from '../ops/buffer';\nimport {Tensor2D} from '../tensor';\nimport {TypedArray} from '../types';\n\nexport function whereImpl(condShape: number[], condVals: TypedArray): Tensor2D {\n const indices = [];\n for (let i = 0; i < condVals.length; i++) {\n   if (condVals[i]) {\n   indices.push(i);\n   }\n }\n\n const inBuffer = buffer(condShape, 'int32');\n\n const out = buffer([indices.length, condShape.length], 'int32');\n for (let i = 0; i < indices.length; i++) {\n   const loc = inBuffer.indexToLoc(indices[i]);\n   const offset = i * condShape.length;\n   out.values.set(loc, offset);\n }\n return out.toTensor() as Tensor2D;\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\nimport {whereImpl} from '../backends/where_impl';\nimport {Tensor, Tensor2D} from '../tensor';\nimport

{convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\n\n/**\n * Returns the coordinates of true elements of condition.\n *\n * The coordinates are returned in a 2-D tensor where the first dimension (rows)\n * represents the number of true elements, and the second dimension (columns)\n * represents the coordinates of the true elements. Keep in mind, the shape of\n * the output tensor can vary depending on how many true values there are in\n * input. Indices are output in row-major order. The resulting tensor has the\n * shape `[numTrueElems, condition.rank]`.\n *\n * This is analogous to calling the python `tf.where(cond)` without an x or y.\n *\n * ```js\n * const cond = tf.tensor1d([false, false, true], 'bool');\n * const result = await tf.whereAsync(cond);\n * result.print();\n * ```\n *\n * @doc {heading: 'Operations', subheading: 'Logical'}\n */\nasync function whereAsync_(condition: Tensor|TensorLike): Promise<Tensor2D> {\n const $condition =\n convertToTensor(condition, 'condition', 'whereAsync', 'bool');\n const vals = await $condition.data();\n const res = whereImpl($condition.shape, vals);\n if (condition !== $condition) {\n $condition.dispose();\n }\n return res;\n}\n\nexport const whereAsync = whereAsync_;\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {gather} from './gather';\nimport {reshape} from './reshape';\nimport {squeeze} from './squeeze';\nimport {whereAsync} from './where_async';\n\n/**\n * Apply boolean mask to tensor.\n *\n * ```js\n * const tensor = tf.tensor2d([1, 2, 3, 4, 5, 6], [3, 2]);\n * const mask = tf.tensor1d([1, 0, 1], 'bool');\n * const result = await tf.booleanMaskAsync(tensor, mask);\n * result.print();\n * ```\n *\n * @param tensor N-D tensor.\n * @param mask K-D boolean tensor, K <= N and K must be known statically.\n * @param axis A 0-D int Tensor representing the axis in tensor to mask from.\n * By default, axis is 0 which will mask from the first dimension.\n * Otherwise K + axis <= N.\n *\n * @doc {heading: 'Tensors', subheading: 'Slicing and Joining'}\n */\nasync function booleanMaskAsync_(\n tensor: Tensor|TensorLike, mask: Tensor|TensorLike,\n axis?: number): Promise<Tensor> {\n const $tensor = convertToTensor(tensor, 'tensor', 'boolMask');\n const $mask = convertToTensor(mask, 'mask', 'boolMask', 'bool');\n\n const axisFrom = axis == null ? 0 : axis;\n const maskDim = $mask.rank;\n const tensorShape = $tensor.shape;\n\n util.assert(maskDim > 0, () => 'mask cannot be scalar');\n util.assertShapesMatch(\n tensorShape.slice(axisFrom, axisFrom + maskDim), $mask.shape,\n `mask's shape must match the first K dimensions of tensor's shape,`);\n\n let leadingSize = 1;\n for (let i = axisFrom; i < axisFrom + maskDim; i++)
 {\n leadingSize *= tensorShape[i];\n }\n const targetTensorShape =\n tensorShape.slice(0, axisFrom)\n .concat([leadingSize], tensorShape.slice(axisFrom + maskDim));\n const reshapedTensor = reshape($tensor, targetTensorShape);\n const reshapedMask = reshape($mask, [-1]);\n const positivePositions = await whereAsync(reshapedMask);\n const indices = squeeze(positivePositions, [1]);\n\n const res = gather(reshapedTensor, indices, axisFrom);\n\n // Ensure no memory leak.\n if (tensor !== $tensor) {\n $tensor.dispose();\n }\n if (mask !== $mask) {\n $mask.dispose();\n }\n indices.dispose();\n reshapedTensor.dispose();\n reshapedMask.dispose();\n positivePositions.dispose();\n\n return res;\n}\n\nexport const booleanMaskAsync = booleanMaskAsync_;\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n
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* See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========================================================================\n */\n\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {parseAxisParam} from '../util';\n\nimport {abs} from './abs';\nimport * as axis_util from './axis_util';\nimport {max} from './max';\nimport {min} from './min';\nimport {op} from './operation';\nimport {pow} from './pow';\nimport {reshape} from './reshape';\nimport {scalar} from './scalar';\nimport {sqrt} from './sqrt';\nimport {square} from
 './square';\nimport {sum} from './sum';\n\n/**\n * Computes the norm of scalar, vectors, and matrices.\n * This function can compute several different vector norms (the 1-norm, the\n * Euclidean or 2-norm, the inf-norm, and in general the p-norm for p > 0)\n * and matrix norms (Frobenius, 1-norm, and inf-norm).\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 3, 4]);\n *\n * x.norm().print();  // or tf.norm(x)\n * ```\n *\n * @param x The input array.\n * @param ord Optional. Order of the norm. Supported norm types are\n * following:\n *\n *  | ord        | norm for matrices         | norm for vectors\n *  |------------|---------------------------|---------------------\n *  |'euclidean' |Frobenius norm             |2-norm\n *  |'fro'       |Frobenius norm\t           |\n *  |Infinity    |max(sum(abs(x), axis=1))   |max(abs(x))\n *  |-Infinity   |min(sum(abs(x), axis=1))   |min(abs(x))\n *  |1           |max(sum(abs(x), axis=0))   |sum(abs(x))\n *  |2           |
  |sum(abs(x)^2)^1/2*\n *\n * @param axis Optional. If axis is null (the default), the input is\n * considered a vector and a single vector norm is computed over the entire\n * set of values in the Tensor, i.e. norm(x, ord) is equivalent\n * to norm(x.reshape([-1]), ord). If axis is a integer, the input\n * is considered a batch of vectors, and axis determines the axis in x\n * over which to compute vector norms. If axis is a 2-tuple of integer it is\n * considered a batch of matrices and axis determines the axes in NDArray\n * over which to compute a matrix norm.\n * @param keepDims Optional. If true, the norm have the same dimensionality\n * as the input.\n *\n * @doc {heading: 'Operations', subheading: 'Matrices'}\n */\nfunction norm_(\n    x: Tensor|TensorLike, ord: number|'euclidean'|'fro' = 'euclidean',\n    axis: number|number[] = null, keepDims = false): Tensor {\n  x = convertToTensor(x, 'x', 'norm');\n\n  const norm = normImpl(x, ord, axis);\n  let keepDimsShape = norm.shape;\n
  if (keepDims) {\n    const axes = parseAxisParam(axis, x.shape);\n    keepDimsShape = axis_util.expandShapeToKeepDim(norm.shape, axes);\n  }\n  return reshape(norm, keepDimsShape);\n}\n\nfunction normImpl(\n    x: Tensor, p: number|string, axis: number|number[] = null): Tensor {\n  if (x.rank === 0) {\n    return abs(x);\n  }\n\n  // consider vector when no axis is specified\n  if (x.rank !== 1 && axis === null) {\n    return normImpl(reshape(x, [-1]), p, axis);\n  }\n\n  // vector\n  if (x.rank === 1 || typeof axis === 'number' ||\n      Array.isArray(axis) && axis.length === 1) {\n    if (p === 1) {\n      return sum(abs(x), axis);\n    }\n    if (p === Infinity) {\n      return max(abs(x), axis);\n    }\n    if (p === -Infinity) {\n      return min(abs(x), axis);\n    }\n    if (p === 'euclidean' || p === 2) {\n      // norm(x, 2) = sum(abs(xi) ^ 2) ^ 1/2\n      return sqrt(sum(pow(abs(x), scalar(2, 'int32')), axis));\n    }\n\n    throw new Error(`Error in norm: invalid ord value: ${p}`);\n  }\n\n  // matrix (assumption axis[0] < axis[1])\n  if (Array.isArray(axis) && axis.length === 2) {\n    if (p === 1) {\n      return max(sum(abs(x), axis[0]), axis[1] - 1);\n    }\n    if (p === Infinity) {\n      return max(sum(abs(x), axis[1]), axis[0]);\n    }\n    if (p === -Infinity) {\n      return min(sum(abs(x), axis[1]), axis[0]);\n    }\n    if (p === 'fro' || p === 'euclidean') {\n      // norm(x) = sqrt(sum(pow(x, 2)))\n      return sqrt(sum(square(x), axis));\n    }\n\n    throw new Error(`Error in norm: invalid ord value: ${p}`);\n  }\n\n  throw new Error(`Error in norm: invalid axis: ${axis}`);\n}\n\nexport const norm = op({norm_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required
 by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========================================================================\n */\n\nimport {Scalar, Tensor} from '../tensor';\nimport {assertTypesMatch} from '../tensor_util';\nimport
```

{convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {add} from './add';\nimport {div} from './div';\nimport {mul} from './mul';\nimport {op} from './operation';\nimport {pow} from './pow';\nimport {scalar} from './scalar';\nimport {sub} from './sub';\n\n/**\n * Compute the moving average of a variable.\n *\n * Without zeroDebias, the moving average operation is defined by:\n *   `v += delta`\n * where\n *   `delta = (1 - decay) * (x - v)`\n *\n * With zeroDebias (default), the `delta` term is scaled to debias the\n * effect of the (assumed) zero-initialization of `v`.\n *   `delta /= (1 - decay ^ step)`\n *\n * For more details on the zero-debiasing algorithm, see:\n *   https://arxiv.org/abs/1412.6980\n *\n * Note that this function is completely stateless and does not keep track of\n * step count. The step count needs to be maintained by the caller and passed\n * in as `step`.\n *\n * @param v The current moving average value.\n * @param x New input value, must have the same shape and dtype as `v`.\n * @param decay The decay factor. Typical values are 0.95 and 0.99.\n * @param step Step count.\n * @param zeroDebias: Whether zeroDebias is to be performed (default: `true`).\n * @returns The new moving average value.\n *\n * @doc {heading: 'Operations', subheading: 'Moving Average'}\n */\nfunction movingAverage_<T extends Tensor>(\n   v: T|TensorLike, x: T|TensorLike, decay: number|Scalar,\n   step?: number|Scalar, zeroDebias = true): T {\n const $v = convertToTensor(v, 'v', 'movingAverage');\n const $x = convertToTensor(x, 'x', 'movingAverage');\n const $decay = convertToTensor(decay, 'decay', 'movingAverage');\n\n assertTypesMatch($v, $x);\n util.assert(\n   util.arraysEqual($v.shape, $x.shape), () => 'Shape mismatch in v and x');\n\n const one = scalar(1);\n const oneMinusDecay = sub(one, $decay);\n\n let update = mul(sub($x, $v), oneMinusDecay);\n if (zeroDebias) {\n   util.assert(\n   step != null, () => 'When using zeroDebias: true, step is required.');\n   const $step = convertToTensor(step, 'step', 'movingAverage');\n   update = div(update, sub(one, pow($decay, $step)));\n }\n return add($v, update);\n}\n\nexport const movingAverage = op({movingAverage_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ===\n */\n\nimport {ENGINE} from '../engine';\nimport {ScatterNd, ScatterNdAttrs, ScatterNdInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {Rank, ShapeMap, TensorLike} from '../types';\n\nimport {op} from './operation';\nimport * as scatter_nd_util from './scatter_nd_util';\n\n/**\n * Creates a new tensor by applying sparse updates to individual\n * values or slices within a zero tensor of the given shape tensor according to\n * indices. This operator is the inverse of the `tf.gatherND` operator which\n * extracts values or slices from a given tensor.\n *\n * ```js\n * const indices = tf.tensor2d([4, 3, 1, 7], [4, 1], 'int32');\n * const updates = tf.tensor1d([9, 10, 11, 12]);\n * const shape = [8];\n * tf.scatterND(indices, updates, shape).print() //[0, 11, 0, 10, 9, 0, 0, 12]\n * ```\n *\n * @param indices The tensor contains the indices into the output tensor.\n * @param updates The tensor contains the value for the indices.\n * @param shape: The shape of the output tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Slicing and Joining'}\n */\nfunction scatterND_<R extends Rank>(\n   indices: Tensor|TensorLike, updates: Tensor|TensorLike,\n   shape: ShapeMap[R]): Tensor<R> {\n const $indices = convertToTensor(indices, 'indices', 'scatterND', 'int32');\n const $updates = convertToTensor(updates, 'updates', 'scatterND');\n scatter_nd_util.validateInput($updates, $indices, shape);\n\n const inputs: ScatterNdInputs = {indices: $indices, updates: $updates};\n const attrs: ScatterNdAttrs = {shape};\n\n // tslint:disable-next-line: no-unnecessary-type-assertion\n return ENGINE.runKernel(\n   ScatterNd, inputs as {} as NamedTensorMap,\n   attrs as {} as NamedAttrMap) as Tensor<R>;\n}\n\nexport const scatterND = op({scatterND_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under

the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\nimport {Tensor} from '../tensor';\n\n/**\n * Validate sparseToDense inputs.\n *\n * @param sparseIndices A 0-D, 1-D, or 2-D Tensor of type int32.\n * sparseIndices[i] contains the complete index where sparseValues[i] will be\n * placed.\n * @param sparseValues A 0-D or 1-D Tensor. Values\n * corresponding to each row of sparseIndices, or a scalar value to be used for\n * all sparse indices.\n * @param outputShape number[]. Shape of the dense output tensor.\n * @param validateIndices boolean. indice validation is not supported, error\n * will be thrown if it is set.\n */\nexport function validateInput(\n sparseIndices: Tensor, sparseValues: Tensor, outputShape: number[],\n defaultValues: Tensor) {\n if (sparseIndices.dtype !== 'int32') {\n throw new Error(\n 'tf.sparseToDense()
expects the indices to be int32 type,' +\n ` but the dtype was ${sparseIndices.dtype}.`);\n }\n if (sparseIndices.rank > 2) {\n throw new Error(\n 'sparseIndices should be a scalar, vector, or matrix,' +\n ` but got shape ${sparseIndices.shape}.`);\n }\n\n const numElems = sparseIndices.rank > 0 ? sparseIndices.shape[0] : 1;\n const numDims = sparseIndices.rank > 1 ? sparseIndices.shape[1] : 1;\n\n if (outputShape.length !== numDims) {\n throw new Error(\n 'outputShape has incorrect number of elements:,' +\n ` ${outputShape.length}, should be: ${numDims}.`);\n }\n\n const numValues = sparseValues.size;\n if (!(sparseValues.rank === 0 ||\n sparseValues.rank === 1 && numValues === numElems)) {\n throw new Error(\n 'sparseValues has incorrect shape ' +\n `${sparseValues.shape}, should be [] or [${numElems}]`);\n }\n\n if (sparseValues.dtype !== defaultValues.dtype) {\n throw new Error('sparseValues.dtype
must match defaultValues.dtype');\n }\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\n\nimport {ENGINE} from '../engine';\nimport {SparseToDense, SparseToDenseAttrs, SparseToDenseInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport * as sparse_to_dense from '../ops/sparse_to_dense_util';\nimport
{Scalar, Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {Rank, ScalarLike, ShapeMap, TensorLike} from '../types';\n\nimport {op} from './operation';\n\n/**\n * Converts a sparse representation into a dense tensor.\n *\n * Builds an array dense with shape outputShape such that:\n *\n * // If sparseIndices is scalar\n * dense[i] = (i == sparseIndices ? sparseValues : defaultValue)\n *\n * // If sparseIndices is a vector, then for each i\n * dense[sparseIndices[i]] = sparseValues[i]\n *\n * // If sparseIndices is an n by d matrix, then for each i in [0, n)\n * dense[sparseIndices[i][0], ..., sparseIndices[i][d-1]] = sparseValues[i]\n * All other values in dense are set to defaultValue. If sparseValues is a\n * scalar, all sparse indices are set to this single value.\n *\n * If indices are repeated the final value is summed over all values for those\n * indices.\n *\n * ```js\n
* const indices = tf.tensor1d([4, 5, 6, 1, 2, 3], 'int32');\n * const values = tf.tensor1d([10, 11, 12, 13, 14, 15], 'float32');\n * const shape = [8];\n * tf.sparseToDense(indices, values, shape).print();\n * ```\n *\n * @param sparseIndices A 0-D, 1-D, or 2-D Tensor of type int32.\n * sparseIndices[i] contains the complete index where

sparseValues[i] will be\n * placed.\n * @param sparseValues A 0-D or 1-D Tensor. Values\n * corresponding to each row of sparseIndices, or a scalar value to be used for\n * all sparse indices.\n * @param outputShape Shape of the dense output tensor. the type is inferred.\n * @param defaultValue Scalar. Value to set for indices not specified in\n * sparseIndices. Defaults to zero.\n *\n * @doc {heading: 'Operations', subheading: 'Normalization'}\n */\nfunction sparseToDense_<R extends Rank>(\n sparseIndices: Tensor|TensorLike, sparseValues: Tensor|TensorLike,\n outputShape: ShapeMap[R], defaultValue: Scalar|ScalarLike = 0): Tensor<R> {\n const $sparseIndices =\n convertToTensor(sparseIndices, 'sparseIndices', 'sparseToDense', 'int32');\n const $sparseValues =\n convertToTensor(sparseValues, 'sparseValues', 'sparseToDense');\n const $defaultValue = convertToTensor(\n defaultValue, 'defaultValue', 'sparseToDense', $sparseValues.dtype);\n\n sparse_to_dense.validateInput(\n $sparseIndices, $sparseValues, outputShape, $defaultValue);\n\n const inputs: SparseToDenseInputs = {\n sparseIndices: $sparseIndices,\n sparseValues: $sparseValues,\n defaultValue: $defaultValue\n };\n\n const attrs: SparseToDenseAttrs = {outputShape};\n\n return ENGINE.runKernel(\n SparseToDense, inputs as {} as NamedTensorMap,\n attrs as {} as NamedAttrMap);\n}\n\nexport const sparseToDense = op({sparseToDense_});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with
the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport {ENGINE} from '../engine';\nimport {GatherNd, GatherNdInputs} from '../kernel_names';\nimport {Tensor} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {op} from './operation';\n\n/**\n * Gather slices from input tensor into a Tensor with shape specified by\n * `indices`.\n *\n * `indices` is an K-dimensional integer tensor, best thought of as
a\n * (K-1)-dimensional tensor of indices into input, where each element defines a\n * slice of input:\n * output[\\\\(i_0, ..., i_{K-2}\\\\)] = input[indices[\\\\(i_0, ..., i_{K-2}\\\\)]]\n *\n * Whereas in `tf.gather`, `indices` defines slices into the first dimension of\n * input, in `tf.gatherND`, `indices` defines slices into the first N dimensions\n * of input, where N = indices.shape[-1].\n *\n * The last dimension of indices can be at most the rank of input:\n * indices.shape[-1] <= input.rank\n *\n * The last dimension of `indices` corresponds to elements\n * (if indices.shape[-1] == input.rank) or slices\n * (if indices.shape[-1] < input.rank) along dimension indices.shape[-1] of\n * input.\n * The output tensor has shape\n * indices.shape[:-1] + input.shape[indices.shape[-1]:]\n *\n * Note that on CPU, if an out of bound index is found, an error is returned. On\n * GPU, if an out of bound index is found, a 0 is stored in the corresponding\n * output value.\n *\n * ```js\n *
const indices = tf.tensor2d([0, 1, 1, 0], [2,2], 'int32');\n * const input = tf.tensor2d([9, 10, 11, 12], [2, 2]);\n * tf.gatherND(input, indices).print() // [10, 11]\n * ```\n *\n * @param x The tensor from which to gather values.\n * @param indices Index tensor, must be of type int32.\n *\n * @doc {heading: 'Operations', subheading: 'Slicing and Joining'}\n */\nfunction gatherND_(x: Tensor|TensorLike, indices: Tensor|TensorLike): Tensor {\n const $indices = convertToTensor(indices, 'indices', 'gatherND', 'int32');\n const $x = convertToTensor(x, 'x', 'gatherND');\n\n const inputs: GatherNdInputs = {params: $x, indices: $indices};\n\n return ENGINE.runKernel(GatherNd, inputs as {} as NamedTensorMap);\n}\n\nexport const gatherND = op({gatherND_});\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy
of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for

the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {Tensor} from '../tensor';\nimport * as util from '../util';\n\n/**\n * Normalize noise shape based on provided tensor and noise shape.\n *\n * @param x Tensor.\n * @param noiseShape The shape for the randomly generated keep/drop flags, as\n * an array of numbers. Optional.\n * @returns Normalized noise shape.\n */\nexport function getNoiseShape(x: Tensor, noiseShape?: number[]): number[] {\n if (noiseShape == null) {\n return x.shape.slice();\n }\n if (util.arraysEqual(x.shape, noiseShape))
{\n return noiseShape;\n }\n if (x.shape.length === noiseShape.length) {\n const newDimension: number[] = [];\n for (let i = 0; i < x.shape.length; i++) {\n if (noiseShape[i] == null && x.shape[i] != null) {\n newDimension.push(x.shape[i]);\n } else {\n newDimension.push(noiseShape[i]);\n }\n }\n return newDimension;\n }\n\n return noiseShape;\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions
and\n * limitations under the License.\n *
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*/\n\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport * as util from '../util';\n\nimport {add} from './add';\nimport {div} from './div';\nimport {getNoiseShape} from './dropout_util';\nimport {floor} from './floor';\nimport {mul} from './mul';\nimport {op} from './operation';\nimport {randomUniform} from './random_uniform';\n\n/**\n * Computes dropout.\n *\n * ```js\n * const x = tf.tensor1d([1, 2, 2, 1]);\n * const rate = 0.75;\n * const output = tf.dropout(x, rate);\n * output.print();\n * ```\n *\n * @param x A floating point Tensor or TensorLike.\n * @param rate A float in the range [0, 1). The probability that each element\n * of x is discarded.\n * @param noiseShape An array of numbers of type int32, representing the\n * shape for randomly generated keep/drop flags. If the
noiseShape has null\n * value, it will be automatically replaced with the x's relative dimension\n * size. Optional.\n * @param seed Used to create random seeds. Optional.\n * @returns A Tensor of the same shape of x.\n *\n * @doc {heading: 'Operations', subheading: 'Dropout'}\n */\nfunction dropout_(\n x: Tensor|TensorLike, rate: number, noiseShape?: number[],\n seed?: number|string): Tensor {\n const $x = convertToTensor(x, 'x', 'dropout');\n\n util.assert(\n $x.dtype === 'float32',\n () => `x has to be a floating point tensor since it's going to be ` +\n `scaled, but got a ${$x.dtype} tensor instead.`);\n util.assert(\n rate >= 0 && rate < 1,\n () => `rate must be a float in the range [0, 1), but got ${rate}.`);\n\n if (rate === 0) {\n return x instanceof Tensor ? $x.clone() : $x;\n }\n\n const $noiseShape = getNoiseShape($x, noiseShape);\n const keepProb = 1 - rate;\n const multiplier = div(\n floor(add(randomUniform($noiseShape,
0, 1, 'float32', seed), keepProb)),\n keepProb);\n\n return mul($x, multiplier);\n}\n\nexport const dropout = op({dropout_});\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {Tensor1D} from '../tensor';\nimport {tensor1d} from './tensor1d';\n\nexport function enclosingPowerOfTwo(value: number) {\n // Return

2**N for integer N such that 2**N >= value.\n return Math.floor(Math.pow(2, Math.ceil(Math.log(value) / Math.log(2.0))));\n}\n\nexport function cosineWindow(\n windowLength: number, a: number, b: number): Tensor1D {\n const even = 1 - windowLength % 2;\n const newValues = new Float32Array(windowLength);\n for (let i = 0; i < windowLength; ++i) {\n const cosArg = (2.0 * Math.PI * i) / (windowLength + even - 1);\n newValues[i] = a - b * Math.cos(cosArg);\n }\n return tensor1d(newValues, 'float32');\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {Tensor} from '../tensor';\nimport {convertToTensor} from '../tensor_util_env';\nimport {TensorLike} from '../types';\nimport {assert, assertShapesMatch, getTypedArrayFromDType} from '../util';\nimport {tensor} from './tensor';\n\n/**\n * Returns whether the targets are in the top K predictions.\n *\n * ```js\n * const predictions = tf.tensor2d([[20, 10, 40, 30], [30, 50, -20, 10]]);\n * const targets = tf.tensor1d([2, 0]);\n * const precision = await tf.inTopKAsync(predictions, targets);\n * precision.print();\n * ```\n * @param predictions 2-D or higher `tf.Tensor` with last dimension being\n * at least `k`.\n * @param targets 1-D or higher `tf.Tensor`.\n * @param k Optional Number of top elements to look at for computing precision,\n
* default to 1.\n *\n * @doc {heading: 'Operations', subheading: 'Evaluation'}\n */\nasync function inTopKAsync_<T extends Tensor, U extends Tensor>(\n predictions: T|TensorLike, targets: U|TensorLike, k = 1): Promise<U> {\n const $predictions = convertToTensor(predictions, 'predictions', 'inTopK');\n const $targets = convertToTensor(targets, 'targets', 'inTopK');\n\n assert(\n $predictions.rank > 1,\n () => 'inTopK() expects the predictions to be of rank 2 or higher, ' +\n `but got ${$predictions.rank}`);\n assert(\n $predictions.rank - 1 === $targets.rank,\n () => `predictions rank should be 1 larger than ` +\n `targets rank, but got predictions rank ` +\n `${$predictions.rank} and targets rank ${$targets.rank}`);\n assertShapesMatch(\n $predictions.shape.slice(0, $predictions.shape.length - 1),\n $targets.shape,\n `predictions's shape should be align with the targets' shape, ` +\n 'except the
last dimension.');\n const lastDim = $predictions.shape[$predictions.shape.length - 1];\n assert(\n k > 0 && k <= lastDim,\n () => `'k' passed to inTopK() must be > 0 && <= the predictions last ` +\n `dimension (${lastDim}), but got ${k}`);\n\n const predictionsVals = await $predictions.data();\n const targetsVals = await $targets.data();\n\n // Reshape predictionsVals into a 2d tensor [batch, lastDim]\n // and look up topK along lastDim.\n const [batch, size] = [predictionsVals.length / lastDim, lastDim];\n const precision = getTypedArrayFromDType('bool', batch);\n\n for (let b = 0; b < batch; b++) {\n const offset = b * size;\n const vals = predictionsVals.subarray(offset, offset + size);\n const valAndInd: Array<{value: number, index: number}> = [];\n for (let i = 0; i < vals.length; i++) {\n valAndInd.push({value: vals[i], index: i});\n }\n valAndInd.sort((a, b) => b.value - a.value);\n\n precision[b] = 0;\n for (let i = 0;
i < k; i++) {\n if (valAndInd[i].index === targetsVals[b]) {\n precision[b] = 1;\n break;\n }\n }\n }\n\n if (predictions !== $predictions) {\n $predictions.dispose();\n }\n if (targets !== $targets) {\n $targets.dispose();\n }\n\n // Output precision has the same shape as targets.\n return tensor(precision, $targets.shape, 'bool') as U;\n}\n\nexport const inTopKAsync = inTopKAsync_;\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language

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*/\nimport {ENGINE} from '../engine';\nimport {Conv2DBackpropFilter, Conv2DBackpropFilterAttrs,
Conv2DBackpropFilterInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport
{Tensor3D, Tensor4D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\nimport * as util from
'../util';\n\nimport * as conv_util from './conv_util';\nimport {op} from './operation';\nimport {reshape} from
'./reshape';\n\n/**\n * Computes the derivative of the filter of a 2D convolution.\n *\n * @param x The input tensor,
of rank 4 or rank 3 of shape\n * [batch, height, width, inChannels]. If rank 3, batch of 1 is assumed.\n * @param
dy The dy image, of rank 4 or rank 3, of shape\n * [batch, height, width, outDepth]. If rank 3, batch of 1 is
assumed.\n * @param filterShape The shape of the filter, length 4,\n
 * [filterHeight, filterWidth, inDepth, outDepth].\n * @param strides The strides of the convolution:
[strideHeight,\n * strideWidth].\n * @param pad A string from: 'same', 'valid'. The type of padding algorithm\n *
used in the forward prop of the op.\n * @param dataFormat: An optional string from: \"NHWC\", \"NCHW\".
Defaults to\n * \"NHWC\". Specify the data format of the input and output data. With the\n * default format
\"NHWC\", the data is stored in the order of: [batch,\n * height, width, channels].\n * @param
dimRoundingMode A string from: 'ceil', 'round', 'floor'. If none is\n * provided, it will default to truncate.\n
*/\nfunction conv2DBackpropFilter_<T extends Tensor3D|Tensor4D>(\n x: T, dy: T, filterShape: [number,
number, number, number],\n strides: [number, number]|number,\n pad:
'valid'|'same'|number|conv_util.ExplicitPadding,\n dataFormat: 'NHWC'|'NCHW' = 'NHWC',\n
dimRoundingMode?: 'floor'|'round'|'ceil'): Tensor4D {\n let x4D =
 x as Tensor4D;\n if (x.rank === 3) {\n x4D = reshape(x, [1, x.shape[0], x.shape[1], x.shape[2]]);\n }\n let dy4D
= dy as Tensor4D;\n if (dy4D.rank === 3) {\n dy4D = reshape(dy, [1, dy.shape[0], dy.shape[1], dy.shape[2]]);\n
}\n util.assert(\n x4D.rank === 4,\n () => `Error in conv2dDerFilter: input must be rank 4, but got shape ` +\n
 `${x4D.shape}.`);\n util.assert(\n dy4D.rank === 4,\n () => `Error in conv2dDerFilter: dy must be rank
4, but got shape ` +\n  `${dy4D.shape}.`);\n  util.assert(\n  filterShape.length === 4,\n  () => `Error in
conv2dDerFilter: filterShape must be length 4, but got ` +\n  `${filterShape}.`);\n const inDepth = dataFormat
=== 'NHWC' ? x4D.shape[3] : x4D.shape[1];\n const outDepth = dataFormat === 'NHWC' ? dy4D.shape[3] :
dy4D.shape[1];\n util.assert(\n inDepth === filterShape[2],\n () => `Error in conv2dDerFilter: depth of input
${inDepth}) must ` +\n  `match input depth in
 filter (${filterShape[2]}.`);\n  util.assert(\n  outDepth === filterShape[3],\n  () => `Error in conv2dDerFilter:
depth of dy (${outDepth}) must ` +\n  `match output depth for filter (${filterShape[3]}).`);\n if
(dimRoundingMode != null) {\n util.assert(\n util.isInt(pad as number),\n () => `Error in conv2dDerFilter:
pad must be an integer when using, ` +\n  `dimRoundingMode ${dimRoundingMode} but got pad
${pad}.`);\n }\n\n const inputs: Conv2DBackpropFilterInputs = {x: x4D, dy: dy4D};\n const attrs:
Conv2DBackpropFilterAttrs =\n {strides, pad, dataFormat, dimRoundingMode, filterShape};\n\n //
tslint:disable-next-line: no-unnecessary-type-assertion\n return ENGINE.runKernel(\n
Conv2DBackpropFilter, inputs as {} as NamedTensorMap,\n attrs as {} as NamedAttrMap) as
Tensor4D;\n}\n\nexport const conv2DBackpropFilter = op({conv2DBackpropFilter_});\n","/**\n * @license\n *
Copyright 2019 Google LLC. All Rights Reserved.\n
 * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {Tensor} from '../tensor';\n\nimport * as broadcast_util from './broadcast_util';\nimport {elu} from
'./elu';\nimport {Activation} from './fused_types';\nimport {leakyRelu} from './leaky_relu';\nimport {mul} from

'./mul';\nimport {prelu} from './prelu';\nimport {relu} from './relu';\nimport {relu6} from './relu6';\nimport {reshape} from './reshape';\nimport {step} from './step';\nimport {sum} from './sum';\n\n// Returns gradient for fused activation.\nexport function getFusedDyActivation(\n dy: Tensor, y: Tensor, activation: Activation): Tensor {\n if (activation == null || activation === 'linear') {\n return dy;\n }\n if (activation === 'relu') {\n return mul(dy, step(y));\n }\n throw new Error(\n `Cannot compute gradient for fused activation ${activation}.`);\n}\n\n// Returns gradient for fused bias.\nexport function getFusedBiasGradient(\n bias: Tensor, dyActivation: Tensor): Tensor {\n let res = dyActivation;\n const reduceAxes =\n broadcast_util.getReductionAxes(bias.shape, dyActivation.shape);\n if (reduceAxes.length > 0) {\n res = sum(res, reduceAxes);\n }\n return reshape(res, bias.shape);\n}\n\nexport function applyActivation(\n x: Tensor, activation: Activation, preluActivationWeights?: Tensor,\n leakyreluAlpha?: number): Tensor {\n if (activation === 'linear')
{\n return x;\n } else if (activation === 'relu') {\n return relu(x);\n } else if (activation === 'elu') {\n return elu(x);\n } else if (activation === 'relu6') {\n return relu6(x);\n } else if (activation === 'prelu') {\n return prelu(x, preluActivationWeights);\n } else if (activation === 'leakyrelu') {\n return leakyRelu(x, leakyreluAlpha);\n }\n throw new Error(`Unknown fused activation ${activation}.`);\n}\n\n// Whether we should call fused ops.\nexport const shouldFuse = (gradientDepth: number, activation: Activation) => {\n const gradientMode = gradientDepth > 0;\n return !gradientMode || activation === 'linear';\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {ENGINE} from '../../engine';\nimport {customGrad} from '../../gradients';\nimport {FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs} from '../../kernel_names';\nimport {NamedAttrMap} from '../../kernel_registry';\nimport {Tensor, Tensor3D, Tensor4D} from '../../tensor';\nimport {GradSaveFunc, NamedTensorMap} from '../../tensor_types';\nimport {makeTypesMatch} from '../../tensor_util';\nimport {convertToTensor} from '../../tensor_util_env';\nimport {TensorLike} from '../../types';\nimport * as util from '../../util';\nimport {add} from '../add';\nimport * as broadcast_util from '../broadcast_util';\nimport
{conv2d as unfusedConv2d} from '../conv2d';\nimport {conv2DBackpropFilter} from '../conv2d_backprop_filter';\nimport {conv2DBackpropInput} from '../conv2d_backprop_input';\nimport * as conv_util from '../conv_util';\nimport {Activation} from '../fused_types';\nimport {applyActivation, getFusedBiasGradient, getFusedDyActivation, shouldFuse} from '../fused_util';\nimport {op} from '../operation';\nimport {reshape} from '../reshape';\n\n/**\n * Computes a 2D convolution over the input x, optionally fused with adding a\n * bias and applying an activation.\n *\n * ```js\n * const inputDepth = 2;\n * const inShape = [2, 2, 2, inputDepth];\n * const outputDepth = 2;\n * const fSize = 1;\n * const pad = 0;\n * const strides = 1;\n *\n * const x = tf.tensor4d([1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15,\n * 16], inShape);\n * const w = tf.tensor4d([-1, 1, -2, 0.5], [fSize, fSize, inputDepth,\n * outputDepth]);\n *\n * tf.fused.conv2d({ x, filter: w, strides, pad, dataFormat:
'NHWC',\n * dilations: [1, 1], bias: tf.scalar(5), activation: 'relu' }).print();\n * ```\n *\n * @param obj An object with the following properties:\n * @param x The input tensor, of rank 4 or rank 3, of shape\n * `[batch, height, width, inChannels]`. If rank 3, batch of 1 is\n * assumed.\n * @param filter The filter, rank 4, of shape\n * `[filterHeight, filterWidth, inDepth, outDepth]`.\n * @param strides The strides of the convolution: `[strideHeight,\n * strideWidth]`.\n * @param pad The type of padding algorithm.\n * - `same` and stride 1: output will be of same size as input,\n * regardless of filter size.\n * - `valid` output will be smaller than input if filter is larger\n * than 1x1.\n * - For more info, see this guide:\n * [https://www.tensorflow.org/api_guides/python/nn#Convolution](\n * https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dataFormat An optional string from:

```
\"NHWC\", \"NCHW\". Defaults to\n *     \"NHWC\".
 Specify the data format of the input and output data. With the\n *     default format \"NHWC\", the data is stored in
the order of: [batch,\n *     height, width, channels]. Only \"NHWC\" is currently supported.\n * @param dilations
The dilation rates: `[dilationHeight, dilationWidth]`\n *     in which we sample input values across the height and
width dimensions\n *     in atrous convolution. Defaults to `[1, 1]`. If `dilations` is a single\n *     number, then
`dilationHeight == dilationWidth`. If it is greater than\n *     1, then all values of `strides` must be 1.\n * @param
dimRoundingMode A string from: 'ceil', 'round', 'floor'. If none is\n *     provided, it will default to truncate.\n *
@param bias Tensor to be added to the result.\n * @param activation Name of activation kernel (defaults to `linear`)
to be\n *     applied\n *     after biasAdd.\n * @param preluActivationWeights Tensor of prelu weights to be applied
as part\n *     of a `prelu` activation, typically
 the same shape as `x`.\n * @param leakyreluAlpha Optional. Alpha to be applied as part of a `leakyrelu`\n *
activation.\n */\nfunction fusedConv2d_<T extends Tensor3D|Tensor4D>({\n  x,\n  filter,\n  strides,\n  pad,\n
dataFormat = 'NHWC',\n  dilations = [1, 1],\n  dimRoundingMode,\n  bias,\n  activation = 'linear',\n
preluActivationWeights,\n  leakyreluAlpha\n}: {\n  x: T|TensorLike,\n  filter: Tensor4D|TensorLike,\n  strides:
[number, number]|number,\n  pad: 'valid'|'same'|number|conv_util.ExplicitPadding,\n  dataFormat?:
'NHWC'|'NCHW',\n  dilations?: [number, number]|number,\n  dimRoundingMode?: 'floor'|'round'|'ceil',\n  bias?:
Tensor|TensorLike,\n  activation?: Activation,\n  preluActivationWeights?: Tensor,\n  leakyreluAlpha?: number\n}):
T {\n  activation = activation || 'linear';\n\n  if (shouldFuse(ENGINE.state.gradientDepth, activation) === false) {\n
let result = unfusedConv2d(\n      x, filter, strides, pad, dataFormat, dilations, dimRoundingMode);\n    if (bias !=
 null) {\n      result = add(result, bias);\n    }\n\n    return applyActivation(\n        result, activation,
preluActivationWeights, leakyreluAlpha) as T;\n  }\n\n  const $x = convertToTensor(x, 'x', 'conv2d');\n  const $filter
= convertToTensor(filter, 'filter', 'conv2d');\n\n  let x4D = $x as Tensor4D;\n  let reshapedTo4D = false;\n\n  if
($x.rank === 3) {\n    reshapedTo4D = true;\n    x4D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2]]);\n
}\n  util.assert(\n      x4D.rank === 4,\n      () => `Error in fused conv2d: input must be rank 4, but got rank ` +\n
 `${x4D.rank}.`);\n  util.assert(\n      $filter.rank === 4,\n      () => `Error in fused conv2d: filter must be rank 4, but
got rank ` +\n          `${$filter.rank}.`);\n  if (dimRoundingMode != null) {\n    util.assert(\n        util.isInt(pad as
number),\n        () => `Error in fused conv2d: pad must be an integer when using, ` +\n            `dimRoundingMode
${dimRoundingMode} but got pad ${pad}.`);\n
  }\n\n  util.assert(\n      x4D.shape[3] === $filter.shape[2],\n      () => `Error in conv2d: depth of input
(${x4D.shape[3]}) must match ` +\n          `input depth for filter ${$filter.shape[2]}.`);\n  util.assert(\n
conv_util.eitherStridesOrDilationsAreOne(strides, dilations),\n      () => 'Error in conv2D: Either strides or dilations
must be 1. ' +\n          `Got strides ${strides} and dilations '${dilations}'`);\n  util.assert(\n      dataFormat ===
'NHWC',\n      () => `Error in conv2d: got dataFormat of ${\n          dataFormat} but only NHWC is currently
supported.`);\n\n  const convInfo = conv_util.computeConv2DInfo(\n      x4D.shape, $filter.shape, strides, dilations,
pad, dimRoundingMode);\n\n  let $bias: Tensor;\n  if (bias != null) {\n    $bias = convertToTensor(bias, 'bias', 'fused
conv2d');\n    [$bias] = makeTypesMatch($bias, $x);\n\n
broadcast_util.assertAndGetBroadcastShape(convInfo.outShape, $bias.shape);\n  }\n\n  let
$preluActivationWeights: Tensor;\n
  if (preluActivationWeights != null) {\n    $preluActivationWeights = convertToTensor(\n
preluActivationWeights, 'prelu weights', 'fused conv2d');\n  }\n\n  const grad = (dy: Tensor4D, saved: Tensor[]) =>
{\n    const [$filter, x4D, y, $bias] =\n        saved as [Tensor4D, Tensor4D, Tensor4D, Tensor];\n\n    const
dyActivation = getFusedDyActivation(dy, y, activation) as Tensor4D;\n\n    util.assert(\n
conv_util.tupleValuesAreOne(dilations),\n        () => 'Error in gradient of fused conv2D: ' +\n            `dilation rates
greater than 1 ` +\n            `are not yet supported in gradients. Got dilations '${dilations}'`);\n\n    const xDer =\n
conv2DBackpropInput(x4D.shape, dyActivation, $filter, strides, pad);\n    const filterDer =\n
conv2DBackpropFilter(x4D, dyActivation, $filter.shape, strides, pad);\n    const der: Tensor[] = [xDer,
filterDer];\n\n    if ($bias != null) {\n      const biasDer = getFusedBiasGradient($bias, dyActivation);\n
der.push(biasDer);\n
```

}\n return der;\n };\n\n const inputs: FusedConv2DInputs = {\n x: x4D,\n filter: $filter,\n bias: $bias,\n preluActivationWeights: $preluActivationWeights\n };\n\n const attrs: FusedConv2DAttrs = {\n strides,\n pad,\n dataFormat,\n dilations,\n dimRoundingMode,\n activation,\n leakyreluAlpha\n };\n\n // Depending on the the params passed in we will have different number of\n // inputs and thus a a different number of elements in the gradient.\n if (bias == null) {\n const customOp =\n customGrad((x4D: Tensor4D, filter: Tensor4D, save: GradSaveFunc) => {\n let res: Tensor4D|Tensor3D =\n // tslint:disable-next-line: no-unnecessary-type-assertion\n ENGINE.runKernel(\n FusedConv2D, inputs as {} as NamedTensorMap,\n attrs as {} as NamedAttrMap);\n\n save([filter, x4D, res]);\n\n if (reshapedTo4D) {\n // tslint:disable-next-line: no-unnecessary-type-assertion\n res = reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as\n Tensor3D;\n }\n\n return {value: res, gradFunc: grad};\n });\n return customOp(x4D, $filter) as T;\n } else {\n const customOpWithBias = customGrad(\n (x4D: Tensor4D, filter: Tensor4D, bias: Tensor, save: GradSaveFunc) => {\n let res: Tensor4D|Tensor3D = ENGINE.runKernel(\n FusedConv2D, inputs as {} as NamedTensorMap,\n attrs as {} as NamedAttrMap);\n\n save([filter, x4D, res, bias]);\n\n if (reshapedTo4D) {\n // tslint:disable-next-line: no-unnecessary-type-assertion\n res = reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as\n Tensor3D;\n }\n\n return {value: res, gradFunc: grad};\n });\n\n return customOpWithBias(x4D, $filter, $bias) as T;\n }\n}\nexport const conv2d = op({fusedConv2d_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport {ENGINE} from '../engine';\nimport {DepthwiseConv2dNativeBackpropFilter, DepthwiseConv2dNativeBackpropFilterAttrs, DepthwiseConv2dNativeBackpropFilterInputs} from '../kernel_names';\nimport {NamedAttrMap} from '../kernel_registry';\nimport {Tensor3D, Tensor4D} from '../tensor';\nimport {NamedTensorMap} from '../tensor_types';\n\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\nfunction depthwiseConv2dNativeBackpropFilter_<T extends Tensor3D|Tensor4D>(\n x: T, dy: T, filterShape: [number, number, number, number],\n strides: [number, number]|number, pad: 'valid'|'same'|number,\n dilations: [number, number]|number = [1, 1],\n dimRoundingMode?: 'floor'|'round'|'ceil'): Tensor4D {\n let x4D = x as Tensor4D;\n if (x.rank === 3) {\n x4D = reshape(x, [1, x.shape[0], x.shape[1], x.shape[2]]);\n }\n let dy4D = dy as Tensor4D;\n if (dy4D.rank === 3) {\n dy4D = reshape(dy, [1, dy.shape[0], dy.shape[1], dy.shape[2]]);\n }\n\n const inputs: DepthwiseConv2dNativeBackpropFilterInputs = {x: x4D, dy: dy4D};\n const attrs: DepthwiseConv2dNativeBackpropFilterAttrs =\n {strides, pad, dimRoundingMode, dilations, filterShape};\n\n // tslint:disable-next-line: no-unnecessary-type-assertion\n return ENGINE.runKernel(\n DepthwiseConv2dNativeBackpropFilter,\n inputs as {} as NamedTensorMap, attrs as {} as NamedAttrMap) as\n Tensor4D;\n}\n\nexport const depthwiseConv2dNativeBackpropFilter =\n op({depthwiseConv2dNativeBackpropFilter_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n

*/\nimport {ENGINE} from '../engine';\nimport
{DepthwiseConv2dNativeBackpropInput, DepthwiseConv2dNativeBackpropInputAttrs,
DepthwiseConv2dNativeBackpropInputInputs} from '../kernel_names';\nimport {NamedAttrMap} from
'../kernel_registry';\nimport {Tensor3D, Tensor4D} from '../tensor';\nimport {NamedTensorMap} from
'../tensor_types';\n\nimport {op} from './operation';\nimport {reshape} from './reshape';\n\nfunction
depthwiseConv2dNativeBackpropInput_<T extends Tensor3D|Tensor4D>(\n xShape: [number, number, number,
number], dy: T, filter: Tensor4D,\n strides: [number, number]|number, pad: 'valid'|'same'|number,\n dilations:
[number, number]|number = [1, 1],\n dimRoundingMode?: 'floor'|'round'|'ceil'): T {\n let dy4D = dy as
Tensor4D;\n let reshapedTo4D = false;\n if (dy.rank === 3) {\n reshapedTo4D = true;\n dy4D = reshape(dy, [1,
dy.shape[0], dy.shape[1], dy.shape[2]]);\n }\n\n const inputs: DepthwiseConv2dNativeBackpropInputInputs = {dy:
dy4D, filter};\n const attrs: DepthwiseConv2dNativeBackpropInputAttrs
=\n {strides, pad, dimRoundingMode, dilations, inputShape: xShape};\n\n const res =\n // tslint:disable-next-
line: no-unnecessary-type-assertion\n ENGINE.runKernel(\n DepthwiseConv2dNativeBackpropInput,
inputs as {} as NamedTensorMap,\n attrs as {} as NamedAttrMap) as T;\n\n if (reshapedTo4D) {\n return
reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as T;\n }\n return res;\n}\n\nexport const
depthwiseConv2dNativeBackpropInput =\n op({depthwiseConv2dNativeBackpropInput_});\n","/**\n *
@license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n
* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License
for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {ENGINE} from '../../engine';\nimport {customGrad} from '../../gradients';\nimport
{FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs, FusedDepthwiseConv2DInputs} from
'../../kernel_names';\nimport {NamedAttrMap} from '../../kernel_registry';\nimport {Tensor, Tensor3D, Tensor4D}
from '../../tensor';\nimport {GradSaveFunc, NamedTensorMap} from '../../tensor_types';\nimport
{makeTypesMatch} from '../../tensor_util';\nimport {convertToTensor} from '../../tensor_util_env';\nimport
{TensorLike} from '../../types';\nimport * as util from '../../util';\n\nimport {add} from '../add';\nimport * as
broadcast_util from '../broadcast_util';\nimport * as conv_util from '../conv_util';\nimport {depthwiseConv2d as
unfusedDepthwiseConv2d}
from '../depthwise_conv2d';\nimport {depthwiseConv2dNativeBackpropFilter} from
'../depthwise_conv2d_native_backprop_filter';\nimport {depthwiseConv2dNativeBackpropInput} from
'../depthwise_conv2d_native_backprop_input';\nimport {Activation} from '../fused_types';\nimport
{applyActivation, getFusedBiasGradient, getFusedDyActivation, shouldFuse} from '../fused_util';\nimport {op}
from '../operation';\nimport {reshape} from '../reshape';\n\n/**\n * Computes depthwise 2D convolution, optionally
fused with adding a\n * bias and applying an activation.\n *\n * Given a 4D `input` array and a `filter` array of
shape\n * `[filterHeight, filterWidth, inChannels, channelMultiplier]` containing\n * `inChannels` convolutional
filters of depth 1, this op applies a\n * different filter to each input channel (expanding from 1 channel to\n *
`channelMultiplier` channels for each), then concatenates the results\n * together. The output has `inChannels *
channelMultiplier` channels.\n *\n
* See\n * [https://www.tensorflow.org/api_docs/python/tf/nn/depthwise_conv2d](\n *
https://www.tensorflow.org/api_docs/python/tf/nn/depthwise_conv2d)\n * for more details.\n *\n * @param obj An
object with the following properties:\n * @param x The input tensor, of rank 4 or rank 3, of shape\n * `[batch,
height, width, inChannels]`. If rank 3, batch of 1 is\n * assumed.\n * @param filter The filter tensor, rank 4, of
shape\n * `[filterHeight, filterWidth, inChannels, channelMultiplier]`.\n * @param strides The strides of the
convolution: `[strideHeight,\n * strideWidth]`. If strides is a single number, then `strideHeight ==\n *
strideWidth`.\n * @param pad The type of padding algorithm.\n * - `same` and stride 1: output will be of same size

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as input,\n *       regardless of filter size.\n *   - `valid`: output will be smaller than input if filter is larger\n *       than 1x1.\n *   - For more info, see this guide:\n *     [https://www.tensorflow.org/api_guides/python/nn#Convolution](\n *          https://www.tensorflow.org/api_guides/python/nn#Convolution)\n * @param dilations The dilation rates: `[dilationHeight, dilationWidth]`\n *     in which we sample input values across the height and width dimensions\n *   in atrous convolution. Defaults to `[1, 1]`. If `rate` is a single\n *     number, then `dilationHeight == dilationWidth`. If it is greater than\n *     1, then all values of `strides` must be 1.\n * @param dataFormat: An optional string from: \"NHWC\", \"NCHW\". Defaults to\n *     \"NHWC\". Specify the data format of the input and output data. With the\n *     default format \"NHWC\", the data is stored in the order of: [batch,\n *     height, width, channels]. Only \"NHWC\" is currently supported.\n * @param dimRoundingMode A string from: 'ceil', 'round', 'floor'. If none is\n *     provided, it will default to truncate.\n * @param bias Tensor to be added to the result.\n * @param activation Name of activation kernel (defaults to `linear`).\n
 * @param preluActivationWeights Tensor of prelu weights to be applied as part\n *     of a `prelu` activation, typically the same shape as `x`.\n * @param leakyreluAlpha Optional. Alpha to be applied as part of a `leakyrelu`\n *     activation.\n */\nfunction fusedDepthwiseConv2d_<T extends Tensor3D|Tensor4D>({\n  x,\n  filter,\n  strides,\n  pad,\n  dataFormat = 'NHWC',\n  dilations = [1, 1],\n  dimRoundingMode,\n  bias,\n  activation = 'linear',\n  preluActivationWeights,\n  leakyreluAlpha\n}: {\n  x: T|TensorLike,\n  filter: Tensor4D|TensorLike,\n  strides: [number, number]|number,\n  pad: 'valid'|'same'|number,\n  dataFormat?: 'NHWC'|'NCHW',\n  dilations?: [number, number]|number,\n  dimRoundingMode?: 'floor'|'round'|'ceil',\n  bias?: Tensor|TensorLike,\n  activation?: Activation,\n  preluActivationWeights?: Tensor,\n  leakyreluAlpha?: number\n}): T {\n  if (shouldFuse(ENGINE.state.gradientDepth, activation) === false) {\n    let result = unfusedDepthwiseConv2d(\n x,
 filter, strides, pad, dataFormat, dilations, dimRoundingMode);\n    if (bias != null) {\n      result = add(result, bias);\n    }\n\n    return applyActivation(\n        result, activation, preluActivationWeights, leakyreluAlpha) as T;\n  }\n\n  const $x = convertToTensor(x, 'x', 'depthwiseConv2d');\n  const $filter = convertToTensor(filter, 'filter', 'depthwiseConv2d');\n\n  let x4D = $x as Tensor4D;\n  let reshapedTo4D = false;\n  if ($x.rank === 3) {\n    reshapedTo4D = true;\n    x4D = reshape($x, [1, $x.shape[0], $x.shape[1], $x.shape[2]]);\n  }\n  util.assert(\n      x4D.rank === 4,\n      () => `Error in fused depthwiseConv2d: input must be rank 4, but got ` +\n          `rank ${x4D.rank}.`);\n  util.assert(\n      $filter.rank === 4,\n      () => `Error in fused depthwiseConv2d: filter must be rank 4, ` +\n          `but got rank ${$filter.rank}.`);\n  util.assert(\n      x4D.shape[3] === $filter.shape[2],\n      () => `Error in fused depthwiseConv2d: number of input channels
 ` +\n          `(${x4D.shape[3]}) must match the inChannels dimension in ` +\n          `filter ${$filter.shape[2]}.`);\n  if (dilations == null) {\n    dilations = [1, 1];\n  }\n  util.assert(\n      conv_util.eitherStridesOrDilationsAreOne(strides, dilations),\n      () =>\n          'Error in fused depthwiseConv2d: Either strides or dilations must ' +\n          `be 1. Got strides ${strides} and dilations '${dilations}'`);\n\n  if (dimRoundingMode != null) {\n    util.assert(\n        util.isInt(pad as number),\n        () => `Error in fused depthwiseConv2d: pad must be an integer when ` +\n            `using dimRoundingMode ${dimRoundingMode} but got pad ${pad}.`);\n  }\n\n  const convInfo = conv_util.computeConv2DInfo(\n      x4D.shape, $filter.shape, strides, dilations, pad, dimRoundingMode,\n      true /* depthwise */);\n\n  let $bias: Tensor;\n  if (bias != null) {\n    $bias = convertToTensor(bias, 'bias', 'fused conv2d');\n    [$bias] = makeTypesMatch($bias, $x);\n\n
   broadcast_util.assertAndGetBroadcastShape(convInfo.outShape, $bias.shape);\n  }\n\n  let $preluActivationWeights: Tensor;\n  if (preluActivationWeights != null) {\n    $preluActivationWeights = convertToTensor(\n        preluActivationWeights, 'prelu weights', 'fused depthwiseConv2d');\n  }\n\n  const grad = (dy: Tensor4D, saved: Tensor[]) => {\n    util.assert(\n        conv_util.tupleValuesAreOne(dilations),\n        () => 'Error in gradient of fused depthwiseConv2d: dilation rates ' +\n            `greater than 1 are not yet supported. Got dilations ` +\n            `'${dilations}'`);\n    const [$filter, x4D, y, bias] = saved;\n\n    const dyActivation = getFusedDyActivation(dy, y, activation) as Tensor4D;\n\n    const xDer = depthwiseConv2dNativeBackpropInput(\n
    (x4D as Tensor4D).shape, dyActivation, $filter as Tensor4D, strides,\n        pad, dilations,
dimRoundingMode);\n    const filterDer = depthwiseConv2dNativeBackpropFilter(\n        x4D as Tensor4D,
```

dyActivation, ($filter
as Tensor4D).shape, strides,\n pad, dilations, dimRoundingMode);\n\n if (bias != null) {\n const biasDer = getFusedBiasGradient($bias, dyActivation);\n return [xDer, filterDer, biasDer];\n }\n return [xDer, filterDer];\n };\n\n const inputs: FusedDepthwiseConv2DInputs = {\n x: x4D,\n filter: $filter,\n bias: $bias,\n preluActivationWeights: $preluActivationWeights\n };\n const attrs: FusedDepthwiseConv2DAttrs = {\n strides,\n pad,\n dataFormat,\n dilations,\n dimRoundingMode,\n activation,\n leakyreluAlpha\n };\n\n // Depending on the the params passed in we will have different number of\n // inputs and thus a a different number of elements in the gradient.\n if (bias == null) {\n const customOp =\n customGrad((x4D: Tensor4D, filter: Tensor4D, save: GradSaveFunc) => {\n // tslint:disable-next-line: no-unnecessary-type-assertion\n let res: Tensor4D|Tensor3D = ENGINE.runKernel(\n FusedDepthwiseConv2D, inputs as {} as NamedTensorMap,\n attrs as {} as NamedAttrMap);\n\n save([filter, x4D, res]);\n\n if (reshapedTo4D) {\n // tslint:disable-next-line: no-unnecessary-type-assertion\n res = reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as\n Tensor3D;\n }\n\n return {value: res, gradFunc: grad};\n });\n return customOp(x4D, $filter) as T;\n } else {\n const customOpWithBias = customGrad(\n (x4D: Tensor4D, filter: Tensor4D, bias: Tensor, save: GradSaveFunc) => {\n // tslint:disable-next-line: no-unnecessary-type-assertion\n let res: Tensor4D|Tensor3D = ENGINE.runKernel(\n FusedDepthwiseConv2D, inputs as {} as NamedTensorMap,\n attrs as {} as NamedAttrMap);\n\n save([filter, x4D, res, bias]);\n\n if (reshapedTo4D) {\n // tslint:disable-next-line: no-unnecessary-type-assertion\n res = reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as\n Tensor3D;\n }\n\n return {value: res, gradFunc: grad};\n });\n\n return customOpWithBias(x4D, $filter, $bias) as T;\n }\n}\nexport const depthwiseConv2d = op({fusedDepthwiseConv2d_});\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {ENGINE} from '../../engine';\nimport {customGrad} from '../../gradients';\nimport {_FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs} from '../../kernel_names';\nimport {NamedAttrMap} from '../../kernel_registry';\nimport {Tensor, Tensor3D} from '../../tensor';\nimport {GradSaveFunc, NamedTensorMap} from '../../tensor_types';\nimport {makeTypesMatch} from '../../tensor_util';\nimport {convertToTensor} from '../../tensor_util_env';\nimport {TensorLike} from '../../types';\nimport * as util from '../../util';\n\nimport {add} from '../add';\nimport * as broadcast_util from '../broadcast_util';\nimport {Activation} from '../fused_types';\nimport {applyActivation, getFusedBiasGradient, getFusedDyActivation, shouldFuse} from '../fused_util';\nimport {matMul as unfusedMatMul} from '../mat_mul';\nimport {op} from '../operation';\nimport {reshape} from '../reshape';\n\n/**\n * Computes the dot product of two matrices with optional activation and
bias.\n *\n * ```js\n * const a = tf.tensor2d([-1, -2], [1, 2]);\n * const b = tf.tensor2d([1, 2, 3, 4], [2, 2]);\n * const bias = tf.tensor2d([1, 2], [1, 2]);\n *\n * tf.fused.matMul({a, b, bias, activation: 'relu'}).print();\n * ```\n *\n * @param obj An object with the following properties:\n * - `a` First matrix in dot product operation.\n * - `b` Second matrix in dot product operation.\n * - `transposeA` If true, `a` is transposed before multiplication.\n * - `transposeB` If true, `b` is transposed before multiplication.\n * - `bias` Matrix to be added to the result.\n * - `activation` Name of activation kernel (defaults to `linear`).\n * - `preluActivationWeights` Tensor of prelu weights.\n * - `leakyreluAlpha` Alpha of leakyrelu.\n */\nfunction fusedMatMul_<T extends Tensor>({\n a,\n b,\n transposeA = false,\n transposeB = false,\n bias,\n activation = 'linear',\n preluActivationWeights,\n leakyreluAlpha,\n}: {\n a: T|TensorLike,\n b: T|TensorLike,\n transposeA?: boolean,\n

```
 transposeB?: boolean,\n  bias?: Tensor|TensorLike,\n  activation?: Activation,\n  preluActivationWeights?:
Tensor\n  leakyreluAlpha?: number\n}): T {\n   if (shouldFuse(ENGINE.state.gradientDepth, activation) === false)
{\n     let result = unfusedMatMul(a, b, transposeA, transposeB);\n     if (bias != null) {\n       result = add(result,
bias);\n     }\n\n     return applyActivation(\n         result, activation, preluActivationWeights, leakyreluAlpha)
as\n         T;\n   }\n\n   let $a = convertToTensor(a, 'a', 'fused matMul');\n   let $b = convertToTensor(b, 'b', 'fused
matMul');\n   [$a, $b] = makeTypesMatch($a, $b);\n\n   const innerShapeA =\n       transposeA ? $a.shape[$a.rank
- 2] : $a.shape[$a.rank - 1];\n   const innerShapeB =\n       transposeB ? $b.shape[$b.rank - 1] : $b.shape[$b.rank -
2];\n\n   const outerShapeA =\n       transposeA ? $a.shape[$a.rank - 1] : $a.shape[$a.rank - 2];\n   const
outerShapeB =\n       transposeB ? $b.shape[$b.rank
 - 2] : $b.shape[$b.rank - 1];\n\n   const outerDimsA = $a.shape.slice(0, -2);\n   const outerDimsB =
$b.shape.slice(0, -2);\n   const batchDimA = util.sizeFromShape(outerDimsA);\n   const batchDimB =
util.sizeFromShape(outerDimsB);\n\n   util.assert(\n       $a.rank >= 2 && $b.rank >= 2 && $a.rank === $b.rank,\n
    () => `Error in fused matMul: inputs must have the same rank of at ` +\n         `least 2, got ranks ${$a.rank}
and ${$b.rank}.`);\n\n   util.assert(\n       util.arraysEqual(outerDimsA, outerDimsB),\n       () => `Error in fused
matMul: outer dimensions (${outerDimsA}) and (` +\n         `${outerDimsB}) of Tensors with shapes ${$a.shape}
and ` +\n         `${$b.shape} must match.`);\n\n   util.assert(\n       innerShapeA === innerShapeB,\n       () =>
`Error in fused matMul: inner shapes (${innerShapeA}) and (` +\n         `${innerShapeB}) of Tensors with shapes
${$a.shape} and ` +\n         `${$b.shape} and transposeA=${transposeA}` +\n
      ` and transposeB=${transposeB} must match.`);\n\n   const outShape = $a.shape.slice(0, -
2).concat([outerShapeA, outerShapeB]);\n\n   const a3D: Tensor3D = transposeA ?\n       reshape($a, [batchDimA,
innerShapeA, outerShapeA]) :\n       reshape($a, [batchDimA, outerShapeA, innerShapeA]);\n   const b3D:
Tensor3D = transposeB ?\n       reshape($b, [batchDimB, outerShapeB, innerShapeB]) :\n       reshape($b,
[batchDimB, innerShapeB, outerShapeB]);\n\n   let $bias: Tensor;\n   if (bias != null) {\n     $bias =
convertToTensor(bias, 'bias', 'fused matMul');\n     [$bias] = makeTypesMatch($bias, $a);\n\n
broadcast_util.assertAndGetBroadcastShape(outShape, $bias.shape);\n   }\n\n   let $preluActivationWeights:
Tensor;\n   if (preluActivationWeights != null) {\n     $preluActivationWeights = convertToTensor(\n
preluActivationWeights, 'prelu weights', 'fused matMul');\n   }\n\n   const grad = (dy: Tensor3D, saved: Tensor[])
=> {\n     const [a3D, b3D,
 y, $bias] = saved;\n     // we reshape dy because the result of the forward is not\n     // necessarily going to be a 3d
tensor due to a reshape done at the end of\n     // the customOp.\n     const dyActivation =\n
getFusedDyActivation(reshape(dy, y.shape), y, activation);\n     let aDer: Tensor;\n     let bDer: Tensor;\n\n     if
(!transposeA && !transposeB) {\n       aDer = unfusedMatMul(dyActivation, b3D, false, true);\n       bDer =
unfusedMatMul(a3D, dyActivation, true, false);\n     } else if (!transposeA && transposeB) {\n       aDer =
unfusedMatMul(dyActivation, b3D, false, false);\n       bDer = unfusedMatMul(dyActivation, a3D, true, false);\n
} else if (transposeA && !transposeB) {\n       aDer = unfusedMatMul(b3D, dyActivation, false, true);\n       bDer =
unfusedMatMul(a3D, dyActivation, false, false);\n     } else {\n       aDer = unfusedMatMul(b3D, dyActivation,
true, true);\n       bDer = unfusedMatMul(dyActivation, a3D, true, true);\n
   }\n\n     if (bias != null) {\n       const biasDer = getFusedBiasGradient($bias, dyActivation);\n       return [aDer,
bDer, biasDer];\n     } else {\n       return [aDer, bDer];\n     }\n   };\n\n   const inputs: _FusedMatMulInputs = {\n
  a: a3D,\n     b: b3D,\n     bias: $bias,\n     preluActivationWeights: $preluActivationWeights\n   };\n   const
attrs: _FusedMatMulAttrs =\n       {transposeA, transposeB, activation, leakyreluAlpha};\n\n   // Depending on the
the params passed in we will have different number of\n   // inputs and thus a a different number of elements in the
gradient.\n   if (bias == null) {\n     const customOp =\n         customGrad((a3D: Tensor3D, b3D: Tensor3D, save:
GradSaveFunc) => {\n           const res =\n               // tslint:disable-next-line: no-unnecessary-type-assertion\n
     ENGINE.runKernel(\n                 _FusedMatMul, inputs as {} as NamedTensorMap,\n                 attrs as {}
as NamedAttrMap) as
 T;\n\n           save([a3D, b3D, res]);\n\n           return {value: reshape(res, outShape), gradFunc: grad};\n         });\n
   return customOp(a3D, b3D) as T;\n   } else {\n     const customOpWithBias = customGrad(\n         (a3D:
```

Tensor3D, b3D: Tensor3D, $bias: Tensor, save: GradSaveFunc) => {\n const res =\n // tslint:disable-next-line: no-unnecessary-type-assertion\n ENGINE.runKernel(\n _FusedMatMul, inputs as {} as NamedTensorMap,\n attrs as {} as NamedAttrMap) as T;\n\n save([a3D, b3D, res, $bias]);\n\n return {value: reshape(res, outShape), gradFunc: grad};\n });\n\n return customOpWithBias(a3D, b3D, $bias) as T;\n }\n }\n\n export const matMul = op({fusedMatMul_});\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {conv2d} from './fused/conv2d';\nimport {depthwiseConv2d} from './fused/depthwise_conv2d';\nimport {matMul} from './fused/mat_mul';\nimport {Activation} from './fused_types';\n\nexport {Activation, conv2d, depthwiseConv2d, matMul};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {Tensor1D} from '../../tensor';\nimport {op} from '../operation';\nimport {cosineWindow} from '../signal_ops_util';\n\n/**\n * Generate a hamming window.\n *\n * See: https://en.wikipedia.org/wiki/Window_function#Hann_and_Hamming_windows\n *\n * ```js\n * tf.signal.hammingWindow(10).print();\n * ```\n * @param The length of window\n *\n * @doc {heading: 'Operations', subheading: 'Signal', namespace: 'signal'}\n */\nfunction hammingWindow_(windowLength: number): Tensor1D {\n return cosineWindow(windowLength, 0.54, 0.46);\n}\nexport const hammingWindow = op({hammingWindow_});\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {Tensor1D} from '../../tensor';\nimport {op} from '../operation';\nimport {cosineWindow} from '../signal_ops_util';\n\n/**\n * Generate a Hann window.\n *\n * See: https://en.wikipedia.org/wiki/Window_function#Hann_and_Hamming_windows\n *\n * ```js\n * tf.signal.hannWindow(10).print();\n * ```\n * @param The length of window\n *\n * @doc {heading: 'Operations', subheading: 'Signal', namespace: 'signal'}\n */\nfunction hannWindow_(windowLength: number): Tensor1D {\n return cosineWindow(windowLength, 0.5, 0.5);\n}\n\nexport const hannWindow = op({hannWindow_});\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed

on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions
and\n * limitations under the License.\n *
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*/\n\nimport {Tensor, Tensor1D} from '../../tensor';\nimport {concat} from '../concat';\nimport {fill} from '../fill';\nimport {op} from '../operation';\nimport {reshape} from '../reshape';\nimport {slice} from '../slice';\nimport {tensor2d} from '../tensor2d';\n\n/**\n * Expands input into frames of frameLength.\n * Slides a window size with frameStep.\n *\n * ```js\n * tf.signal.frame([1, 2, 3], 2, 1).print();\n * ```\n * @param signal The input tensor to be expanded\n * @param frameLength Length of each frame\n * @param frameStep The frame hop size in samples.\n * @param padEnd Whether to pad the end of signal with padValue.\n * @param padValue An number to use where the input signal does\n * not exist when padEnd is True.\n *\n * @doc {heading: 'Operations', subheading: 'Signal', namespace: 'signal'}\n */\nfunction frame_(\n signal: Tensor1D, frameLength:
number, frameStep: number, padEnd = false,\n padValue = 0): Tensor {\n let start = 0;\n const output: Tensor[] = [];\n while (start + frameLength <= signal.size) {\n output.push(slice(signal, start, frameLength));\n start += frameStep;\n }\n\n if (padEnd) {\n while (start < signal.size) {\n const padLen = (start + frameLength) - signal.size;\n const pad = concat([\n slice(signal, start, frameLength - padLen), fill([padLen], padValue)\n]);\n output.push(pad);\n start += frameStep;\n }\n }\n\n if (output.length === 0) {\n return tensor2d([], [0, frameLength]);\n }\n\n return reshape(concat(output), [output.length, frameLength]);\n}\nexport const frame = op({frame_});\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {Tensor, Tensor1D} from '../../tensor';\nimport {concat} from '../concat';\nimport {mul} from '../mul';\nimport {op} from '../operation';\nimport {enclosingPowerOfTwo} from '../signal_ops_util';\nimport {slice} from '../slice';\nimport {rfft} from '../spectral/rfft';\n\nimport {frame} from './frame';\nimport {hannWindow} from './hann_window';\n\n/**\n * Computes the Short-time Fourier Transform of signals\n * See: https://en.wikipedia.org/wiki/Short-time_Fourier_transform\n *\n * ```js\n * const input = tf.tensor1d([1, 1,
1, 1, 1])\n * tf.signal.stft(input, 3, 1).print();\n * ```\n * @param signal 1-dimensional real value tensor.\n * @param frameLength The window length of samples.\n * @param frameStep The number of samples to step.\n * @param fftLength The size of the FFT to apply.\n * @param windowFn A callable that takes a window length and returns 1-d tensor.\n *\n * @doc {heading: 'Operations', subheading: 'Signal', namespace: 'signal'}\n */\nfunction stft_(\n signal: Tensor1D, frameLength: number, frameStep: number,\n fftLength?: number,\n windowFn: (length:
number) => Tensor1D = hannWindow): Tensor {\n if (fftLength == null) {\n fftLength =
enclosingPowerOfTwo(frameLength);\n }\n const framedSignal = frame(signal, frameLength, frameStep);\n const windowedSignal = mul(framedSignal, windowFn(frameLength));\n const output: Tensor[] = [];\n for (let i = 0; i <
framedSignal.shape[0]; i++) {\n output.push(\n rfft(slice(windowedSignal, [i, 0], [1, frameLength]),
fftLength));\n
}\n return concat(output);\n}\nexport const stft = op({stft_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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==========================================================================\n
*/\n\nimport {ENGINE} from '../../engine';\nimport {CropAndResize, CropAndResizeAttrs, CropAndResizeInputs}
from '../../kernel_names';\nimport {NamedAttrMap} from '../../kernel_registry';\nimport {Tensor1D, Tensor2D,
 Tensor4D} from '../../tensor';\nimport {NamedTensorMap} from '../../tensor_types';\nimport {convertToTensor}
from '../../tensor_util_env';\nimport {TensorLike} from '../../types';\nimport * as util from '../../util';\n\nimport {op}
from '../operation';\n\n/**\n * Extracts crops from the input image tensor and resizes them using bilinear\n *
sampling or nearest neighbor sampling (possibly with aspect ratio change)\n * to a common output size specified by
cropSize.\n *\n * @param image 4d tensor of shape `[batch,imageHeight,imageWidth, depth]`,\n *     where
imageHeight and imageWidth must be positive, specifying the\n *     batch of images from which to take crops\n *
@param boxes 2d float32 tensor of shape `[numBoxes, 4]`. Each entry is\n *     `[y1, x1, y2, x2]`, where `(y1, x1)`
and `(y2, x2)` are the normalized\n *     coordinates of the box in the boxInd[i]'th image in the batch\n * @param
boxInd 1d int32 tensor of shape `[numBoxes]` with values in range\n *     `[0, batch)`
 that specifies the image that the `i`-th box refers to.\n * @param cropSize 1d int32 tensor of 2 elements
`[cropHeigh, cropWidth]`\n *     specifying the size to which all crops are resized to.\n * @param method Optional
string from `'bilinear' | 'nearest'`,\n *     defaults to bilinear, which specifies the sampling method for resizing\n *
@param extrapolationValue A threshold for deciding when to remove boxes based\n *     on score. Defaults to 0.\n *
@return A 4D tensor of the shape `[numBoxes,cropHeight,cropWidth,depth]`\n *\n * @doc {heading: 'Operations',
subheading: 'Images', namespace: 'image'}\n */\nfunction cropAndResize_(\n    image: Tensor4D|TensorLike,\n
boxes: Tensor2D|TensorLike,\n    boxInd: Tensor1D|TensorLike,\n    cropSize: [number, number],\n    method:
'bilinear'|'nearest' = 'bilinear',\n    extrapolationValue = 0,\n    ): Tensor4D {\n  const $image =
convertToTensor(image, 'image', 'cropAndResize');\n  const $boxes = convertToTensor(boxes, 'boxes',
'cropAndResize',
 'float32');\n  const $boxInd = convertToTensor(boxInd, 'boxInd', 'cropAndResize', 'int32');\n\n  const numBoxes =
$boxes.shape[0];\n\n  util.assert(\n      $image.rank === 4,\n      () => 'Error in cropAndResize: image must be rank
4,' +\n          `but got rank ${$image.rank}.`);\n  util.assert(\n      $boxes.rank === 2 && $boxes.shape[1] === 4,\n
() => `Error in cropAndResize: boxes must be have size [${numBoxes},4] ` +\n          `but had shape
${$boxes.shape}.`);\n  util.assert(\n      $boxInd.rank === 1 && $boxInd.shape[0] === numBoxes,\n      () => `Error
in cropAndResize: boxInd must be have size [${numBoxes}] ` +\n          `but had shape ${$boxes.shape}.`);\n
util.assert(\n      cropSize.length === 2,\n      () => `Error in cropAndResize: cropSize must be of length 2, but got `
+\n          `length ${cropSize.length}.`);\n  util.assert(\n      cropSize[0] >= 1 && cropSize[1] >= 1,\n      () =>
`cropSize must be atleast [1,1], but was ${cropSize}`);\n  util.assert(\n
    method === 'bilinear' || method === 'nearest',\n      () => `method must be bilinear or nearest, but was
${method}`);\n\n  const inputs:\n      CropAndResizeInputs = {image: $image, boxes: $boxes, boxInd: $boxInd};\n
const attrs: CropAndResizeAttrs = {method, extrapolationValue, cropSize};\n  const res = ENGINE.runKernel(\n
CropAndResize, inputs as {} as NamedTensorMap,\n      attrs as {} as NamedAttrMap);\n  return res as
Tensor4D;\n}\n\nexport const cropAndResize = op({cropAndResize_});\n","/**\n * @license\n * Copyright 2020
Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you
may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF
 ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n *
limitations under the License.\n *
==========================================================================\n
*/\n\nimport {ENGINE} from '../../engine';\nimport {FlipLeftRight, FlipLeftRightInputs} from
'../../kernel_names';\nimport {Tensor4D} from '../../tensor';\nimport {NamedTensorMap} from
'../../tensor_types';\nimport {convertToTensor} from '../../tensor_util_env';\nimport {TensorLike} from
'../../types';\nimport * as util from '../../util';\nimport {op} from '../operation';\n\n/**\n * Flips the image left to right.
```

Currently available in the CPU, WebGL, and\n * WASM backends.\n *\n * @param image 4d tensor of shape `[batch, imageHeight, imageWidth, depth]`.\n */\n/** @doc {heading: 'Operations', subheading: 'Images', namespace: 'image'} */\nfunction flipLeftRight_(image: Tensor4D|TensorLike): Tensor4D {\n const $image = convertToTensor(image, 'image', 'flipLeftRight',
'float32');\n\n util.assert(\n $image.rank === 4,\n   () => 'Error in flipLeftRight: image must be rank 4,' +\n
`but got rank ${$image.rank}.`);\n\n const inputs: FlipLeftRightInputs = {image: $image};\n const res =\n ENGINE.runKernel(FlipLeftRight, inputs as {} as NamedTensorMap, {});\n return res as Tensor4D;\n}\n\nexport const flipLeftRight = op({flipLeftRight_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions
and\n * limitations under the License.\n *
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*/\n\nimport {ENGINE} from '../../engine';\nimport {RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs} from '../../kernel_names';\nimport {NamedAttrMap} from '../../kernel_registry';\nimport {Tensor4D} from '../../tensor';\nimport {NamedTensorMap} from '../../tensor_types';\nimport {convertToTensor} from '../../tensor_util_env';\nimport {TensorLike} from '../../types';\nimport * as util from '../../util';\n\nimport {op} from '../operation';\n\n/**\n * Rotates the input image tensor counter-clockwise with an optional offset\n * center of rotation. Currently available in the CPU, WebGL, and WASM backends.\n *\n * @param image 4d tensor of shape `[batch, imageHeight, imageWidth, depth]`.\n * @param radians The amount of rotation.\n * @param fillValue The value to fill in the empty space leftover\n *   after rotation. Can be either a single grayscale
value (0-255), or an\n *   array of three numbers `[red, green, blue]` specifying the red, green,\n *   and blue channels. Defaults to `0` (black).\n * @param center The center of rotation. Can be either a single value (0-1), or\n *
an array of two numbers `[centerX, centerY]`. Defaults to `0.5` (rotates\n *   the image around its center).\n *\n * @doc {heading: 'Operations', subheading: 'Images', namespace: 'image'}\n */\nfunction rotateWithOffset_(\n image: Tensor4D|TensorLike, radians: number,\n   fillValue: number|[number, number, number] = 0,\n   center: number|[number, number] = 0.5): Tensor4D {\n const $image = convertToTensor(image, 'image', 'rotateWithOffset', 'float32');\n\n util.assert(\n $image.rank === 4,\n   () => 'Error in rotateWithOffset: image must be rank 4,' +\n   `but got rank ${$image.rank}.`);\n\n const inputs: RotateWithOffsetInputs = {image: $image};\n const attrs: RotateWithOffsetAttrs = {radians, fillValue, center};\n const
res = ENGINE.runKernel(\n   RotateWithOffset, inputs as {} as NamedTensorMap,\n   attrs as {} as NamedAttrMap);\n return res as Tensor4D;\n}\n\nexport const rotateWithOffset = op({rotateWithOffset_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {Tensor1D, Tensor2D} from '../tensor';\nimport * as util
from '../util';\n\nfunction nonMaxSuppSanityCheck(\n   boxes: Tensor2D, scores: Tensor1D, maxOutputSize: number,\n   iouThreshold: number, scoreThreshold: number, softNmsSigma?: number): {\n maxOutputSize: number,\n iouThreshold: number,\n scoreThreshold: number,\n softNmsSigma: number\n} {\n if (iouThreshold == null) {\n   iouThreshold = 0.5;\n }\n if (scoreThreshold == null) {\n   scoreThreshold =

Number.NEGATIVE_INFINITY;\n }\n if (softNmsSigma == null) {\n   softNmsSigma = 0.0;\n }\n\n const numBoxes = boxes.shape[0];\n maxOutputSize = Math.min(maxOutputSize, numBoxes);\n\n util.assert(\n   0 <= iouThreshold && iouThreshold <= 1,\n   () => `iouThreshold must be in [0, 1], but was '${iouThreshold}'`);\n util.assert(\n   boxes.rank === 2,\n   () => `boxes must be a 2D tensor, but was of rank '${boxes.rank}'`);\n util.assert(\n   boxes.shape[1] === 4,\n   () =>\n   `boxes must have 4 columns, but 2nd dimension was ${boxes.shape[1]}`);\n
  util.assert(scores.rank === 1, () => 'scores must be a 1D tensor');\n util.assert(\n   scores.shape[0] === numBoxes,\n   () => `scores has incompatible shape with boxes. Expected ${numBoxes}, ` +\n   `but was ${scores.shape[0]}`);\n util.assert(\n   0 <= softNmsSigma && softNmsSigma <= 1,\n   () => `softNmsSigma must be in [0, 1], but was '${softNmsSigma}'`);\n return {maxOutputSize, iouThreshold, scoreThreshold, softNmsSigma};\n}\n\nexport {nonMaxSuppSanityCheck};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either
 express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {ENGINE} from '../../engine';\nimport {NonMaxSuppressionV3} from '../../kernel_names';\nimport {Tensor1D, Tensor2D} from '../../tensor';\nimport {convertToTensor} from '../../tensor_util_env';\nimport {TensorLike} from '../../types';\n\nimport {nonMaxSuppSanityCheck} from '../nonmax_util';\nimport {op} from '../operation';\n\n/**\n * Performs non maximum suppression of bounding boxes based on\n * iou (intersection over union).\n *\n * @param boxes a 2d tensor of shape `[numBoxes, 4]`. Each entry is\n *   `[y1, x1, y2, x2]`, where `(y1, x1)` and `(y2, x2)` are the corners of\n *   the bounding box.\n * @param scores a 1d tensor providing the box scores of shape `[numBoxes]`.\n * @param maxOutputSize The maximum number of boxes to be selected.\n * @param iouThreshold
 A float representing the threshold for deciding whether\n *   boxes overlap too much with respect to IOU. Must be between [0, 1].\n *   Defaults to 0.5 (50% box overlap).\n * @param scoreThreshold A threshold for deciding when to remove boxes based\n *   on score. Defaults to -inf, which means any score is accepted.\n * @return A 1D tensor with the selected box indices.\n *\n * @doc {heading: 'Operations', subheading: 'Images', namespace: 'image'}\n */\nfunction nonMaxSuppression_(\n   boxes: Tensor2D|TensorLike, scores: Tensor1D|TensorLike,\n maxOutputSize: number, iouThreshold = 0.5,\n   scoreThreshold = Number.NEGATIVE_INFINITY): Tensor1D {\n const $boxes = convertToTensor(boxes, 'boxes', 'nonMaxSuppression');\n const $scores = convertToTensor(scores, 'scores', 'nonMaxSuppression');\n\n const inputs = nonMaxSuppSanityCheck(\n $boxes, $scores, maxOutputSize, iouThreshold, scoreThreshold);\n maxOutputSize = inputs.maxOutputSize;\n iouThreshold = inputs.iouThreshold;\n
  scoreThreshold = inputs.scoreThreshold;\n\n const attrs = {maxOutputSize, iouThreshold, scoreThreshold};\n return ENGINE.runKernel(\n   NonMaxSuppressionV3, {boxes: $boxes, scores: $scores}, attrs);\n}\n\nexport const nonMaxSuppression = op({nonMaxSuppression_});\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\n/**\n * Inserts a value into a sorted array. This method allows duplicate, meaning it\n * allows inserting duplicate value, in which case, the element will be inserted\n * at the lowest index of the value.\n * @param arr The array to modify.\n * @param element The element to insert.\n * @param comparator Optional. If no comparator is specified, elements are\n * compared using array_util.defaultComparator, which is suitable for Strings\n * and Numbers in ascending arrays. If the array contains multiple instances of\n * the target value, the left-most instance will be returned. To provide a\n * comparator, it should take 2 arguments to compare and return a negative,\n * zero, or a positive number.\n */\nexport function binaryInsert<T>(\n    arr: T[], element: T, comparator?: (a: T, b: T) => number) {\n  const index = binarySearch(arr, element, comparator);\n  const insertionPoint = index < 0 ? -(index + 1) : index;\n  arr.splice(insertionPoint, 0, element);\n}\n\n/**\n * Searches the array for the target using binary search, returns the index\n * of the found element, or position to insert if element not found. If no\n * comparator is specified, elements are compared using array_\n * util.defaultComparator, which is suitable for Strings and Numbers in\n * ascending arrays. If the array contains multiple instances of the target\n * value, the left-most instance will be returned.\n * @param arr The array to be searched in.\n * @param target The target to be searched for.\n * @param comparator Should take 2 arguments to compare and return a negative,\n *     zero, or a positive number.\n * @return Lowest index of the target value if found, otherwise the insertion\n *     point where the target should be inserted, in the form of\n *     (-insertionPoint - 1).\n */\nexport function binarySearch<T>(\n    arr: T[], target: T, comparator?: (a: T, b: T) => number) {\n  return binarySearch_(arr, target, comparator || defaultComparator);\n}\n\n/**\n * Compares its two arguments for order.\n * @param a The first element to be compared.\n * @param b The second element to be compared.\n * @return A negative number, zero, or a positive number as the first\n *     argument is less than, equal to, or greater than the second.\n */\nfunction defaultComparator<T>(a: T, b: T): number {\n  return a > b ? 1 : a < b ? -1 : 0;\n}\n\nfunction binarySearch_<T>(\n    arr: T[], target: T, comparator: (a: T, b: T) => number) {\n  let left = 0;\n  let right = arr.length;\n  let middle = 0;\n  let found = false;\n  while (left < right) {\n    middle = left + ((right - left) >>> 1);\n    const compareResult = comparator(target, arr[middle]);\n    if (compareResult > 0) {\n      left = middle + 1;\n    } else {\n      right = middle;\n      // If compareResult is 0, the value is found. We record it is found,\n      // and then keep looking because there may be duplicate.\n      found = !compareResult;\n    }\n  }\n\n  return found ? left : -left - 1;\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ============================================================================\n */\n\nimport {TypedArray} from '../types';\nimport {binaryInsert} from './non_max_suppression_util';\n\n/**\n * Implementation of the NonMaxSuppression kernel shared between webgl and cpu.\n */\ninterface Candidate {\n  score: number;\n  boxIndex: number;\n  suppressBeginIndex: number;\n}\n\ninterface NonMaxSuppressionResult {\n  selectedIndices: number[];\n  selectedScores?: number[];\n  validOutputs?: number;\n}\n\nexport function nonMaxSuppressionV3Impl(\n    boxes: TypedArray, scores: TypedArray, maxOutputSize: number,\n    iouThreshold: number, scoreThreshold: number): NonMaxSuppressionResult {\n  return nonMaxSuppressionImpl_(\n      boxes, scores, maxOutputSize, iouThreshold, scoreThreshold,\n      0 /* softNmsSigma */);\n}\n\nexport function nonMaxSuppressionV4Impl(\n    boxes: TypedArray, scores: TypedArray, maxOutputSize: number,\n    iouThreshold: number, scoreThreshold: number,\n    padToMaxOutputSize: boolean): NonMaxSuppressionResult {\n  return nonMaxSuppressionImpl_(\n      boxes, scores, maxOutputSize, iouThreshold, scoreThreshold,\n      0 /* softNmsSigma */, false /* returnScoresTensor */,\n      padToMaxOutputSize /* padToMaxOutputSize */, true\n      /* returnValidOutputs */);\n}\n\nexport function nonMaxSuppressionV5Impl(\n    boxes: TypedArray, scores:
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TypedArray, maxOutputSize: number,\n    iouThreshold: number, scoreThreshold: number,\n    softNmsSigma: number): NonMaxSuppressionResult {\n  return nonMaxSuppressionImpl_(\n      boxes, scores, maxOutputSize, iouThreshold, scoreThreshold, softNmsSigma,\n      true /* returnScoresTensor */);\n}\n\nfunction nonMaxSuppressionImpl_(\n    boxes: TypedArray, scores: TypedArray, maxOutputSize: number,\n    iouThreshold: number, scoreThreshold: number, softNmsSigma: number,\n    returnScoresTensor = false, padToMaxOutputSize = false,\n    returnValidOutputs = false): NonMaxSuppressionResult {\n  // The list is sorted in ascending order, so that we can always pop the\n  // candidate with the largest score in O(1) time.\n  const candidates = [];\n\n  for (let i = 0; i < scores.length; i++) {\n    if (scores[i] > scoreThreshold) {\n      candidates.push({score: scores[i], boxIndex: i, suppressBeginIndex: 0});\n    }\n  }\n\n  candidates.sort(ascendingComparator);\n\n  // If softNmsSigma is 0,
 the outcome of this algorithm is exactly same as\n  // before.\n  const scale = softNmsSigma > 0 ? (-0.5 / softNmsSigma) : 0.0;\n\n  const selectedIndices: number[] = [];\n  const selectedScores: number[] = [];\n\n  while (selectedIndices.length < maxOutputSize && candidates.length > 0) {\n    const candidate = candidates.pop();\n    const {score: originalScore, boxIndex, suppressBeginIndex} = candidate;\n\n    if (originalScore < scoreThreshold) {\n      break;\n    }\n\n    // Overlapping boxes are likely to have similar scores, therefore we\n    // iterate through the previously selected boxes backwards in order to\n    // see if candidate's score should be suppressed. We use\n    // suppressBeginIndex to track and ensure a candidate can be suppressed\n    // by a selected box no more than once. Also, if the overlap exceeds\n    // iouThreshold, we simply ignore the candidate.\n    let ignoreCandidate = false;\n    for (let j = selectedIndices.length - 1; j >= suppressBeginIndex; --j)
 {\n      const iou = intersectionOverUnion(boxes, boxIndex, selectedIndices[j]);\n\n      if (iou >= iouThreshold) {\n        ignoreCandidate = true;\n        break;\n      }\n\n      candidate.score =\n          candidate.score * suppressWeight(iouThreshold, scale, iou);\n\n      if (candidate.score <= scoreThreshold) {\n        break;\n      }\n    }\n\n    // At this point, if `candidate.score` has not dropped below\n    // `scoreThreshold`, then we know that we went through all of the\n    // previous selections and can safely update `suppressBeginIndex` to the\n    // end of the selected array. Then we can re-insert the candidate with\n    // the updated score and suppressBeginIndex back in the candidate list.\n    // If on the other hand, `candidate.score` has dropped below the score\n    // threshold, we will not add it back to the candidates list.\n    candidate.suppressBeginIndex = selectedIndices.length;\n\n    if (!ignoreCandidate) {\n      // Candidate has passed all the
 tests, and is not suppressed, so\n      // select the candidate.\n      if (candidate.score === originalScore) {\n        selectedIndices.push(boxIndex);\n        selectedScores.push(candidate.score);\n      } else if (candidate.score > scoreThreshold) {\n        // Candidate's score is suppressed but is still high enough to be\n        // considered, so add back to the candidates list.\n        binaryInsert(candidates, candidate, ascendingComparator);\n      }\n    }\n  }\n\n  // NonMaxSuppressionV4 feature: padding output to maxOutputSize.\n  const validOutputs = selectedIndices.length;\n  const elemsToPad = maxOutputSize - validOutputs;\n\n  if (padToMaxOutputSize && elemsToPad > 0) {\n    selectedIndices.push(...new Array(elemsToPad).fill(0));\n    selectedScores.push(...new Array(elemsToPad).fill(0.0));\n  }\n\n  const result: NonMaxSuppressionResult = {selectedIndices};\n\n  if (returnScoresTensor) {\n    result['selectedScores'] = selectedScores;\n  }\n\n  if (returnValidOutputs)
 {\n    result['validOutputs'] = validOutputs;\n  }\n\n  return result;\n}\n\nfunction intersectionOverUnion(boxes: TypedArray, i: number, j: number) {\n  const iCoord = boxes.subarray(i * 4, i * 4 + 4);\n  const jCoord = boxes.subarray(j * 4, j * 4 + 4);\n  const yminI = Math.min(iCoord[0], iCoord[2]);\n  const xminI = Math.min(iCoord[1], iCoord[3]);\n  const ymaxI = Math.max(iCoord[0], iCoord[2]);\n  const xmaxI = Math.max(iCoord[1], iCoord[3]);\n  const yminJ = Math.min(jCoord[0], jCoord[2]);\n  const xminJ = Math.min(jCoord[1], jCoord[3]);\n  const ymaxJ = Math.max(jCoord[0], jCoord[2]);\n  const xmaxJ = Math.max(jCoord[1], jCoord[3]);\n  const areaI = (ymaxI - yminI) * (xmaxI - xminI);\n  const areaJ = (ymaxJ - yminJ) * (xmaxJ - xminJ);\n  if (areaI <= 0 || areaJ <= 0) {\n    return 0.0;\n  }\n  const intersectionYmin = Math.max(yminI, yminJ);\n  const intersectionXmin = Math.max(xminI, xminJ);\n  const intersectionYmax = Math.min(ymaxI, ymaxJ);\n  const intersectionXmax = Math.min(xmaxI,
```

xmaxJ);\n const intersectionArea = Math.max(intersectionYmax - intersectionYmin, 0.0) *\n Math.max(intersectionXmax - intersectionXmin, 0.0);\n return intersectionArea / (areaI + areaJ - intersectionArea);\n}\n\n// A Gaussian penalty function, this method always returns values in [0, 1].\n// The weight is a function of similarity, the more overlap two boxes are, the\n// smaller the weight is, meaning highly overlapping boxe will be significantly\n// penalized. On the other hand, a non-overlapping box will not be penalized.\nfunction suppressWeight(iouThreshold: number, scale: number, iou: number) {\n const weight = Math.exp(scale * iou * iou);\n return iou <= iouThreshold ? weight : 0.0;\n}\n\nfunction ascendingComparator(c1: Candidate, c2: Candidate) {\n // For objects with same scores, we make the object with the larger index go\n // first. In an array that pops from the end, this means that the object with\n // the smaller index will be popped first. This ensures the same output as\n // the TensorFlow python version.\n return (c1.score - c2.score) ||\n   ((c1.score === c2.score) && (c2.boxIndex - c1.boxIndex));\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {nonMaxSuppressionV3Impl} from '../../backends/non_max_suppression_impl';\nimport {Tensor1D, Tensor2D}
 from '../../tensor';\nimport {convertToTensor} from '../../tensor_util_env';\nimport {TensorLike} from '../../types';\nimport {nonMaxSuppSanityCheck} from '../nonmax_util';\nimport {tensor1d} from '../tensor1d';\n\n/**\n * Performs non maximum suppression of bounding boxes based on\n * iou (intersection over union).\n *\n * This is the async version of `nonMaxSuppression`\n *\n * @param boxes a 2d tensor of shape `[numBoxes, 4]`. Each entry is\n *   `[y1, x1, y2, x2]`, where `(y1, x1)` and `(y2, x2)` are the corners of\n *   the bounding box.\n * @param scores a 1d tensor providing the box scores of shape `[numBoxes]`.\n * @param maxOutputSize The maximum number of boxes to be selected.\n * @param iouThreshold A float representing the threshold for deciding whether\n *   boxes overlap too much with respect to IOU. Must be between [0, 1].\n *   Defaults to 0.5 (50% box overlap).\n * @param scoreThreshold A threshold for deciding when to remove boxes based\n *   on score. Defaults
 to -inf, which means any score is accepted.\n * @return A 1D tensor with the selected box indices.\n *\n * @doc {heading: 'Operations', subheading: 'Images', namespace: 'image'}\n */\nasync function nonMaxSuppressionAsync_(\n   boxes: Tensor2D|TensorLike, scores: Tensor1D|TensorLike,\n   maxOutputSize: number, iouThreshold = 0.5,\n   scoreThreshold = Number.NEGATIVE_INFINITY): Promise<Tensor1D> {\n const $boxes = convertToTensor(boxes, 'boxes', 'nonMaxSuppressionAsync');\n const $scores = convertToTensor(scores, 'scores', 'nonMaxSuppressionAsync');\n\n const inputs = nonMaxSuppSanityCheck(\n $boxes, $scores, maxOutputSize, iouThreshold, scoreThreshold);\n maxOutputSize = inputs.maxOutputSize;\n iouThreshold = inputs.iouThreshold;\n scoreThreshold = inputs.scoreThreshold;\n\n const boxesAndScores = await Promise.all([$boxes.data(), $scores.data()]);\n const boxesVals = boxesAndScores[0];\n const scoresVals = boxesAndScores[1];\n\n // We call a cpu based impl directly
 with the typedarray data here rather\n // than a kernel because all kernels are synchronous (and thus cannot await\n // .data()).\n const {selectedIndices} = nonMaxSuppressionV3Impl(\n   boxesVals, scoresVals, maxOutputSize, iouThreshold, scoreThreshold);\n if ($boxes !== boxes) {\n $boxes.dispose();\n }\n if ($scores !== scores) {\n $scores.dispose();\n }\n\n return tensor1d(selectedIndices, 'int32');\n}\n\nexport const nonMaxSuppressionAsync = nonMaxSuppressionAsync_;\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,

software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND,
either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n*/\n\nimport {ENGINE} from '../../engine';\nimport {NonMaxSuppressionV5, NonMaxSuppressionV5Attrs, NonMaxSuppressionV5Inputs} from '../../kernel_names';\nimport {NamedAttrMap} from '../../kernel_registry';\nimport {Tensor, Tensor1D, Tensor2D} from '../../tensor';\nimport {NamedTensorMap} from '../../tensor_types';\nimport {convertToTensor} from '../../tensor_util_env';\nimport {TensorLike} from '../../types';\n\nimport {nonMaxSuppSanityCheck} from '../nonmax_util';\nimport {op} from '../operation';\n\n/**\n * Performs non maximum suppression of bounding boxes based on\n * iou (intersection over union).\n *\n * This op also supports a Soft-NMS mode (c.f.\n * Bodla et al, https://arxiv.org/abs/1704.04503) where boxes reduce the score\n * of other overlapping boxes, therefore
favoring different regions of the image\n * with high scores. To enable this Soft-NMS mode, set the `softNmsSigma`\n * parameter to be larger than 0.\n *\n * @param boxes a 2d tensor of shape `[numBoxes, 4]`. Each entry is\n * `[y1, x1, y2, x2]`, where `(y1, x1)` and `(y2, x2)` are the corners of\n * the bounding box.\n * @param scores a 1d tensor providing the box scores of shape `[numBoxes]`.\n * @param maxOutputSize The maximum number of boxes to be selected.\n * @param iouThreshold A float representing the threshold for deciding whether\n * boxes overlap too much with respect to IOU. Must be between [0, 1].\n * Defaults to 0.5 (50% box overlap).\n * @param scoreThreshold A threshold for deciding when to remove boxes based\n * on score. Defaults to -inf, which means any score is accepted.\n * @param softNmsSigma A float representing the sigma parameter for Soft NMS.\n * When sigma is 0, it falls back to nonMaxSuppression.\n * @return A map with the following
properties:\n * - selectedIndices: A 1D tensor with the selected box indices.\n * - selectedScores: A 1D tensor with the corresponding scores for each\n * selected box.\n *\n * @doc {heading: 'Operations', subheading: 'Images', namespace: 'image'}\n */\nfunction nonMaxSuppressionWithScore_(\n boxes: Tensor2D|TensorLike, scores: Tensor1D|TensorLike,\n maxOutputSize: number, iouThreshold = 0.5,\n scoreThreshold = Number.NEGATIVE_INFINITY,\n softNmsSigma = 0.0): NamedTensorMap {\n const $boxes = convertToTensor(boxes, 'boxes', 'nonMaxSuppression');\n const $scores = convertToTensor(scores, 'scores', 'nonMaxSuppression');\n\n const params = nonMaxSuppSanityCheck(\n $boxes, $scores, maxOutputSize, iouThreshold, scoreThreshold,\n softNmsSigma);\n maxOutputSize = params.maxOutputSize;\n iouThreshold = params.iouThreshold;\n scoreThreshold = params.scoreThreshold;\n softNmsSigma = params.softNmsSigma;\n\n const inputs: NonMaxSuppressionV5Inputs
= {boxes: $boxes, scores: $scores};\n const attrs: NonMaxSuppressionV5Attrs =\n {maxOutputSize, iouThreshold, scoreThreshold, softNmsSigma};\n\n // tslint:disable-next-line: no-unnecessary-type-assertion\n const result = ENGINE.runKernel(\n NonMaxSuppressionV5, inputs as {} as NamedTensorMap,\n attrs as {} as NamedAttrMap) as Tensor[];\n\n return {selectedIndices: result[0], selectedScores: result[1]};\n}\n\nexport const nonMaxSuppressionWithScore = op({nonMaxSuppressionWithScore_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT
WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n*/\nimport {nonMaxSuppressionV5Impl} from '../../backends/non_max_suppression_impl';\nimport {Tensor1D, Tensor2D} from '../../tensor';\nimport {NamedTensorMap} from '../../tensor_types';\nimport {convertToTensor}

from '../../tensor_util_env';\nimport {TensorLike} from '../../types';\nimport {nonMaxSuppSanityCheck} from '../nonmax_util';\nimport {tensor1d} from '../tensor1d';\n\n/**\n * Asynchronously performs non maximum suppression of bounding boxes based on\n * iou (intersection over union).\n *\n * This op also supports a Soft-NMS mode (c.f.\n * Bodla et al, https://arxiv.org/abs/1704.04503) where boxes reduce the score\n * of other overlapping boxes, therefore favoring different regions of the image\n * with high scores. To enable this Soft-NMS mode, set the `softNmsSigma`\n * parameter to be larger than 0.\n *\n * @param boxes a 2d tensor of shape `[numBoxes, 4]`. Each entry is\n *   `[y1, x1, y2, x2]`, where `(y1, x1)` and `(y2, x2)` are the corners of\n *   the bounding box.\n * @param scores a 1d tensor providing the box scores of shape `[numBoxes]`.\n * @param maxOutputSize The maximum number of boxes to be selected.\n * @param iouThreshold A float representing the threshold for deciding whether\n *   boxes overlap too much with respect to IOU. Must be between [0, 1].\n *   Defaults to 0.5 (50% box overlap).\n * @param scoreThreshold A threshold for deciding when to remove boxes based\n *   on score. Defaults to -inf, which means any score is accepted.\n * @param softNmsSigma A float representing the sigma parameter for Soft NMS.\n *   When sigma is 0, it falls back to nonMaxSuppression.\n * @return A map with the following properties:\n *   - selectedIndices: A 1D tensor with the selected box indices.\n *   - selectedScores: A 1D tensor with the corresponding scores for each\n *   selected box.\n *\n * @doc {heading: 'Operations', subheading: 'Images', namespace: 'image'}\n */\nasync function nonMaxSuppressionWithScoreAsync_(\n   boxes: Tensor2D|TensorLike, scores: Tensor1D|TensorLike,\n   maxOutputSize: number, iouThreshold = 0.5,\n   scoreThreshold = Number.NEGATIVE_INFINITY,\n   softNmsSigma = 0.0): Promise<NamedTensorMap> {\n const $boxes = convertToTensor(boxes, 'boxes', 'nonMaxSuppressionAsync');\n const $scores = convertToTensor(scores, 'scores', 'nonMaxSuppressionAsync');\n\n const params = nonMaxSuppSanityCheck(\n $boxes, $scores, maxOutputSize, iouThreshold, scoreThreshold,\n   softNmsSigma);\n maxOutputSize = params.maxOutputSize;\n iouThreshold = params.iouThreshold;\n scoreThreshold = params.scoreThreshold;\n softNmsSigma = params.softNmsSigma;\n\n const boxesAndScores = await Promise.all([$boxes.data(), $scores.data()]);\n const boxesVals = boxesAndScores[0];\n const scoresVals = boxesAndScores[1];\n\n // We call a cpu based impl directly with the typedarray data here rather\n // than a kernel because all kernels are synchronous (and thus cannot await\n // .data()).\n const {selectedIndices, selectedScores} = nonMaxSuppressionV5Impl(\n   boxesVals, scoresVals, maxOutputSize, iouThreshold, scoreThreshold,\n   softNmsSigma);\n\n if ($boxes !== boxes) {\n $boxes.dispose();\n }\n if ($scores !== scores) {\n $scores.dispose();\n }\n\n return {\n   selectedIndices: tensor1d(selectedIndices, 'int32'),\n   selectedScores: tensor1d(selectedScores)\n };\n}\n\nexport const nonMaxSuppressionWithScoreAsync = nonMaxSuppressionWithScoreAsync_;\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {ENGINE} from '../../engine';\nimport {NonMaxSuppressionV4, NonMaxSuppressionV4Attrs, NonMaxSuppressionV4Inputs} from '../../kernel_names';\nimport {NamedAttrMap} from '../../kernel_registry';\nimport {Tensor, Tensor1D, Tensor2D} from '../../tensor';\nimport {NamedTensorMap} from '../../tensor_types';\nimport {convertToTensor} from '../../tensor_util_env';\nimport {TensorLike} from '../../types';\n\nimport {nonMaxSuppSanityCheck} from '../nonmax_util';\nimport {op} from '../operation';\n\n/**\n * Asynchronously performs non maximum suppression of bounding boxes based on\n * iou (intersection over union), with an option to pad results.\n *\n * @param boxes a 2d tensor of shape `[numBoxes, 4]`. Each entry is\n *   `[y1, x1, y2, x2]`, where `(y1, x1)` and `(y2, x2)` are the corners of\n *   the bounding box.\n * @param scores a 1d tensor providing the box scores of shape `[numBoxes]`.\n * @param maxOutputSize The maximum number of boxes to be selected.\n *

@param iouThreshold A float representing the threshold for deciding whether\n *   boxes overlap too much with respect to IOU. Must be between [0, 1].\n *   Defaults to 0.5 (50% box overlap).\n * @param scoreThreshold A threshold for deciding when to remove boxes based\n *   on score. Defaults to -inf, which means any score is accepted.\n * @param padToMaxOutputSize Defalts to false. If true, size of output\n *   `selectedIndices` is padded to maxOutputSize.\n * @return A map with the following properties:\n *   - selectedIndices: A 1D tensor with the selected box indices.\n *   - validOutputs: A scalar denoting how many elements in `selectedIndices`\n *   are valid. Valid elements occur first, then padding.\n *\n * @doc {heading: 'Operations', subheading: 'Images', namespace: 'image'}\n */\nfunction nonMaxSuppressionPadded_(\n   boxes: Tensor2D|TensorLike, scores: Tensor1D|TensorLike,\n   maxOutputSize: number, iouThreshold = 0.5,\n   scoreThreshold = Number.NEGATIVE_INFINITY,\n   padToMaxOutputSize = false): NamedTensorMap {\n const $boxes = convertToTensor(boxes, 'boxes', 'nonMaxSuppression');\n const $scores = convertToTensor(scores, 'scores', 'nonMaxSuppression');\n\n const params = nonMaxSuppSanityCheck(\n $boxes, $scores, maxOutputSize, iouThreshold, scoreThreshold,\n   null /* softNmsSigma */);\n const $maxOutputSize = params.maxOutputSize;\n const $iouThreshold = params.iouThreshold;\n const $scoreThreshold = params.scoreThreshold;\n\n const inputs: NonMaxSuppressionV4Inputs = {boxes: $boxes, scores: $scores};\n const attrs: NonMaxSuppressionV4Attrs = {\n   maxOutputSize: $maxOutputSize,\n   iouThreshold: $iouThreshold,\n   scoreThreshold: $scoreThreshold,\n   padToMaxOutputSize\n };\n\n // tslint:disable-next-line: no-unnecessary-type-assertion\n const result = ENGINE.runKernel(\n   NonMaxSuppressionV4, inputs as {} as NamedTensorMap,\n   attrs as {} as NamedAttrMap) as Tensor[];\n\n return {selectedIndices: result[0], validOutputs: result[1]};\n}\n\nexport const nonMaxSuppressionPadded = op({nonMaxSuppressionPadded_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ==\n */\nimport {nonMaxSuppressionV4Impl} from '../../backends/non_max_suppression_impl';\nimport {Tensor1D, Tensor2D} from '../../tensor';\nimport {NamedTensorMap} from '../../tensor_types';\nimport {convertToTensor} from '../../tensor_util_env';\nimport {TensorLike} from '../../types';\nimport {nonMaxSuppSanityCheck} from '../nonmax_util';\nimport {scalar} from '../scalar';\nimport {tensor1d} from '../tensor1d';\n\n/**\n * Asynchronously performs non maximum suppression of bounding boxes based on\n * iou (intersection over union), with an option to pad results.\n *\n * @param boxes a 2d tensor of shape `[numBoxes, 4]`. Each entry is\n *   `[y1, x1, y2, x2]`, where `(y1, x1)` and `(y2, x2)` are the corners of\n *   the bounding box.\n * @param scores a 1d tensor providing the box scores of shape `[numBoxes]`.\n * @param maxOutputSize The maximum number of boxes to be selected.\n * @param iouThreshold A float representing the threshold for deciding whether\n *   boxes overlap too much with respect to IOU. Must be between [0, 1].\n *   Defaults to 0.5 (50% box overlap).\n * @param scoreThreshold A threshold for deciding when to remove boxes based\n *   on score. Defaults to -inf, which means any score is accepted.\n * @param padToMaxOutputSize Defalts to false. If true, size of output\n *   `selectedIndices` is padded to maxOutputSize.\n * @return A map with the following properties:\n *   - selectedIndices: A 1D tensor with the selected box indices.\n *   - validOutputs: A scalar denoting how many elements in `selectedIndices`\n *   are valid. Valid elements occur first, then padding.\n *\n * @doc {heading: 'Operations', subheading: 'Images', namespace: 'image'}\n */\nasync function nonMaxSuppressionPaddedAsync_(\n   boxes: Tensor2D|TensorLike, scores: Tensor1D|TensorLike,\n   maxOutputSize: number, iouThreshold = 0.5,\n   scoreThreshold = Number.NEGATIVE_INFINITY,\n   padToMaxOutputSize = false): Promise<NamedTensorMap> {\n const

$boxes = convertToTensor(boxes, 'boxes', 'nonMaxSuppressionAsync');\n const $scores = convertToTensor(scores, 'scores', 'nonMaxSuppressionAsync');\n\n const params = nonMaxSuppSanityCheck(\n $boxes, $scores, maxOutputSize, iouThreshold, scoreThreshold,\n   null /* softNmsSigma */);\n const $maxOutputSize = params.maxOutputSize;\n const $iouThreshold = params.iouThreshold;\n const $scoreThreshold = params.scoreThreshold;\n\n const [boxesVals, scoresVals] =\n   await Promise.all([$boxes.data(), $scores.data()]);\n\n // We call a cpu based impl directly with the typedarray data here rather\n // than a kernel because all kernels are synchronous (and thus cannot await\n // .data()).\n const {selectedIndices, validOutputs} = nonMaxSuppressionV4Impl(\n   boxesVals, scoresVals, $maxOutputSize, $iouThreshold, $scoreThreshold,\n   padToMaxOutputSize);\n\n if ($boxes !== boxes) {\n $boxes.dispose();\n }\n if ($scores !== scores) {\n $scores.dispose();\n }\n\n return {\n   selectedIndices: tensor1d(selectedIndices, 'int32'),\n   validOutputs: scalar(validOutputs, 'int32')\n };\n}\n\nexport const nonMaxSuppressionPaddedAsync = nonMaxSuppressionPaddedAsync_;\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS
 OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {ENGINE} from '../../engine';\nimport {ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs} from '../../kernel_names';\nimport {NamedAttrMap} from '../../kernel_registry';\nimport {Tensor3D, Tensor4D} from '../../tensor';\nimport {NamedTensorMap} from '../../tensor_types';\nimport {convertToTensor} from '../../tensor_util_env';\nimport {TensorLike} from '../../types';\nimport * as util from '../../util';\n\nimport {op} from '../operation';\nimport {reshape} from '../reshape';\n\n/**\n * Bilinear resize a single 3D image or a batch of 3D images to a new shape.\n *\n * @param images The images, of rank 4 or rank 3, of shape\n *   `[batch, height, width, inChannels]`. If rank 3, batch of 1 is assumed.\n * @param size The new shape `[newHeight, newWidth]` to resize the\n *   images to. Each channel is resized individually.\n * @param alignCorners Defaults to `false`. If true, rescale\n *   input by `(new_height - 1) / (height - 1)`, which exactly aligns the 4\n *   corners of images and resized images. If false, rescale by\n *   `new_height / height`. Treat similarly the width dimension.\n * @param halfPixelCenters Defaults to `false`. Whether to assume pixel centers\n *   are at 0.5, which would make the floating point coordinates of the top\n *   left pixel 0.5, 0.5.\n *\n * @doc {heading: 'Operations', subheading: 'Images', namespace: 'image'}\n */\nfunction resizeBilinear_<T extends Tensor3D|Tensor4D>(\n   images: T|TensorLike, size: [number, number], alignCorners = false,\n   halfPixelCenters = false): T {\n const $images = convertToTensor(images, 'images', 'resizeBilinear');\n\n util.assert(\n $images.rank === 3 || $images.rank === 4,\n   () => `Error in resizeBilinear: x must be rank 3 or 4,
 but got ` +\n          `rank ${$images.rank}.`);\n  util.assert(\n      size.length === 2,\n      () => `Error in resizeBilinear: new shape must 2D, but got shape ` +\n          `${size}.`);\n  util.assert(\n      halfPixelCenters === false || alignCorners === false,\n      () => `Error in resizeBilinear: If halfPixelCenters is true, ` +\n          `alignCorners must be false.`);\n\n let batchImages = $images as Tensor4D;\n let reshapedTo4D = false;\n if ($images.rank === 3) {\n   reshapedTo4D = true;\n   batchImages = reshape(\n $images, [1, $images.shape[0], $images.shape[1], $images.shape[2]]);\n }\n\n const [] = size;\n\n const inputs: ResizeBilinearInputs = {images: batchImages};\n const attrs: ResizeBilinearAttrs = {alignCorners, halfPixelCenters, size};\n\n // tslint:disable-next-line: no-unnecessary-type-assertion\n const res = ENGINE.runKernel(\n   ResizeBilinear, inputs as {} as NamedTensorMap,\n   attrs as {} as NamedAttrMap) as
 T;\n\n if (reshapedTo4D) {\n   return reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as T;\n }\n return res;\n}\n\nexport const resizeBilinear = op({resizeBilinear_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not

use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {ENGINE} from '../../engine';\nimport {ResizeNearestNeighbor, ResizeNearestNeighborAttrs, ResizeNearestNeighborInputs} from '../../kernel_names';\nimport {NamedAttrMap} from '../../kernel_registry';\nimport {Tensor3D, Tensor4D} from '../../tensor';\nimport {NamedTensorMap} from '../../tensor_types';\nimport {convertToTensor} from '../../tensor_util_env';\nimport {TensorLike} from '../../types';\nimport * as util from '../../util';\n\nimport {op} from '../operation';\nimport {reshape} from '../reshape';\n\n/**\n * NearestNeighbor resize a batch of 3D images to a new shape.\n *\n * @param images The images, of rank 4 or rank 3, of shape\n * `[batch, height, width, inChannels]`. If rank 3, batch of 1 is assumed.\n * @param size The new shape `[newHeight, newWidth]` to resize the\n * images to. Each channel is resized individually.\n * @param alignCorners Defaults to False. If true, rescale\n * input by `(new_height - 1) / (height - 1)`, which exactly aligns the 4\n * corners of images and resized images. If false, rescale by\n * `new_height / height`.
Treat similarly the width dimension.\n * @param halfPixelCenters Defaults to `false`. Whether to assumes pixels are of\n * half the actual dimensions, and yields more accurate resizes. This flag\n * would also make the floating point coordinates of the top left pixel\n * 0.5, 0.5.\n *\n * @doc {heading: 'Operations', subheading: 'Images', namespace: 'image'}\n */\nfunction resizeNearestNeighbor_<T extends Tensor3D|Tensor4D>(\n images: T|TensorLike, size: [number, number], alignCorners = false,\n halfPixelCenters = false): T {\n const $images = convertToTensor(images, 'images', 'resizeNearestNeighbor');\n\n util.assert(\n $images.rank === 3 || $images.rank === 4,\n () => `Error in resizeNearestNeighbor: x must be rank 3 or 4, but got ` +\n `rank ${$images.rank}.`);\n util.assert(\n size.length === 2,\n () =>\n `Error in resizeNearestNeighbor: new shape must 2D, but got shape ` +\n `${size}.`);\n util.assert(\n $images.dtype === 'float32' || $images.dtype === 'int32',\n () => '`images` must have `int32` or `float32` as dtype');\n util.assert(\n halfPixelCenters === false || alignCorners === false,\n () => `Error in resizeNearestNeighbor: If halfPixelCenters is true, ` +\n `alignCorners must be false.`);\n let batchImages = $images as Tensor4D;\n let reshapedTo4D = false;\n if ($images.rank === 3) {\n reshapedTo4D = true;\n batchImages = reshape(\n $images, [1, $images.shape[0], $images.shape[1], $images.shape[2]]);\n }\n const [] = size;\n\n const inputs: ResizeNearestNeighborInputs = {images: batchImages};\n const attrs:\n ResizeNearestNeighborAttrs = {alignCorners, halfPixelCenters, size};\n\n // tslint:disable-next-line: no-unnecessary-type-assertion\n const res = ENGINE.runKernel(\n ResizeNearestNeighbor, inputs as {} as NamedTensorMap,\n attrs as {} as NamedAttrMap) as T;\n\n if (reshapedTo4D) {\n return reshape(res, [res.shape[1], res.shape[2], res.shape[3]]) as T;\n }\n return res;\n}\n\nexport const resizeNearestNeighbor = op({resizeNearestNeighbor_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {Tensor} from '../../tensor';\nimport {convertToTensor} from '../../tensor_util_env';\nimport {TensorLike}
from '../../types';\nimport {assert} from '../../util';\n\nimport {greaterEqual} from '../greater_equal';\nimport {lessEqual} from '../less_equal';\nimport {logicalAnd} from '../logical_and';\nimport {op} from

'../operation';\nimport {range} from '../range';\nimport {reshape} from '../reshape';\nimport {scalar} from '../scalar';\nimport {stack} from '../stack';\nimport {sub} from '../sub';\nimport {unstack} from '../unstack';\nimport {where} from '../where';\nimport {zeros} from '../zeros';\n\n/**\n * Copy a tensor setting everything outside a central band in each innermost\n * matrix to zero.\n *\n * The band part is computed as follows: Assume input has `k` dimensions\n * `[I, J, K, ..., M, N]`, then the output is a tensor with the same shape where\n * `band[i, j, k, ..., m, n] = in_band(m, n) * input[i, j, k, ..., m, n]`.\n * The indicator function\n * `in_band(m, n) = (num_lower < 0 || (m-n) <= num_lower))`\n * `&& (num_upper < 0 || (n-m) <= num_upper)`\n *\n * ```js\n *
const x = tf.tensor2d([[0, 1, 2, 3],\n *   [-1, 0, 1, 2],\n *   [-2, -1, 0, 1],\n *
[-3, -2, -1, 0]]);\n * let y = tf.linalg.bandPart(x, 1, -1);\n * y.print(); // [[0, 1, 2, 3],\n *   // [-1, 0, 1, 2],\n *
// [0, -1, 0, 1],\n *   // [0, 0 , -1, 0]]\n * let z = tf.linalg.bandPart(x, 2, 1);\n * z.print(); // [[0, 1, 0, 0],\n
*   // [-1, 0, 1, 0],\n *   // [-2, -1, 0, 1],\n *   // [0, -2, -1, 0]]\n * ```\n *\n * @param x Rank `k` tensor\n * @param numLower Number of subdiagonals to keep.\n *   If negative, keep entire lower triangle.\n * @param numUpper Number of subdiagonals to keep.\n *   If negative, keep entire upper triangle.\n * @returns Rank `k` tensor of the same shape as input.\n *   The extracted banded tensor.\n *\n * @doc {heading:'Operations', subheading:'Linear Algebra', namespace:'linalg'}\n */\nfunction bandPart_<T extends Tensor>(\n
a: T|TensorLike, numLower: number, numUpper: number): T {\n assert(\n   numLower % 1 === 0,\n   () => `bandPart(): numLower must be an integer, got ${numLower}.`);\n assert(\n   numUpper % 1 === 0,\n   () => `bandPart(): numUpper must be an integer, got ${numUpper}.`);\n\n const $a = convertToTensor(a, 'a', 'bandPart');\n\n assert(\n $a.rank >= 2,\n   () => `bandPart(): Rank must be at least 2, got ${$a.rank}.`);\n\n const shape = $a.shape;\n const [M, N] = $a.shape.slice(-2);\n\n if (!(numLower <= M)) {\n   throw new Error(\n
`bandPart(): numLower (${numLower})` +\n   ` must not be greater than the number of rows (${M}).`);\n }\n if (!(numUpper <= N)) {\n   throw new Error(\n   `bandPart(): numUpper (${numUpper})` +\n   ` must not be greater than the number of columns (${N}).`);\n }\n\n if (numLower < 0) {\n   numLower = M;\n }\n if (numUpper < 0) {\n   numUpper = N;\n }\n\n const i = reshape(range(0, M, 1, 'int32'),
[-1, 1]);\n const j = range(0, N, 1, 'int32');\n const ij = sub(i, j);\n\n const inBand = logicalAnd(\n   lessEqual(ij, scalar(+numLower, 'int32')),\n   greaterEqual(ij, scalar(-numUpper, 'int32')));\n\n const zero = zeros([M, N], $a.dtype);\n\n return reshape(\n   stack(unstack(reshape($a, [-1, M, N]))\n   .map(mat => where(inBand, mat, zero))),\n   shape) as T;\n}\n\nexport const bandPart = op({bandPart_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n
* See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ENGINE} from '../../engine';\nimport {Tensor1D, Tensor2D} from '../../tensor';\nimport {assert} from '../../util';\n\nimport {div} from '../div';\nimport {mul} from '../mul';\nimport {norm} from '../norm';\nimport {op} from '../operation';\nimport {split} from '../split';\nimport {squeeze} from '../squeeze';\nimport {stack} from '../stack';\nimport {sub} from '../sub';\nimport {sum} from '../sum';\n\n/**\n * Gram-Schmidt orthogonalization.\n *\n * ```js\n * const x = tf.tensor2d([[1, 2], [3, 4]]);\n * let y = tf.linalg.gramSchmidt(x);\n * y.print();\n * console.log('Othogonalized:');\n * y.dot(y.transpose()).print(); // should be nearly the identity matrix.\n * console.log('First row direction maintained:');\n * const data = await y.array();\n * console.log(data[0][1] / data[0][0]);
// should be nearly 2.\n * ```\n *\n * @param xs The vectors to be orthogonalized, in one of the two following\n * formats:\n *   - An Array of `tf.Tensor1D`.\n *   - A `tf.Tensor2D`, i.e., a matrix, in which case the vectors are the rows\n *   of `xs`.\n *   In each case, all the vectors must have the same length and the length\n *   must be greater than or equal to the number of vectors.\n * @returns The orthogonalized and normalized vectors or matrix.\n * Orthogonalization means that the vectors or the rows of the matrix\n *   are orthogonal (zero inner products).

Normalization means that each\n * vector or each row of the matrix has an L2 norm that equals `1`.\n *\n * @doc {heading:'Operations', subheading:'Linear Algebra', namespace:'linalg'}\n */\nfunction gramSchmidt_(xs: Tensor1D[]|Tensor2D): Tensor1D[]|Tensor2D {\n let inputIsTensor2D: boolean;\n if (Array.isArray(xs)) {\n inputIsTensor2D = false;\n assert(\n xs != null && xs.length > 0,\n () => 'Gram-Schmidt process: input must not be null, undefined, or ' +\n 'empty');\n const dim = xs[0].shape[0];\n for (let i = 1; i < xs.length; ++i) {\n assert(\n xs[i].shape[0] === dim,\n () =>\n 'Gram-Schmidt: Non-unique lengths found in the input vectors: ' +\n `(${(xs as Tensor1D[])[i].shape[0]} vs. ${dim})`);\n }\n } else {\n inputIsTensor2D = true;\n xs = split(xs, xs.shape[0], 0).map(x => squeeze(x, [0]));\n }\n\n assert(\n xs.length <= xs[0].shape[0],\n () => `Gram-Schmidt: Number of vectors (${\n  (xs as Tensor1D[]).length}) exceeds ` +\n `number of dimensions (${(xs as Tensor1D[])[0].shape[0]}).`);\n\n const ys: Tensor1D[] = [];\n const xs1d = xs;\n for (let i = 0; i < xs.length; ++i) {\n ys.push(ENGINE.tidy(() => {\n let x = xs1d[i];\n if (i > 0) {\n for (let j = 0; j < i; ++j) {\n const proj = mul(sum(mul(ys[j], x)), ys[j]);\n x = sub(x, proj);\n }\n }\n return div(x, norm(x, 'euclidean'));\n }));\n }\n\n if (inputIsTensor2D) {\n return stack(ys, 0) as Tensor2D;\n } else {\n return ys;\n }\n}\n\nexport const gramSchmidt = op({gramSchmidt_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\nimport {ENGINE} from '../../engine';\nimport {dispose} from '../../globals';\nimport {Tensor, Tensor2D} from '../../tensor';\nimport {assert} from '../../util';\n\nimport {clone} from '../clone';\nimport {concat} from '../concat';\nimport {div} from '../div';\nimport {eye} from '../eye';\nimport {greater} from '../greater';\nimport {matMul} from '../mat_mul';\nimport {mul} from '../mul';\nimport {neg} from '../neg';\nimport {norm} from '../norm';\nimport {op} from '../operation';\nimport {reshape} from '../reshape';\nimport {slice} from '../slice';\nimport {stack} from '../stack';\nimport {sub} from '../sub';\nimport {tensor2d} from '../tensor2d';\nimport {transpose} from '../transpose';\nimport {unstack} from '../unstack';\nimport {where} from '../where';\n\n/**\n * Compute QR decomposition of m-by-n matrix using Householder transformation.\n *\n * Implementation based on\n * [http://www.cs.cornell.edu/~bindel/class/cs6210-f09/lec18.pdf]\n * (http://www.cs.cornell.edu/~bindel/class/cs6210-f09/lec18.pdf)\n *\n * ```js\n * const a = tf.tensor2d([[1, 2], [3, 4]]);\n * let [q, r] = tf.linalg.qr(a);\n * console.log('Q');\n * q.print();\n * console.log('R');\n * r.print();\n * console.log('Orthogonalized');\n * q.dot(q.transpose()).print() // should be nearly the identity matrix.\n * console.log('Reconstructed');\n * q.dot(r).print(); // should be nearly [[1, 2], [3, 4]];\n * ```\n *\n * @param x The `tf.Tensor` to be QR-decomposed. Must have rank >= 2. Suppose\n * it has the shape `[..., M, N]`.\n * @param fullMatrices An optional boolean parameter. Defaults to `false`.\n * If `true`, compute full-sized `Q`. If `false` (the default),\n * compute only the leading N columns of `Q` and `R`.\n * @returns An `Array` of two `tf.Tensor`s: `[Q, R]`. `Q` is a unitary matrix,\n * i.e., its columns all have unit norm and are mutually orthogonal.\n * If `M >= N`,\n * If `fullMatrices` is `false` (default),\n * - `Q` has a shape of `[..., M, N]`,\n * - `R` has a shape of `[..., N, N]`.\n * If `fullMatrices` is `true` (default),\n * - `Q` has a shape of `[..., M, M]`,\n * - `R` has a shape of `[..., M, N]`.\n * If `M < N`,\n * - `Q` has a shape of `[..., M, M]`,\n * - `R` has a shape of `[..., M, N]`.\n * @throws If the rank of `x` is less than 2.\n *\n * @doc {heading:'Operations',\n * subheading:'Linear Algebra',\n * namespace:'linalg'}\n */\nfunction qr_(x: Tensor, fullMatrices = false): [Tensor, Tensor] {\n assert(\n x.rank >= 2,\n () => `qr() requires input tensor to have a rank >= 2, but got rank ${\n  x.rank}`);\n\n if (x.rank === 2) {\n return qr2d(x as Tensor2D, fullMatrices);\n } else {\n // Rank > 2.\n // TODO(cais): Below

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we split the input into individual 2D tensors,\n    // perform QR decomposition on them and then stack the results back\n    // together. We should explore whether this can be parallelized.\n    const outerDimsProd = x.shape.slice(0, x.shape.length - 2)\n                .reduce((value, prev) => value * prev);\n    const x2ds = unstack(\n        reshape(\n            x,\n            [\n                outerDimsProd, x.shape[x.shape.length - 2],\n                x.shape[x.shape.length - 1]\n            ]),\n        0);\n    const q2ds: Tensor2D[] = [];\n    const r2ds: Tensor2D[] = [];\n    x2ds.forEach(x2d => {\n      const [q2d, r2d] = qr2d(x2d as Tensor2D, fullMatrices);\n      q2ds.push(q2d);\n      r2ds.push(r2d);\n    });\n    const q = reshape(stack(q2ds, 0), x.shape);\n    const r = reshape(stack(r2ds, 0), x.shape);\n    return [q, r];\n  }\n}\n\nfunction qr2d(x: Tensor2D, fullMatrices = false): [Tensor2D, Tensor2D] {\n  return ENGINE.tidy(() => {\n    assert(\n        x.shape.length === 2,\n        () => `qr2d() requires a 2D Tensor, but got a ${\n            x.shape.length}D Tensor.`);\n\n    const m = x.shape[0];\n    const n = x.shape[1];\n\n    let q = eye(m);    // Orthogonal transform so far.\n    let r = clone(x);  // Transformed matrix so far.\n\n    const one2D = tensor2d([[1]], [1, 1]);\n    let w: Tensor2D = clone(one2D);\n\n    const iters = m >= n ? n : m;\n    for (let j = 0; j < iters; ++j) {\n      // This tidy within the for-loop ensures we clean up temporary\n      // tensors as soon as they are no longer needed.\n      const rTemp = r;\n      const wTemp = w;\n      const qTemp = q;\n      [w, r, q] = ENGINE.tidy((): [Tensor2D, Tensor2D, Tensor2D] => {\n        // Find H = I - tau * w * w', to put zeros below R(j, j).\n        const rjEnd1 = slice(r, [j, j], [m - j, 1]);\n        const normX = norm(rjEnd1);\n        const rjj = slice(r, [j, j], [1, 1]);\n\n        // The sign() function returns 0 on 0, which causes division by zero.\n        const s = where(greater(rjj, 0), tensor2d([[-1]]), tensor2d([[1]]));\n\n        const u1 = sub(rjj, mul(s, normX));\n        const wPre = div(rjEnd1, u1);\n        if (wPre.shape[0] === 1) {\n          w = clone(one2D);\n        } else {\n          w = concat(\n              [\n                one2D,\n                slice(wPre, [1, 0], [wPre.shape[0] - 1, wPre.shape[1]])\n              ] as\n              Tensor2D\n              ],\n              0);\n        }\n        const tau = neg(div(matMul(s, u1), normX)) as Tensor2D;\n\n        // -- R := HR, Q := QH.\n        const rjEndAll = slice(r, [j, 0], [m - j, n]);\n        const tauTimesW: Tensor2D = mul(tau, w);\n        const wT: Tensor2D = transpose(w);\n        if (j === 0) {\n          r = sub(rjEndAll, matMul(tauTimesW, matMul(wT, rjEndAll)));\n        } else {\n          const rTimesTau: Tensor2D =\n              sub(rjEndAll, matMul(tauTimesW, matMul(wT, rjEndAll)));\n          r = concat([slice(r, [0, 0], [j, n]), rTimesTau], 0);\n        }\n        const tawTimesWT: Tensor2D = transpose(tauTimesW);\n        const qAllJEnd = slice(q, [0, j], [m, q.shape[1] - j]);\n        if (j === 0) {\n          q = sub(qAllJEnd, matMul(matMul(qAllJEnd, w), tawTimesWT));\n        } else {\n          const qTimesTau: Tensor2D =\n              sub(qAllJEnd, matMul(matMul(qAllJEnd, w), tawTimesWT));\n          q = concat([slice(q, [0, 0], [m, j]), qTimesTau], 1);\n        }\n        return [w, r, q];\n      });\n      dispose([rTemp, wTemp, qTemp]);\n    }\n\n    if (!fullMatrices && m > n) {\n      q = slice(q, [0, 0], [m, n]);\n      r = slice(r, [0, 0], [n, n]);\n    }\n\n    return [q, r];\n  }) as [Tensor2D, Tensor2D];\n}\n\nexport const qr = op({qr_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ============================================================================\n */\n\nexport enum Reduction {\n  NONE,\n  MEAN,\n  SUM,\n  SUM_BY_NONZERO_WEIGHTS\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
```

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==========================================================================\n
 */\nimport {Tensor} from '../../tensor';\nimport {convertToTensor} from '../../tensor_util_env';\nimport
{TensorLike} from '../../types';\n\nimport {cast} from '../cast';\nimport {div} from '../div';\nimport {Reduction} from
'../loss_ops_utils';\nimport {mean} from '../mean';\nimport {mul} from '../mul';\nimport {notEqual} from
'../not_equal';\nimport {ones} from '../ones';\nimport {op} from '../operation';\nimport {scalar} from
'../scalar';\nimport {sum} from '../sum';\n\n/**\n * Computes the weighted loss between two tensors.\n *\n *
@param losses Tensor of shape `[batch_size, d1, ... dN]`.\n * @param weights Tensor whose rank is either 0, or the
same rank as\n *    `losses`, and must be broadcastable to `losses` (i.e., all\n *    dimensions must be either `1`, or the
same as the corresponding\n *    `losses` dimension).\n *\n * @doc {heading: 'Training', subheading: 'Losses',
namespace: 'losses'}\n */\nfunction computeWeightedLoss_<T extends Tensor, O extends Tensor>(\n    losses:
 T|TensorLike, weights?: Tensor|TensorLike,\n    reduction = Reduction.SUM_BY_NONZERO_WEIGHTS): O {\n
const $losses = convertToTensor(losses, 'losses', 'computeWeightedLoss');\n  let $weights: Tensor = null;\n  if
(weights != null) {\n    $weights = convertToTensor(weights, 'weights', 'computeWeightedLoss');\n  }\n\n  const
weightedLoss = ($weights == null) ? $losses : mul($losses, $weights);\n\n  if (reduction === Reduction.NONE) {\n
 return weightedLoss as O;\n  }\n  if (reduction === Reduction.SUM) {\n    return sum(weightedLoss);\n  }\n  if
(reduction === Reduction.MEAN) {\n    if ($weights == null) {\n      return mean(weightedLoss);\n    } else {\n
const broadcastFactor = $losses.size / $weights.size;\n      const result = div(sum(weightedLoss), sum($weights));\n
  return broadcastFactor > 1 ? div(result, scalar(broadcastFactor)) :\n                                result as O;\n    }\n  }\n  if
(reduction === Reduction.SUM_BY_NONZERO_WEIGHTS) {\n    if ($weights == null)
 {\n      return div(sum(weightedLoss), scalar($losses.size));\n    } else {\n      const broadcastedWeights =
mul($weights, ones($losses.shape));\n\n      const numNonZeros =\n          cast(sum(notEqual(broadcastedWeights,
scalar(0))), 'float32');\n      return div(sum(weightedLoss), numNonZeros);\n    }\n  }\n\n  throw Error(`Unknown
reduction: ${reduction}`);\n}\nexport const computeWeightedLoss = op({computeWeightedLoss_});\n","/**\n *
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2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific
 language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {Tensor} from '../../tensor';\nimport {convertToTensor} from '../../tensor_util_env';\nimport
{TensorLike} from '../../types';\nimport {assertShapesMatch} from '../../util';\nimport {abs} from '../abs';\nimport
{Reduction} from '../loss_ops_utils';\nimport {op} from '../operation';\nimport {sub} from '../sub';\n\nimport
{computeWeightedLoss} from './compute_weighted_loss';\n\n/**\n * Computes the absolute difference loss
between two tensors.\n *\n * @param labels The ground truth output tensor, same dimensions as\n *
'predictions'.\n * @param predictions The predicted outputs.\n * @param weights Tensor whose rank is either 0, or
the same rank as\n *    `labels`, and must be broadcastable to `labels` (i.e., all dimensions\n *    must be either `1`, or
the same as the corresponding `losses`\n *    dimension).\n * @param
 reduction Type of reduction to apply to loss. Should be of type\n *    `Reduction`\n *\n * @doc {heading:
'Training', subheading: 'Losses', namespace: 'losses'}\n */\nfunction absoluteDifference_<T extends Tensor, O
extends Tensor>(\n    labels: T|TensorLike, predictions: T|TensorLike,\n    weights?: Tensor|TensorLike,\n
reduction = Reduction.SUM_BY_NONZERO_WEIGHTS): O {\n  const $labels = convertToTensor(labels, 'labels',
'absoluteDifference');\n  const $predictions =\n      convertToTensor(predictions, 'predictions',
'absoluteDifference');\n  let $weights: Tensor = null;\n  if (weights != null) {\n    $weights =
convertToTensor(weights, 'weights', 'absoluteDifference');\n  }\n  assertShapesMatch(\n      $labels.shape,
$predictions.shape, 'Error in absoluteDifference: ');\n\n  const losses = abs(sub($labels, $predictions));\n  return
computeWeightedLoss(losses, $weights, reduction);\n}\n\nexport const absoluteDifference =
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op({absoluteDifference_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n*/\nimport {Tensor} from '../../tensor';\nimport {convertToTensor} from '../../tensor_util_env';\nimport {TensorLike} from '../../types';\nimport {assertShapesMatch} from '../../util';\nimport {Reduction} from '../loss_ops_utils';\nimport {mul} from '../mul';\nimport {op} from '../operation';\nimport {scalar} from '../scalar';\nimport {sub} from '../sub';\nimport {sum} from '../sum';\n\nimport {computeWeightedLoss} from './compute_weighted_loss';\n\n/**\n * Computes the cosine distance loss between two tensors.\n *\n * @param labels The ground truth output tensor, same dimensions as\n *   'predictions'.\n * @param predictions The predicted outputs.\n * @param axis The dimension along which the cosine distance is computed.\n * @param weights Tensor whose rank is either 0, or the same rank as\n *   `labels`, and must be broadcastable to `labels` (i.e., all dimensions\n *   must be either `1`, or the same as the corresponding `losses`\n *   dimension).\n * @param reduction Type of reduction to apply to loss. Should be of type\n *   `Reduction`\n *\n * @doc {heading: 'Training', subheading: 'Losses', namespace: 'losses'}\n */\nfunction cosineDistance_<T extends Tensor, O extends Tensor>(\n   labels: T|TensorLike, predictions: T|TensorLike, axis: number,\n   weights?: Tensor|TensorLike,\n   reduction = Reduction.SUM_BY_NONZERO_WEIGHTS): O {\n const $labels = convertToTensor(labels, 'labels', 'cosineDistance');\n const $predictions =\n   convertToTensor(predictions, 'predictions', 'cosineDistance');\n let $weights: Tensor = null;\n if (weights != null) {\n $weights = convertToTensor(weights, 'weights', 'cosineDistance');\n }\n assertShapesMatch(\n $labels.shape, $predictions.shape, 'Error in cosineDistance: ');\n\n const one = scalar(1);\n const losses = sub(one, sum(mul($labels, $predictions), axis, true));\n return computeWeightedLoss(losses, $weights, reduction);\n}\nexport const cosineDistance = op({cosineDistance_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n*/\nimport {Tensor} from '../../tensor';\nimport {convertToTensor} from '../../tensor_util_env';\nimport {TensorLike} from '../../types';\nimport {assertShapesMatch} from '../../util';\nimport {Reduction} from '../loss_ops_utils';\nimport {mul} from '../mul';\nimport {op} from '../operation';\nimport {relu} from '../relu';\nimport {scalar} from '../scalar';\nimport {sub} from '../sub';\n\nimport {computeWeightedLoss} from './compute_weighted_loss';\n\n/**\n * Computes the Hinge loss between two tensors.\n *\n * @param labels The ground truth output tensor, same dimensions as\n *   'predictions'.\n * @param predictions The predicted outputs.\n * @param weights Tensor whose rank is either 0, or the same rank as\n *   `labels`, and must be broadcastable to `labels` (i.e., all dimensions\n *   must be either `1`, or the same as the corresponding `losses`\n *   dimension).\n * @param reduction Type of reduction to apply to loss. Should be of type\n *   `Reduction`\n *\n * @doc {heading: 'Training', subheading: 'Losses', namespace: 'losses'}\n */\nfunction hingeLoss_<T extends Tensor, O extends Tensor>(\n   labels: T|TensorLike, predictions: T|TensorLike,\n   weights?: Tensor|TensorLike,\n   reduction = Reduction.SUM_BY_NONZERO_WEIGHTS): O {\n let $labels = convertToTensor(labels, 'labels', 'hingeLoss');\n const $predictions = convertToTensor(predictions, 'predictions', 'hingeLoss');\n let $weights: Tensor = null;\n if (weights != null) {\n $weights = convertToTensor(weights,

'weights', 'hingeLoss');\n }\n assertShapesMatch($labels.shape, $predictions.shape, 'Error
 in hingeLoss: ');\n\n const one = scalar(1);\n // Convert binary labels to (-1, 1)\n $labels = sub(mul(scalar(2),
$labels), one);\n const losses = relu(sub(one, mul($labels, $predictions)));\n return computeWeightedLoss(losses,
$weights, reduction);\n}\nexport const hingeLoss = op({hingeLoss_});\n","/**\n * @license\n * Copyright 2020
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may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==\n
 */\n\nimport {Tensor} from '../../tensor';\nimport {convertToTensor} from '../../tensor_util_env';\nimport
{TensorLike} from '../../types';\nimport {assertShapesMatch} from '../../util';\nimport {abs} from '../abs';\nimport
{add} from '../add';\nimport {Reduction} from '../loss_ops_utils';\nimport {minimum} from '../minimum';\nimport
{mul} from '../mul';\nimport {op} from '../operation';\nimport {scalar} from '../scalar';\nimport {square} from
'../square';\nimport {sub} from '../sub';\n\nimport {computeWeightedLoss} from
'./compute_weighted_loss';\n\n/**\n * Computes the huber loss between two tensors.\n *\n * @param labels The
ground truth output tensor, same dimensions as\n *   'predictions'.\n * @param predictions The predicted outputs.\n
* @param weights Tensor whose rank is either 0, or the same rank as\n *   `labels`, and must be broadcastable to
`labels` (i.e., all dimensions\n *   must be either `1`, or the same as the corresponding `losses`\n *   dimension).\n
 * @param delta Point where huber loss changes from quadratic to linear.\n * @param reduction Type of reduction
to apply to loss. Should be of type\n *   `Reduction`.\n *\n * @doc {heading: 'Training', subheading: 'Losses',
namespace: 'losses'}\n */\nfunction huberLoss_<T extends Tensor, O extends Tensor>(\n   labels: T|TensorLike,
predictions: T|TensorLike,\n   weights?: Tensor|TensorLike, delta = 1.0,\n   reduction =
Reduction.SUM_BY_NONZERO_WEIGHTS): O {\n const $labels = convertToTensor(labels, 'labels',
'huberLoss');\n const $predictions = convertToTensor(predictions, 'predictions', 'huberLoss');\n let $weights:
Tensor = null;\n if (weights != null) {\n $weights = convertToTensor(weights, 'weights', 'huberLoss');\n }\n
assertShapesMatch($labels.shape, $predictions.shape, 'Error in huberLoss: ');\n\n const deltaScalar =
scalar(delta);\n const error = abs(sub($predictions, $labels));\n const quadratic = minimum(error, deltaScalar);\n
const linear = sub(error,
 quadratic);\n\n const losses =\n   add(mul(scalar(0.5), square(quadratic)), mul(deltaScalar, linear));\n return
computeWeightedLoss(losses, $weights, reduction);\n}\nexport const huberLoss = op({huberLoss_});\n","/**\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {Tensor} from '../../tensor';\nimport {convertToTensor}
 from '../../tensor_util_env';\nimport {TensorLike} from '../../types';\nimport {assertShapesMatch} from
'../../util';\nimport {add} from '../add';\nimport {log} from '../log';\nimport {Reduction} from
'../loss_ops_utils';\nimport {mul} from '../mul';\nimport {neg} from '../neg';\nimport {op} from
'../operation';\nimport {scalar} from '../scalar';\nimport {sub} from '../sub';\n\nimport {computeWeightedLoss} from
'./compute_weighted_loss';\n\n/**\n * Computes the log loss between two tensors.\n *\n * @param labels The
ground truth output tensor, same dimensions as\n *   'predictions'.\n * @param predictions The predicted outputs.\n
* @param weights Tensor whose rank is either 0, or the same rank as\n *   `labels`, and must be broadcastable to
`labels` (i.e., all dimensions\n *   must be either `1`, or the same as the corresponding `losses`\n *   dimension).\n *

@param epsilon A small increment to avoid taking log of zero\n * @param reduction Type of reduction to apply to loss. Should be of type\n * `Reduction`\n *\n * @doc {heading: 'Training', subheading: 'Losses', namespace: 'losses'}\n */\nfunction logLoss_<T extends Tensor, O extends Tensor>(\n labels: T|TensorLike, predictions: T|TensorLike,\n weights?: Tensor|TensorLike, epsilon = 1e-7,\n reduction = Reduction.SUM_BY_NONZERO_WEIGHTS): O {\n const $labels = convertToTensor(labels, 'labels', 'logLoss');\n const $predictions = convertToTensor(predictions, 'predictions', 'logLoss');\n let $weights: Tensor = null;\n if (weights != null) {\n $weights = convertToTensor(weights, 'weights', 'logLoss');\n }\n assertShapesMatch($labels.shape, $predictions.shape, 'Error in logLoss: ');\n\n const one = scalar(1);\n const epsilonScalar = scalar(epsilon);\n\n const l1 = neg(mul($labels, log(add($predictions, epsilonScalar))));\n const l2 =\n mul(sub(one, $labels), log(add(sub(one, $predictions), epsilonScalar)));\n const losses = sub(l1, l2);\n return computeWeightedLoss(losses,
$weights, reduction);\n}\nexport const logLoss = op({logLoss_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {Tensor} from '../../tensor';\nimport {convertToTensor} from '../../tensor_util_env';\nimport {TensorLike} from '../../types';\nimport {assertShapesMatch} from '../../util';\nimport {Reduction} from '../loss_ops_utils';\nimport {op} from '../operation';\nimport {squaredDifference} from '../squared_difference';\n\nimport {computeWeightedLoss} from './compute_weighted_loss';\n\n/**\n * Computes the mean squared error between two tensors.\n *\n * @param labels The ground truth output tensor, same dimensions as\n * 'predictions'.\n * @param predictions The predicted outputs.\n * @param weights Tensor whose rank is either 0, or the same rank as\n * `labels`, and must be broadcastable to `labels` (i.e., all dimensions\n * must be either `1`, or the same as the corresponding `losses`\n * dimension).\n * @param reduction Type of reduction to apply to loss. Should be of type\n * `Reduction`\n *\n * @doc {heading: 'Training', subheading: 'Losses', namespace: 'losses'}\n */\nfunction meanSquaredError_<T extends Tensor, O extends Tensor>(\n labels: T|TensorLike, predictions: T|TensorLike,\n weights?: Tensor|TensorLike,\n reduction = Reduction.SUM_BY_NONZERO_WEIGHTS): O
{\n const $labels = convertToTensor(labels, 'labels', 'meanSquaredError');\n const $predictions =\n convertToTensor(predictions, 'predictions', 'meanSquaredError');\n let $weights: Tensor = null;\n if (weights != null) {\n $weights = convertToTensor(weights, 'weights', 'meanSquaredError');\n }\n assertShapesMatch(\n $labels.shape, $predictions.shape, 'Error in meanSquaredError: ');\n\n const losses = squaredDifference($labels, $predictions);\n return computeWeightedLoss(losses, $weights, reduction);\n}\nexport const meanSquaredError = op({meanSquaredError_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License
is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {Tensor} from '../../tensor';\nimport {convertToTensor} from '../../tensor_util_env';\nimport {TensorLike} from '../../types';\nimport {assertShapesMatch} from '../../util';\nimport {abs} from '../abs';\nimport {add} from '../add';\nimport {exp} from '../exp';\nimport {log1p} from '../log1p';\nimport {Reduction} from

'../loss_ops_utils';\nimport {mul} from '../mul';\nimport {neg} from '../neg';\nimport {op} from '../operation';\nimport {relu} from '../relu';\nimport {scalar} from '../scalar';\nimport {sub} from '../sub';\n\nimport {computeWeightedLoss} from './compute_weighted_loss';\n\nfunction sigmoidCrossEntropyWithLogits_<T extends Tensor, O extends Tensor>(\n labels: T|TensorLike, logits: T|TensorLike): O {\n const $labels =\n convertToTensor(labels, 'labels', 'sigmoidCrossEntropyWithLogits');\n const $logits =\n convertToTensor(logits, 'logits', 'sigmoidCrossEntropyWithLogits');\n assertShapesMatch(\n $labels.shape, $logits.shape, 'Error in sigmoidCrossEntropyWithLogits: ');\n\n /**\n * Implementation Details:\n *\n * For brevity, let `x = logits`, `z = labels`. The logistic loss is\n * z * -log(sigmoid(x)) + (1 - z) * -log(1 - sigmoid(x))\n * = z * -log(1 / (1 + exp(-x))) + (1 - z) * -log(exp(-x) / (1 + exp(-x)))\n * = z * log(1 + exp(-x)) + (1 - z) * (-log(exp(-x)) + log(1 + exp(-x)))\n * = z * log(1 + exp(-x)) + (1 - z) * (x + log(1 + exp(-x))\n * = (1 - z) * x + log(1 + exp(-x))\n * = x - x * z + log(1 + exp(-x))\n *\n * For x < 0, to avoid overflow in exp(-x), we reformulate the above\n * x - x * z + log(1 + exp(-x))\n * = log(exp(x)) - x * z + log(1 + exp(-x))\n *
= - x * z + log(1 + exp(x))\n *\n * Hence, to ensure stability and avoid overflow, the implementation uses\n * this equivalent formulation:\n * max(x, 0) - x * z + log(1 + exp(-abs(x)))\n */\n const maxOutput = relu($logits);\n const outputXTarget = mul($logits, $labels);\n const sigmoidOutput = log1p(exp(neg(abs($logits))));\n\n return add(sub(maxOutput, outputXTarget), sigmoidOutput);\n}\n\n/**\n * Computes the sigmoid cross entropy loss between two tensors.\n *\n * If labelSmoothing is nonzero, smooth the labels towards 1/2:\n *\n * newMulticlassLabels = multiclassLabels * (1 - labelSmoothing)\n * + 0.5 * labelSmoothing\n *\n * @param multiClassLabels The ground truth output tensor of shape\n * [batch_size, num_classes], same dimensions as 'predictions'.\n * @param logits The predicted outputs.\n * @param weights Tensor whose rank is either 0, or the same rank as\n * `labels`, and must be broadcastable to `labels` (i.e., all dimensions\n
* must be either `1`, or the same as the corresponding `losses`\n * dimension).\n * @param labelSmoothing If greater than 0, then smooth the labels.\n * @param reduction Type of reduction to apply to loss. Should be of type\n * `Reduction`\n *\n * @doc { heading: 'Training', subheading: 'Losses', namespace: 'losses' }\n */\nfunction sigmoidCrossEntropy_<T extends Tensor, O extends Tensor>(\n multiClassLabels: T|TensorLike, logits: T|TensorLike,\n weights?: Tensor|TensorLike, labelSmoothing = 0,\n reduction = Reduction.SUM_BY_NONZERO_WEIGHTS): O {\n let $multiClassLabels = convertToTensor(\n multiClassLabels, 'multiClassLabels', 'sigmoidCrossEntropy');\n const $logits = convertToTensor(logits, 'logits', 'sigmoidCrossEntropy');\n let $weights: Tensor = null;\n if (weights != null) {\n $weights = convertToTensor(weights, 'weights', 'sigmoidCrossEntropy');\n }\n assertShapesMatch(\n $multiClassLabels.shape, $logits.shape, 'Error in sigmoidCrossEntropy: ');\n\n if (labelSmoothing > 0) {\n const labelSmoothingScalar = scalar(labelSmoothing);\n const one = scalar(1);\n const half = scalar(0.5);\n\n $multiClassLabels =\n add(mul($multiClassLabels, sub(one, labelSmoothingScalar)),\n mul(half, labelSmoothingScalar));\n }\n const losses = sigmoidCrossEntropyWithLogits_($multiClassLabels, $logits);\n\n return computeWeightedLoss(losses, $weights, reduction);\n}\n\nexport const sigmoidCrossEntropy = op({sigmoidCrossEntropy_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS
OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\nimport {customGrad} from '../../gradients';\nimport {Tensor} from '../../tensor';\nimport {GradSaveFunc} from '../../tensor_types';\nimport {convertToTensor} from '../../tensor_util_env';\nimport {TensorLike} from

'../../types';\nimport {assertShapesMatch} from '../../util';\nimport {add} from '../add';\nimport {expandShapeToKeepDim} from '../axis_util';\nimport {cast} from '../cast';\nimport {div} from '../div';\nimport {exp} from '../exp';\nimport {logSumExp} from '../log_sum_exp';\nimport {Reduction} from '../loss_ops_utils';\nimport {mul} from '../mul';\nimport {neg} from '../neg';\nimport {op} from '../operation';\nimport {reshape} from '../reshape';\nimport {scalar} from '../scalar';\nimport {sub} from '../sub';\nimport {sum} from '../sum';\n\nimport {computeWeightedLoss} from './compute_weighted_loss';\n\n/**\n * Computes softmax cross entropy between logits and labels.\n *\n * Measures the probability error in discrete classification tasks in which\n * the classes are mutually exclusive (each entry is in exactly one class).\n * For example, each CIFAR-10 image is labeled with one and only one label: an\n * image can be a dog or a truck, but not both.\n *\n * `NOTE`: While the classes are mutually exclusive, their probabilities need\n * not be. All that is required is that each row of labels is a valid\n * probability distribution. If they are not, the computation of the gradient\n * will be incorrect.\n *\n * `WARNING`: This op expects unscaled logits, since it performs a softmax on\n * logits internally for efficiency. Do not call this op with the output of\n * softmax, as it will produce incorrect results.\n *\n * logits and labels must have the same shape, e.g. [batch_size, num_classes]\n * and the same dtype.\n * @param labels The labels array.\n * @param logits The logits array.\n * @param dim The dimension softmax would be performed on. Defaults to `-1`\n *   which indicates the last dimension.\n */\nfunction softmaxCrossEntropyWithLogits_<T extends Tensor, O extends Tensor>(\n   labels: T, logits: T, dim = -1): O {\n if (dim === -1) {\n   dim = logits.rank - 1;\n }\n\n if (dim !== logits.rank - 1) {\n   throw Error(\n   `Softmax cross entropy along a non-last dimension is not yet ` +\n   `supported. Labels / logits was rank ${logits.rank} ` +\n   `and dim was ${dim}`);\n }\n // Use a custom gradient for numerical stability.\n const customOp =\n   customGrad((labels: Tensor, logits: Tensor, save: GradSaveFunc) => {\n   // Reference:\n   //   1. http://cs231n.github.io/linear-classify/#softmax\n   //   2. https://blog.feedly.com/tricks-of-the-trade-logsumexp/\n   const keepDims = true;\n   const lse = logSumExp(logits, [dim], keepDims);\n   const logResult = sub(cast(logits, 'float32'), lse);\n   save([labels, logResult]);\n\n   const costVector =\n   neg(mul(logResult, labels));\n   const value: O = sum(costVector, [dim]);\n\n   const gradFunc = (dy: O, saved: Tensor[]) => {\n   const [labels, logResult] = saved;\n   const dyShape =\n   expandShapeToKeepDim(dy.shape, [dim]);\n   return [\n   mul(reshape(dy, dyShape),\n   sub(cast(labels, 'float32'), exp(logResult))),\n   mul(reshape(dy, dyShape),\n   sub(exp(logResult), cast(labels, 'float32'))),\n   ];\n   };\n   return {value, gradFunc};\n   });\n\n return customOp(labels, logits);\n}\n\n/**\n * Computes the softmax cross entropy loss between two tensors.\n *\n * If labelSmoothing is nonzero, smooth the labels towards 1/2:\n *\n *   newOnehotLabels = onehotLabels * (1 - labelSmoothing)\n *   + labelSmoothing / numClasses\n *\n * @param onehotLabels One hot encoded labels\n *   [batch_size, num_classes], same dimensions as 'predictions'.\n * @param logits The predicted outputs.\n * @param weights Tensor whose rank is either 0, or 1, and must be\n *   broadcastable to `loss` of shape [batch_size]\n * @param labelSmoothing If greater than 0, then smooth the labels.\n * @param reduction Type of reduction to apply to loss. Should be of type\n *   `Reduction`\n *\n * @doc { heading: 'Training', subheading: 'Losses', namespace: 'losses' }\n */\nfunction softmaxCrossEntropy_<T extends Tensor, O extends Tensor>(\n   onehotLabels: T|TensorLike, logits: T|TensorLike,\n   weights?: Tensor|TensorLike, labelSmoothing = 0,\n   reduction = Reduction.SUM_BY_NONZERO_WEIGHTS): O {\n let $onehotLabels =\n   convertToTensor(onehotLabels, 'onehotLabels', 'softmaxCrossEntropy');\n const $logits = convertToTensor(logits, 'logits', 'softmaxCrossEntropy');\n let $weights: Tensor = null;\n\n if (weights != null) {\n $weights = convertToTensor(weights,\n   'weights', 'softmaxCrossEntropy');\n }\n\n assertShapesMatch(\n $onehotLabels.shape, $logits.shape, 'Error in softmaxCrossEntropy: ');\n\n if (labelSmoothing > 0) {\n   const labelSmoothingScalar = scalar(labelSmoothing);\n   const one = scalar(1);\n   const numClasses = scalar($onehotLabels.shape[1]);\n\n $onehotLabels =\n   add(mul($onehotLabels, sub(one, labelSmoothingScalar)),\n   div(labelSmoothingScalar, numClasses));\n }\n\n const losses = softmaxCrossEntropyWithLogits_($onehotLabels, $logits);\n\n return

computeWeightedLoss(losses, $weights, reduction);\n}\n\nexport const softmaxCrossEntropy = op({softmaxCrossEntropy_});\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless
 required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\n// Modularized ops.\nexport {abs} from './abs';\nexport {acos} from './acos';\nexport {acosh} from './acosh';\nexport {add} from './add';\nexport {addN} from './add_n';\nexport {all} from './all';\nexport {any} from './any';\nexport {argMax} from './arg_max';\nexport {argMin} from './arg_min';\nexport {asin} from './asin';\nexport {asinh} from './asinh';\nexport {atan} from './atan';\nexport {atan2} from './atan2';\nexport {atanh} from './atanh';\nexport {avgPool} from './avg_pool';\nexport {avgPool3d} from './avg_pool_3d';\nexport {basicLSTMCell} from './basic_lstm_cell';\nexport {batchToSpaceND}
 from './batch_to_space_nd';\nexport {batchNorm} from './batchnorm';\nexport {batchNorm2d} from './batchnorm2d';\nexport {batchNorm3d} from './batchnorm3d';\nexport {batchNorm4d} from './batchnorm4d';\nexport {bincount} from './bincount';\nexport {broadcastTo} from './broadcast_to';\nexport {buffer} from './buffer';\nexport {cast} from './cast';\nexport {ceil} from './ceil';\nexport {clipByValue} from './clip_by_value';\nexport {clone} from './clone';\nexport {complex} from './complex';\nexport {concat} from './concat';\nexport {concat1d} from './concat_1d';\nexport {concat2d} from './concat_2d';\nexport {concat3d} from './concat_3d';\nexport {concat4d} from './concat_4d';\nexport {conv1d} from './conv1d';\nexport {conv2d} from './conv2d';\nexport {conv2dTranspose} from './conv2d_transpose';\nexport {conv3d} from './conv3d';\nexport {conv3dTranspose} from './conv3d_transpose';\nexport {cos} from './cos';\nexport {cosh} from './cosh';\nexport {cumsum} from './cumsum';\nexport
 {denseBincount} from './dense_bincount';\nexport {depthToSpace} from './depth_to_space';\nexport {depthwiseConv2d} from './depthwise_conv2d';\nexport {diag} from './diag';\nexport {dilation2d} from './dilation2d';\nexport {div} from './div';\nexport {divNoNan} from './div_no_nan';\nexport {dot} from './dot';\nexport {elu} from './elu';\nexport {equal} from './equal';\nexport {erf} from './erf';\nexport {exp} from './exp';\nexport {expandDims} from './expand_dims';\nexport {expm1} from './expm1';\nexport {eye} from './eye';\nexport {fill} from './fill';\nexport {floor} from './floor';\nexport {floorDiv} from './floorDiv';\nexport {gather} from './gather';\nexport {greater} from './greater';\nexport {greaterEqual} from './greater_equal';\nexport {imag} from './imag';\nexport {isFinite} from './is_finite';\nexport {isInf} from './is_inf';\nexport {isNaN} from './is_nan';\nexport {leakyRelu} from './leaky_relu';\nexport {less} from './less';\nexport {lessEqual} from './less_equal';\nexport
 {linspace} from './linspace';\nexport {localResponseNormalization} from './local_response_normalization';\nexport {log} from './log';\nexport {log1p} from './log1p';\nexport {logSigmoid} from './log_sigmoid';\nexport {logSoftmax} from './log_softmax';\nexport {logSumExp} from './log_sum_exp';\nexport {logicalAnd} from './logical_and';\nexport {logicalNot} from './logical_not';\nexport {logicalOr} from './logical_or';\nexport {logicalXor} from './logical_xor';\nexport {matMul} from './mat_mul';\nexport {max} from './max';\nexport {maxPool} from './max_pool';\nexport {maxPool3d} from './max_pool_3d';\nexport {maxPoolWithArgmax} from './max_pool_with_argmax';\nexport {maximum} from './maximum';\nexport {mean} from './mean';\nexport {min} from './min';\nexport {minimum} from './minimum';\nexport {mirrorPad} from './mirror_pad';\nexport {mod} from './mod';\nexport {moments} from './moments';\nexport {mul} from './mul';\nexport {LSTMCellFunc, multiRNNCell} from './multi_rnn_cell';\nexport
 {multinomial} from './multinomial';\nexport {neg} from './neg';\nexport {notEqual} from './not_equal';\nexport {oneHot} from './one_hot';\nexport {ones} from './ones';\nexport {onesLike} from './ones_like';\nexport {outerProduct} from './outer_product';\nexport {pad} from './pad';\nexport {pad1d} from './pad1d';\nexport {pad2d}

from './pad2d';\nexport {pad3d} from './pad3d';\nexport {pad4d} from './pad4d';\nexport {pool} from './pool';\nexport {pow} from './pow';\nexport {prelu} from './prelu';\nexport {print} from './print';\nexport {prod} from './prod';\nexport {rand} from './rand';\nexport {randomGamma} from './random_gamma';\nexport {randomNormal} from './random_normal';\nexport {randomUniform} from './random_uniform';\nexport {range} from './range';\nexport {real} from './real';\nexport {reciprocal} from './reciprocal';\nexport {relu} from './relu';\nexport {relu6} from './relu6';\nexport {reshape} from './reshape';\nexport {reverse} from './reverse';\nexport {reverse1d} from './reverse_1d';\nexport
{reverse2d} from './reverse_2d';\nexport {reverse3d} from './reverse_3d';\nexport {reverse4d} from './reverse_4d';\nexport {round} from './round';\nexport {rsqrt} from './rsqrt';\nexport {scalar} from './scalar';\nexport {selu} from './selu';\nexport {separableConv2d} from './separable_conv2d';\nexport {setdiff1dAsync} from './setdiff1d_async';\nexport {sigmoid} from './sigmoid';\nexport {sign} from './sign';\nexport {sin} from './sin';\nexport {sinh} from './sinh';\nexport {slice} from './slice';\nexport {slice1d} from './slice1d';\nexport {slice2d} from './slice2d';\nexport {slice3d} from './slice3d';\nexport {slice4d} from './slice4d';\nexport {softmax} from './softmax';\nexport {softplus} from './softplus';\nexport {spaceToBatchND} from './space_to_batch_nd';\nexport {fft} from './spectral/fft';\nexport {ifft} from './spectral/ifft';\nexport {irfft} from './spectral/irfft';\nexport {rfft} from './spectral/rfft';\nexport {split} from './split';\nexport {sqrt} from
'./sqrt';\nexport {square} from './square';\nexport {squaredDifference} from './squared_difference';\nexport {squeeze} from './squeeze';\nexport {stack} from './stack';\nexport {step} from './step';\nexport {stridedSlice} from './strided_slice';\nexport {sub} from './sub';\nexport {sum} from './sum';\nexport {tan} from './tan';\nexport {tanh} from './tanh';\nexport {tensor} from './tensor';\nexport {tensor1d} from './tensor1d';\nexport {tensor2d} from './tensor2d';\nexport {tensor3d} from './tensor3d';\nexport {tensor4d} from './tensor4d';\nexport {tensor5d} from './tensor5d';\nexport {tensor6d} from './tensor6d';\nexport {tile} from './tile';\nexport {topk} from './topk';\nexport {truncatedNormal} from './truncated_normal';\nexport {unique} from './unique';\nexport {unsortedSegmentSum} from './unsorted_segment_sum';\nexport {unstack} from './unstack';\nexport {variable} from './variable';\nexport {where} from './where';\nexport {whereAsync} from './where_async';\nexport {zeros} from
'./zeros';\nexport {zerosLike} from './zeros_like';\n\nexport * from './boolean_mask';\nexport * from './transpose';\nexport * from './norm';\nexport * from './moving_average';\nexport * from './scatter_nd';\nexport * from './sparse_to_dense';\nexport * from './gather_nd';\nexport * from './dropout';\nexport * from './signal_ops_util';\nexport * from './in_top_k';\n\nexport {op, OP_SCOPE_SUFFIX} from './operation';\n\nimport {rfft} from './spectral/rfft';\nimport {fft} from './spectral/fft';\nimport {ifft} from './spectral/ifft';\nimport {irfft} from './spectral/irfft';\nconst spectral = {\n fft,\n ifft,\n rfft,\n irfft\n};\n\nimport * as fused from './fused_ops';\n\nimport {hammingWindow} from './signal/hamming_window';\nimport {hannWindow} from
'./signal/hann_window';\nimport {frame} from './signal/frame';\nimport {stft} from './signal/stft';\nconst signal = {\n hammingWindow,\n hannWindow,\n frame,\n stft,\n};\n\n// Image Ops namespace\nimport {cropAndResize} from './image/crop_and_resize';\nimport
{flipLeftRight} from './image/flip_left_right';\nimport {rotateWithOffset} from
'./image/rotate_with_offset';\nimport {nonMaxSuppression} from './image/non_max_suppression';\nimport {nonMaxSuppressionAsync} from './image/non_max_suppression_async';\nimport {nonMaxSuppressionWithScore} from './image/non_max_suppression_with_score';\nimport {nonMaxSuppressionWithScoreAsync} from './image/non_max_suppression_with_score_async';\nimport {nonMaxSuppressionPadded} from './image/non_max_suppression_padded';\nimport {nonMaxSuppressionPaddedAsync} from './image/non_max_suppression_padded_async';\nimport {resizeBilinear} from './image/resize_bilinear';\nimport {resizeNearestNeighbor} from './image/resize_nearest_neighbor';\nconst image = {\n flipLeftRight,\n resizeNearestNeighbor,\n resizeBilinear,\n rotateWithOffset,\n cropAndResize,\n nonMaxSuppression,\n nonMaxSuppressionAsync,\n nonMaxSuppressionWithScore,\n nonMaxSuppressionWithScoreAsync,\n nonMaxSuppressionPadded,\n
nonMaxSuppressionPaddedAsync\n};\n\n// linalg namespace\nimport {bandPart} from
'./linalg/band_part';\nimport {gramSchmidt} from './linalg/gram_schmidt';\nimport {qr} from './linalg/qr';\nconst

linalg = {\n bandPart,\n gramSchmidt,\n qr\n};\n\n// losses namespace;\nimport {absoluteDifference} from './losses/absolute_difference';\nimport {computeWeightedLoss} from './losses/compute_weighted_loss';\nimport {cosineDistance} from './losses/cosine_distance';\nimport {hingeLoss} from './losses/hinge_loss';\nimport {huberLoss} from './losses/huber_loss';\nimport {logLoss} from './losses/log_loss';\nimport {meanSquaredError} from './losses/mean_squared_error';\nimport {sigmoidCrossEntropy} from './losses/sigmoid_cross_entropy';\nimport {softmaxCrossEntropy} from './losses/softmax_cross_entropy';\nconst losses = {\n absoluteDifference,\n computeWeightedLoss,\n cosineDistance,\n hingeLoss,\n huberLoss,\n logLoss,\n meanSquaredError,\n sigmoidCrossEntropy,\n softmaxCrossEntropy\n};\n\n//
 Second level exports.\nexport {image, linalg, losses, spectral, fused, signal};\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {dispose} from '../globals';\nimport {variableGrads} from '../gradients';\nimport {scalar} from '../ops/ops';\nimport {Serializable} from '../serialization';\nimport
 {Scalar, Variable} from '../tensor';\nimport {NamedTensor, NamedTensorMap} from '../tensor_types';\n\n/**\n * A variable that belongs to an optimizer.\n *\n * The `originalName` field is required for keeping track of the canonical\n * name of the variable, which is usually the name of the model weight that\n * the variable is related to plus a suffix, e.g., 'dense1/kernel/momentum'.\n * The name of the `Variable` object itself cannot be used directly due to\n * possible deduplication: Every `Variable` must have a unique name but more\n * than one optimizer objects of the same type may be created for the same model\n * or the same `Variable`.\n */\nexport interface OptimizerVariable {\n originalName: string;\n variable: Variable;\n}\n\n/** @doc {heading: 'Training', subheading: 'Classes', namespace: 'train'} */\nexport abstract class Optimizer extends Serializable {\n protected iterations_: number;\n\n /**\n   * Executes `f()` and minimizes the scalar output of `f()` by computing\n   * gradients of y with respect to the list of trainable variables provided by\n   * `varList`. If no list is provided, it defaults to all trainable variables.\n   *\n   * @param f The function to execute and whose output to minimize.\n   * @param returnCost Whether to return the scalar cost value produced by\n   * executing `f()`.\n   * @param varList An optional list of variables to update. If specified, only\n   * the trainable variables in varList will be updated by minimize. Defaults to\n   * all trainable variables.\n   *\n   * @doc {heading: 'Training', subheading: 'Optimizers'}\n   */\n minimize(f: () => Scalar, returnCost = false, varList?: Variable[]): Scalar\n |null {\n   const {value, grads} = this.computeGradients(f, varList);\n\n   if (varList != null) {\n   const gradArray: NamedTensor[] =\n varList.map(v => ({name: v.name, tensor: grads[v.name]}));\n   this.applyGradients(gradArray);\n   } else {\n this.applyGradients(grads);\n   }\n\n
 // Dispose gradients.\n   dispose(grads);\n\n   if (returnCost) {\n   return value;\n   } else {\n value.dispose();\n   return null;\n   }\n }\n\n /**\n   * The number of iterations that this optimizer instance has been invoked for.\n   */\n get iterations(): number {\n   if (this.iterations_ == null) {\n   this.iterations_ = 0;\n   }\n   return this.iterations_;\n }\n\n protected incrementIterations() {\n   this.iterations_ = this.iterations + 1;\n }\n\n /**\n   * Executes f() and computes the gradient of the scalar output of f() with\n   * respect to the list of trainable variables provided by `varList`. If no\n   * list is provided, it defaults to all trainable variables.\n   *\n   * @param f The function to execute and whose output to use for computing\n   * gradients with respect to variables.\n   * @param varList An optional list of variables to compute gradients with\n   * respect to. If specified, only the trainable variables in varList will have\n
   * gradients computed with respect to. Defaults to all trainable variables.\n   *\n   * @doc {heading: 'Training', subheading: 'Optimizers'}\n   */\n computeGradients(f: () => Scalar, varList?: Variable[]):\n   {value: Scalar, grads: NamedTensorMap} {\n   return variableGrads(f, varList);\n }\n\n /**\n   * Updates variables by using the

computed gradients.\n *\n * @param variableGradients A mapping of variable name to its gradient value.\n *\n * @doc {heading: 'Training', subheading: 'Optimizers'}\n */\n abstract applyGradients(variableGradients: NamedTensorMap|\n NamedTensor[]): void;\n\n /**\n * Dispose the variables (if any) owned by this optimizer instance.\n */\n dispose(): void {\n if (this.iterations_ != null) {\n dispose(this.iterations_);\n }\n }\n\n async saveIterations(): Promise<NamedTensor> {\n if (this.iterations_ == null) {\n this.iterations_ = 0;\n }\n return {\n name: 'iter', // Named for
Python compatibility.\n // TODO(cais): Use 'int64' type when available.\n tensor: scalar(this.iterations_, 'int32')\n };\n }\n\n async getWeights(): Promise<NamedTensor[]> {\n throw new Error('getWeights() is not implemented for this optimizer yet.');\n }\n\n async setWeights(weightValues: NamedTensor[]): Promise<void> {\n throw new Error(\n `setWeights() is not implemented for this optimizer class ` +\n `${this.getClassName()}`);\n }\n\n /**\n * Extract the first element of the weight values and set it\n * as the iterations counter variable of this instance of optimizer.\n *\n * @param weightValues\n * @returns Weight values with the first element consumed and excluded.\n */\n protected async extractIterations(weightValues: NamedTensor[]):\n Promise<NamedTensor[]> {\n this.iterations_ = (await weightValues[0].tensor.data())[0];\n return weightValues.slice(1);\n }\n}\n\nObject.defineProperty(Optimizer, Symbol.hasInstance,
{\n value: (instance: Optimizer) => {\n return instance.minimize != null && instance.computeGradients != null &&\n instance.applyGradients != null;\n }\n});\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {ENGINE} from '../engine';\nimport {dispose, tidy} from '../globals';\nimport {add} from '../ops/add';\nimport
{div} from '../ops/div';\nimport {mul} from '../ops/mul';\nimport {sqrt} from '../ops/ops';\nimport {square} from '../ops/square';\nimport {zerosLike} from '../ops/zeros_like';\nimport {ConfigDict, registerClass, Serializable, SerializableConstructor} from '../serialization';\nimport {NamedTensor, NamedVariableMap} from '../tensor_types';\n\nimport {Optimizer, OptimizerVariable} from './optimizer';\n\n/** @doclink Optimizer */\nexport class AdadeltaOptimizer extends Optimizer {\n /** @nocollapse */\n static className = 'Adadelta'; // Name matters for Python compatibility.\n private accumulatedGrads: OptimizerVariable[] = [];\n private accumulatedUpdates: OptimizerVariable[] = [];\n\n constructor(\n protected learningRate: number, protected rho: number,\n protected epsilon: number = null) {\n super();\n\n if (epsilon == null) {\n this.epsilon = ENGINE.backend.epsilon();\n }\n }\n\n applyGradients(variableGradients: NamedVariableMap|NamedTensor[]) {\n const variableNames = Array.isArray(variableGradients) ?\n variableGradients.map(item => item.name) :\n Object.keys(variableGradients);\n\n variableNames.forEach((name, i) => {\n const value = ENGINE.registeredVariables[name];\n const trainable = false;\n if (this.accumulatedGrads[i] == null) {\n this.accumulatedGrads[i] = {\n originalName: `${name}/accum_grad`,\n variable: tidy(() => zerosLike(value).variable(trainable))\n };\n }\n if (this.accumulatedUpdates[i] == null) {\n this.accumulatedUpdates[i] = {\n originalName: `${name}/accum_var`,\n variable: tidy(() => zerosLike(value).variable(trainable))\n };\n }\n\n const gradient = Array.isArray(variableGradients) ?\n variableGradients[i].tensor :\n variableGradients[name];\n if (gradient == null) {\n return;\n }\n\n const accumulatedGrad = this.accumulatedGrads[i].variable;\n const accumulatedUpdate = this.accumulatedUpdates[i].variable;\n\n tidy(() => {\n const newAccumulatedGrad =\n add(mul(accumulatedGrad, this.rho),\n mul(square(gradient), 1 - this.rho));\n\n const updates =\n mul(div(sqrt(add(accumulatedUpdate, this.epsilon)),\n sqrt(add(accumulatedGrad, this.epsilon))),\n gradient);\n\n const newAccumulatedUpdate =\n

add(mul(accumulatedUpdate, this.rho),\n mul(square(updates), 1 - this.rho));\n\n accumulatedGrad.assign(newAccumulatedGrad);\n accumulatedUpdate.assign(newAccumulatedUpdate);\n\n const newValue = add(mul(updates, -this.learningRate), value);\n value.assign(newValue);\n });\n });\n this.incrementIterations();\n }\n\n dispose(): void {\n if (this.accumulatedUpdates != null) {\n dispose(this.accumulatedGrads.map(v => v.variable));\n dispose(this.accumulatedUpdates.map(v => v.variable));\n }\n }\n\n async getWeights(): Promise<NamedTensor[]> {\n // Order matters for Python compatibility.\n const variables: OptimizerVariable[] =\n [...this.accumulatedGrads, ...this.accumulatedUpdates];\n return [await this.saveIterations()].concat(\n variables.map(v => ({name: v.originalName, tensor: v.variable})));\n }\n\n async setWeights(weightValues: NamedTensor[]): Promise<void> {\n weightValues = await this.extractIterations(weightValues);\n const variableCount = weightValues.length / 2;\n const trainable = false;\n this.accumulatedGrads =\n weightValues.slice(0, variableCount).map(v => ({\n originalName: v.name,\n variable: v.tensor.variable(\n trainable)\n }));\n this.accumulatedUpdates =\n weightValues.slice(variableCount, variableCount * 2)\n .map(v => ({\n originalName: v.name,\n variable: v.tensor.variable(trainable)\n }));\n }\n\n getConfig(): ConfigDict {\n return {\n 'learningRate': this.learningRate,\n 'rho': this.rho,\n 'epsilon': this.epsilon\n };\n }\n\n /** @nocollapse */\n static fromConfig<T extends Serializable>(\n cls: SerializableConstructor<T>, config: ConfigDict): T {\n return new cls(config['learningRate'], config['rho'], config['epsilon']);\n }\n}\nregisterClass(AdadeltaOptimizer);\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ENGINE} from '../engine';\nimport {dispose, tidy} from '../globals';\nimport {add} from '../ops/add';\nimport {div} from '../ops/div';\nimport {fill} from '../ops/fill';\nimport {mul} from '../ops/mul';\nimport {sqrt} from '../ops/sqrt';\nimport {square} from '../ops/square';\nimport {ConfigDict, registerClass, Serializable, SerializableConstructor} from '../serialization';\nimport {NamedTensor, NamedVariableMap} from '../tensor_types';\n\nimport {Optimizer, OptimizerVariable} from './optimizer';\n\n/** @doclink Optimizer */\nexport class AdagradOptimizer extends Optimizer {\n /** @nocollapse */\n static className = 'Adagrad';\n // Note: Name matters for Python compatibility.\n\n private accumulatedGrads: OptimizerVariable[] = [];\n\n constructor(\n protected learningRate: number, private initialAccumulatorValue = 0.1) {\n super();\n }\n\n applyGradients(variableGradients: NamedVariableMap|NamedTensor[]) {\n const variableNames = Array.isArray(variableGradients) ?\n variableGradients.map(item => item.name) :\n Object.keys(variableGradients);\n\n variableNames.forEach((name, i) => {\n const value = ENGINE.registeredVariables[name];\n if (this.accumulatedGrads[i] == null) {\n const trainable = false;\n this.accumulatedGrads[i] = {\n originalName: `${name}/accumulator`,\n variable: tidy(\n () => fill(value.shape, this.initialAccumulatorValue)\n .variable(trainable))\n };\n }\n\n const gradient = Array.isArray(variableGradients) ?\n variableGradients[i].tensor :\n variableGradients[name];\n\n if (gradient == null) {\n return;\n }\n\n const accumulatedGrad = this.accumulatedGrads[i].variable;\n\n tidy(() => {\n const newAccumulatedGrad = add(accumulatedGrad, square(gradient));\n accumulatedGrad.assign(newAccumulatedGrad);\n\n const newValue = add(\n mul(div(gradient,\n sqrt(add(newAccumulatedGrad, ENGINE.backend.epsilon()))),\n -this.learningRate),\n value);\n value.assign(newValue);\n });\n });\n this.incrementIterations();\n

```
}\n\n  dispose(): void {\n    if (this.accumulatedGrads != null) {\n      dispose(this.accumulatedGrads.map(v =>
v.variable));\n    }\n  }\n\n  async getWeights(): Promise<NamedTensor[]> {\n    // Order matters for Python
compatibility.\n    return [await this.saveIterations()].concat(this.accumulatedGrads.map(\n        v => ({name:
v.originalName, tensor: v.variable})));\n  }\n\n  async setWeights(weightValues:
 NamedTensor[]): Promise<void> {\n    weightValues = await this.extractIterations(weightValues);\n    const
trainable = false;\n    this.accumulatedGrads = weightValues.map(\n        v => ({originalName: v.name, variable:
v.tensor.variable(trainable)}));\n  }\n\n  getConfig(): ConfigDict {\n    return {\n      'learningRate':
this.learningRate,\n      'initialAccumulatorValue': this.initialAccumulatorValue,\n    };\n  }\n\n  /** @nocollapse
*/\n  static fromConfig<T extends Serializable>(\n      cls: SerializableConstructor<T>, config: ConfigDict): T {\n
return new cls(config['learningRate'], config['initialAccumulatorValue']);\n
}\n}\nregisterClass(AdagradOptimizer);\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights
Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file
except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless
 required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an
\"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n
* See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {ENGINE} from '../engine';\nimport {dispose, tidy} from '../globals';\nimport {add} from
'../ops/add';\nimport {div} from '../ops/div';\nimport {mul} from '../ops/mul';\nimport {pow} from
'../ops/pow';\nimport {scalar} from '../ops/scalar';\nimport {sqrt} from '../ops/sqrt';\nimport {square} from
'../ops/square';\nimport {sub} from '../ops/sub';\nimport {zerosLike} from '../ops/zeros_like';\nimport {ConfigDict,
registerClass, Serializable, SerializableConstructor} from '../serialization';\nimport {Variable} from
'../tensor';\nimport {NamedTensor, NamedVariableMap} from '../tensor_types';\n\nimport
 {Optimizer, OptimizerVariable} from './optimizer';\n\nexport class AdamOptimizer extends Optimizer {\n  /**
@nocollapse */\n  static className = 'Adam';  // Note: Name matters for Python compatibility.\n  private accBeta1:
Variable;\n  private accBeta2: Variable;\n\n  private accumulatedFirstMoment: OptimizerVariable[] = [];\n  private
accumulatedSecondMoment: OptimizerVariable[] = [];\n\n  constructor(\n      protected learningRate: number,
protected beta1: number,\n      protected beta2: number, protected epsilon: number = null) {\n    super();\n    tidy(()
=> {\n      // accB* will be updated by batch.\n      this.accBeta1 = scalar(beta1).variable();\n      this.accBeta2 =
scalar(beta2).variable();\n    });\n\n    if (epsilon == null) {\n      this.epsilon = ENGINE.backend.epsilon();\n    }\n
}\n\n  applyGradients(variableGradients: NamedVariableMap|NamedTensor[]) {\n    const varNames =
Array.isArray(variableGradients) ?\n        variableGradients.map(v => v.name)
 :\n        Object.keys(variableGradients);\n    tidy(() => {\n      const oneMinusAccBeta1 = sub(1, this.accBeta1);\n
const oneMinusAccBeta2 = sub(1, this.accBeta2);\n\n      varNames.forEach((name, i) => {\n        const value =
ENGINE.registeredVariables[name];\n        const trainable = false;\n        if (this.accumulatedFirstMoment[i] ==
null) {\n          this.accumulatedFirstMoment[i] = {\n            originalName: `${name}/m`,\n            variable: tidy(()
=> zerosLike(value).variable(trainable))\n          };\n        }\n        if (this.accumulatedSecondMoment[i] == null) {\n
          this.accumulatedSecondMoment[i] = {\n            originalName: `${name}/v`,\n            variable: tidy(() =>
zerosLike(value).variable(trainable))\n          };\n        }\n\n        const gradient = Array.isArray(variableGradients)
?\n            variableGradients[i].tensor :\n            variableGradients[name];\n        if (gradient == null) {\n
return;\n        }\n\n
        const firstMoment = this.accumulatedFirstMoment[i].variable;\n        const secondMoment =
this.accumulatedSecondMoment[i].variable;\n\n        const newFirstMoment =\n            add(mul(firstMoment,
this.beta1), mul(gradient, 1 - this.beta1));\n        const newSecondMoment =\n            add(mul(secondMoment,
this.beta2),\n                mul(square(gradient), 1 - this.beta2));\n\n        const biasCorrectedFirstMoment =
div(newFirstMoment, oneMinusAccBeta1);\n        const biasCorrectedSecondMoment =\n
div(newSecondMoment, oneMinusAccBeta2);\n\n        firstMoment.assign(newFirstMoment);\n
```

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secondMoment.assign(newSecondMoment);\n\n        const newValue =\n
add(mul(div(biasCorrectedFirstMoment,\n                    add(sqrt(biasCorrectedSecondMoment), this.epsilon)),\n
            -this.learningRate),\n                value);\n        value.assign(newValue);\n      });\n\n
this.accBeta1.assign(mul(this.accBeta1, this.beta1));\n
  this.accBeta2.assign(mul(this.accBeta2, this.beta2));\n    });\n    this.incrementIterations();\n  }\n\n  dispose(): void
{\n    this.accBeta1.dispose();\n    this.accBeta2.dispose();\n\n    if (this.accumulatedFirstMoment != null) {\n
dispose(this.accumulatedFirstMoment.map(v => v.variable));\n    }\n    if (this.accumulatedSecondMoment != null)
{\n      dispose(this.accumulatedSecondMoment.map(v => v.variable));\n    }\n  }\n\n  async getWeights():
Promise<NamedTensor[]> {\n    // Order matters for Python compatibility.\n    const variables: OptimizerVariable[]
=\n        [...this.accumulatedFirstMoment, ...this.accumulatedSecondMoment];\n    return [await
this.saveIterations()].concat(\n        variables.map(v => ({name: v.originalName, tensor: v.variable})));\n  }\n\n
async setWeights(weightValues: NamedTensor[]): Promise<void> {\n    weightValues = await
this.extractIterations(weightValues);\n    tidy(() => {\n      this.accBeta1.assign(pow(this.beta1, this.iterations_ +
1));\n
    this.accBeta2.assign(pow(this.beta2, this.iterations_ + 1));\n    });\n\n    const variableCount =
weightValues.length / 2;\n    const trainable = false;\n    this.accumulatedFirstMoment =\n        weightValues.slice(0,
variableCount).map(v => ({\n                                originalName: v.name,\n
 variable: v.tensor.variable(\n                                trainable)\n                                }));\n
this.accumulatedSecondMoment =\n        weightValues.slice(variableCount, variableCount * 2)\n            .map(v =>
({\n                originalName: v.name,\n                variable: v.tensor.variable(trainable)\n                }));\n  }\n\n
getConfig(): ConfigDict {\n    return {\n      'learningRate': this.learningRate,\n      'beta1': this.beta1,\n      'beta2':
this.beta2,\n      'epsilon': this.epsilon,\n    };\n  }\n\n  /** @nocollapse */\n
  static fromConfig<T extends Serializable>(\n      cls: SerializableConstructor<T>, config: ConfigDict): T {\n
return new cls(\n        config['learningRate'], config['beta1'], config['beta2'],\n        config['epsilon']);\n
}\n}\nregisterClass(AdamOptimizer);\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n
* Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport
 {ENGINE} from '../engine';\nimport {dispose, tidy} from '../globals';\nimport {abs} from '../ops/abs';\nimport
{add} from '../ops/add';\nimport {div} from '../ops/div';\nimport {maximum} from '../ops/maximum';\nimport {mul}
from '../ops/mul';\nimport {scalar} from '../ops/scalar';\nimport {sub} from '../ops/sub';\nimport {zerosLike} from
'../ops/zeros_like';\nimport {ConfigDict, registerClass, Serializable, SerializableConstructor} from
'../serialization';\nimport {Variable} from '../tensor';\nimport {NamedTensor, NamedVariableMap} from
'../tensor_types';\n\nimport {Optimizer, OptimizerVariable} from './optimizer';\n\nexport class AdamaxOptimizer
extends Optimizer {\n  /** @nocollapse */\n  static className = 'Adamax';  // Note: Name matters for Python
compatbility.\n  private accBeta1: Variable;\n  private iteration: Variable;\n\n  private accumulatedFirstMoment:
OptimizerVariable[] = [];\n  private accumulatedWeightedInfNorm: OptimizerVariable[] = [];\n\n  constructor(\n
protected
 learningRate: number, protected beta1: number,\n      protected beta2: number, protected epsilon: number = null,\n
 protected decay = 0.0) {\n    super();\n\n    tidy(() => {\n      this.iteration = scalar(0).variable();\n      this.accBeta1 =
scalar(beta1).variable();\n    });\n\n    if (epsilon == null) {\n      this.epsilon = ENGINE.backend.epsilon();\n    }\n
}\n\n  applyGradients(variableGradients: NamedVariableMap|NamedTensor[]) {\n    const variableNames =
Array.isArray(variableGradients) ?\n        variableGradients.map(item => item.name) :\n
```

```
Object.keys(variableGradients);\n\n    tidy(() => {\n      const oneMinusAccBeta1 = sub(1, this.accBeta1);\n      const lr =\n          div(-this.learningRate, add(mul(this.iteration, this.decay), 1));\n\n      variableNames.forEach((name, i) => {\n        const value = ENGINE.registeredVariables[name];\n        const trainable = false;\n        if (this.accumulatedFirstMoment[i] == null) {\n          this.accumulatedFirstMoment[i] = {\n            originalName: `${name}/m`,\n            variable: zerosLike(value).variable(trainable)\n          };\n        }\n        if (this.accumulatedWeightedInfNorm[i] == null) {\n          this.accumulatedWeightedInfNorm[i] = {\n            originalName: `${name}/v`,\n            variable: zerosLike(value).variable(trainable)\n          };\n        }\n\n        const gradient = Array.isArray(variableGradients) ?\n            variableGradients[i].tensor :\n            variableGradients[name];\n        if (gradient == null) {\n          return;\n        }\n\n        const firstMoment = this.accumulatedFirstMoment[i].variable;\n        const weightedInfNorm = this.accumulatedWeightedInfNorm[i].variable;\n\n        const newFirstMoment =\n            add(mul(firstMoment, this.beta1), mul(gradient, 1 - this.beta1));\n\n        const ut0 = mul(weightedInfNorm, this.beta2);\n        const ut1 = abs(gradient);\n\n        const newWeightedInfNorm = maximum(ut0, ut1);\n\n        firstMoment.assign(newFirstMoment);\n        weightedInfNorm.assign(newWeightedInfNorm);\n\n        const newValue =\n            add(mul(div(lr, oneMinusAccBeta1),\n                    div(newFirstMoment, add(newWeightedInfNorm, this.epsilon))),\n                value);\n\n        value.assign(newValue);\n      });\n\n      this.iteration.assign(add(this.iteration, 1));\n      this.accBeta1.assign(mul(this.accBeta1, this.beta1));\n    });\n    this.incrementIterations();\n  }\n\n  dispose(): void {\n    this.accBeta1.dispose();\n    this.iteration.dispose();\n\n    if (this.accumulatedFirstMoment != null) {\n      dispose(this.accumulatedFirstMoment.map(v => v.variable));\n    }\n    if (this.accumulatedWeightedInfNorm != null) {\n      dispose(this.accumulatedWeightedInfNorm.map(v => v.variable));\n    }\n  }\n\n  async getWeights(): Promise<NamedTensor[]> {\n    throw new Error('getWeights() is not implemented for Adamax yet.');\n  }\n\n  async setWeights(weightValues: NamedTensor[]): Promise<void> {\n    throw new Error('setWeights() is not implemented for Adamax yet.');\n  }\n\n  getConfig(): ConfigDict {\n    return {\n      'learningRate': this.learningRate,\n      'beta1': this.beta1,\n      'beta2': this.beta2,\n      'epsilon': this.epsilon,\n      'decay': this.decay\n    };\n  }\n\n  /** @nocollapse */\n  static fromConfig<T extends Serializable>(\n      cls: SerializableConstructor<T>, config: ConfigDict): T {\n    return new cls(\n        config['learningRate'], config['beta1'], config['beta2'],\n        config['epsilon'], config['decay']);\n  }\n}\nregisterClass(AdamaxOptimizer);\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
=============================================================================\n */\n\nimport {ENGINE} from '../engine';\nimport {keep, tidy} from '../globals';\nimport {add} from '../ops/add';\nimport {mul} from '../ops/mul';\nimport {scalar} from '../ops/scalar';\nimport {ConfigDict, registerClass, Serializable, SerializableConstructor} from '../serialization';\nimport {Scalar} from '../tensor';\nimport {NamedTensor, NamedTensorMap} from '../tensor_types';\n\nimport {Optimizer} from './optimizer';\n\n/** @doclink Optimizer */\nexport class SGDOptimizer extends Optimizer {\n  /** @nocollapse */\n  static className = 'SGD';  // Note: Name matters for Python compatibility.\n  protected c: Scalar;\n\n  constructor(protected learningRate: number) {\n    super();\n    this.setLearningRate(learningRate);\n  }\n\n  applyGradients(variableGradients: NamedTensorMap|NamedTensor[]) {\n    const varNames = Array.isArray(variableGradients) ?\n        variableGradients.map(v => v.name) :\n        Object.keys(variableGradients);\n    varNames.forEach((name, i) => {\n      const gradient = Array.isArray(variableGradients) ?\n          variableGradients[i].tensor :\n          variableGradients[name];\n      if (gradient == null) {\n        return;\n      }\n      const value = ENGINE.registeredVariables[name];\n      tidy(() => {\n        const newValue = add(mul(this.c, gradient), value);\n        value.assign(newValue);\n      });\n    });\n
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this.incrementIterations();\n }\n\n /**\n   * Sets the learning rate of the optimizer.\n   */\n
setLearningRate(learningRate: number) {\n   this.learningRate = learningRate;\n   if (this.c != null) {\n
this.c.dispose();\n   }\n   this.c = keep(scalar(-learningRate));\n
  }\n\n dispose() {\n   this.c.dispose();\n }\n\n async getWeights(): Promise<NamedTensor[]> {\n   return [await
this.saveIterations()];\n }\n\n async setWeights(weightValues: NamedTensor[]): Promise<void> {\n
weightValues = await this.extractIterations(weightValues);\n   if (weightValues.length !== 0) {\n   throw new
Error('SGD optimizer does not have settable weights.');\n   }\n }\n\n getConfig(): ConfigDict {\n   return
{'learningRate': this.learningRate};\n }\n\n /** @nocollapse */\n static fromConfig<T extends Serializable>(\n
cls: SerializableConstructor<T>, config: ConfigDict): T {\n   return new cls(config['learningRate']);\n
}\n}\nregisterClass(SGDOptimizer);\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n
* Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n
 *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is
distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either
express or implied.\n * See the License for the specific language governing permissions and\n * limitations under
the License.\n *
==\n
*/\n\nimport {ENGINE} from '../engine';\nimport {dispose, tidy} from '../globals';\nimport {add} from
'../ops/add';\nimport {mul} from '../ops/mul';\nimport {scalar} from '../ops/scalar';\nimport {zerosLike} from
'../ops/zeros_like';\nimport {ConfigDict, registerClass, Serializable, SerializableConstructor} from
'../serialization';\nimport {Scalar, Tensor} from '../tensor';\nimport {NamedTensor, NamedVariableMap} from
'../tensor_types';\n\nimport {OptimizerVariable} from './optimizer';\nimport {SGDOptimizer} from
'./sgd_optimizer';\n\n/** @doclink Optimizer */\nexport
 class MomentumOptimizer extends SGDOptimizer {\n /** @nocollapse */\n static className = 'Momentum'; //
Name matters for Python compatibility.\n private m: Scalar;\n private accumulations: OptimizerVariable[] = [];\n\n
constructor(\n   protected learningRate: number, private momentum: number,\n   private useNesterov = false) {\n
  super(learningRate);\n   this.m = scalar(this.momentum);\n }\n\n applyGradients(variableGradients:
NamedVariableMap|NamedTensor[]) {\n   const variableNames = Array.isArray(variableGradients) ?\n
variableGradients.map(item => item.name) :\n   Object.keys(variableGradients);\n\n
variableNames.forEach((name, i) => {\n   const value = ENGINE.registeredVariables[name];\n   if
(this.accumulations[i] == null) {\n   const trainable = false;\n   this.accumulations[i] = {\n   originalName:
`${name}/momentum`,\n   variable: tidy(() => zerosLike(value).variable(trainable))\n   };\n   }\n\n
    const accumulation = this.accumulations[i].variable;\n   const gradient = Array.isArray(variableGradients) ?\n
    variableGradients[i].tensor :\n   variableGradients[name];\n   if (gradient == null) {\n   return;\n   }\n\n
  tidy(() => {\n   let newValue: Tensor;\n   const newAccumulation = add(mul(this.m, accumulation),
gradient);\n   if (this.useNesterov) {\n   newValue = add(\n   mul(this.c, add(gradient,
mul(newAccumulation, this.m))), value);\n   } else {\n   newValue = add(mul(this.c, newAccumulation),
value);\n   }\n   accumulation.assign(newAccumulation);\n   value.assign(newValue);\n   });\n   });\n
this.incrementIterations();\n }\n\n dispose(): void {\n   this.m.dispose();\n   if (this.accumulations != null) {\n
dispose(this.accumulations.map(v => v.variable));\n   }\n }\n\n /**\n   * Sets the momentum of the optimizer.\n
*\n   * @param momentum\n   */\n setMomentum(momentum:
 number) {\n   this.momentum = momentum;\n }\n\n async getWeights(): Promise<NamedTensor[]> {\n   // Order
matters for Python compatibility.\n   return [await this.saveIterations()].concat(this.accumulations.map(\n   v =>
({name: v.originalName, tensor: v.variable})));\n }\n\n async setWeights(weightValues: NamedTensor[]):
Promise<void> {\n   weightValues = await this.extractIterations(weightValues);\n   const trainable = false;\n
this.accumulations = weightValues.map(\n   v => ({originalName: v.name, variable:
v.tensor.variable(trainable)}));\n }\n\n getConfig(): ConfigDict {\n   return {\n   'learningRate':

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this.learningRate,\n      'momentum': this.momentum,\n      'useNesterov': this.useNesterov\n    };\n  }\n\n  /** @nocollapse */\n  static fromConfig<T extends Serializable>(\n      cls: SerializableConstructor<T>, config: ConfigDict): T {\n    return new cls(\n        config['learningRate'], config['momentum'], config['useNesterov']);\n  }\n}\nregisterClass(MomentumOptimizer);\n","/**\n
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=============================================================================\n
*/\n\nimport {ENGINE} from '../engine';\nimport {dispose, tidy} from '../globals';\nimport {add} from '../ops/add';\nimport {div} from '../ops/div';\nimport {mul} from '../ops/mul';\nimport {sqrt} from '../ops/sqrt';\nimport {square} from
 '../ops/square';\nimport {sub} from '../ops/sub';\nimport {zerosLike} from '../ops/zeros_like';\nimport {ConfigDict, registerClass, Serializable, SerializableConstructor} from '../serialization';\nimport {NamedTensor, NamedTensorMap} from '../tensor_types';\n\nimport {Optimizer, OptimizerVariable} from './optimizer';\n\n/** @doclink Optimizer */\nexport class RMSPropOptimizer extends Optimizer {\n  /** @nocollapse */\n  static className = 'RMSProp';  // Note: Name matters for Python compatibility.\n  private centered: boolean;\n\n  private accumulatedMeanSquares: OptimizerVariable[] = [];\n  private accumulatedMoments: OptimizerVariable[] = [];\n  private accumulatedMeanGrads: OptimizerVariable[] = [];\n\n  constructor(\n      protected learningRate: number, protected decay = 0.9,\n      protected momentum = 0.0, protected epsilon: number = null,\n      centered = false) {\n    super();\n\n    this.centered = centered;\n\n    if (epsilon == null) {\n      this.epsilon = ENGINE.backend.epsilon();\n    }\n    if (learningRate == null) {\n      throw new Error(`learningRate for RMSPropOptimizer must be defined.`);\n    }\n  }\n\n  applyGradients(variableGradients: NamedTensorMap|NamedTensor[]) {\n    const variableNames = Array.isArray(variableGradients) ?\n        variableGradients.map(item => item.name) :\n        Object.keys(variableGradients);\n\n    variableNames.forEach((name, i) => {\n      const value = ENGINE.registeredVariables[name];\n      const trainable = false;\n      if (this.accumulatedMeanSquares[i] == null) {\n        this.accumulatedMeanSquares[i] = {\n          originalName: `${name}/rms`,\n          variable: tidy(() => zerosLike(value).variable(trainable))\n        };\n      }\n      if (this.accumulatedMoments[i] == null) {\n        this.accumulatedMoments[i] = {\n          originalName: `${name}/momentum`,\n          variable: tidy(() => zerosLike(value).variable(trainable))\n        };\n      }\n      if (this.accumulatedMeanGrads[i] == null &&
 this.centered) {\n        this.accumulatedMeanGrads[i] = {\n          originalName: `${name}/mg`,\n          variable: tidy(() => zerosLike(value).variable(trainable))\n        };\n      }\n\n      const gradient =
 Array.isArray(variableGradients) ?\n          variableGradients[i].tensor :\n          variableGradients[name];\n      if (gradient == null) {\n        return;\n      }\n\n      const accumulatedMeanSquare =
 this.accumulatedMeanSquares[i].variable;\n      const accumulatedMoments =
 this.accumulatedMoments[i].variable;\n      tidy(() => {\n        const newAccumulatedMeanSquare =\n
 add(mul(accumulatedMeanSquare, this.decay),\n                mul(square(gradient), 1 - this.decay));\n\n        if (this.centered) {\n          const accumulatedMeanGrad = this.accumulatedMeanGrads[i].variable;\n          // Centered gradient\n          const newAccumulatedMeanGrad =\n              add(mul(accumulatedMeanGrad, this.decay),\n
      mul(gradient, 1 - this.decay));\n\n
          const gradContribution =\n              div(mul(gradient, this.learningRate),\n                  sqrt(\n
 sub(newAccumulatedMeanSquare,\n                      add(square(newAccumulatedMeanGrad), this.epsilon))));\n
  const newAccumulatedMoments =\n              add(mul(accumulatedMoments, this.momentum),
 gradContribution);\n\n          accumulatedMeanSquare.assign(newAccumulatedMeanSquare);\n
 accumulatedMeanGrad.assign(newAccumulatedMeanGrad);\n
 accumulatedMoments.assign(newAccumulatedMoments);\n\n          const newValue = sub(value,
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newAccumulatedMoments);\n value.assign(newValue);\n } else {\n // Plain gradient\n const newAccumulatedMeanSquare =\n add(mul(accumulatedMeanSquare, this.decay),\n mul(square(gradient), 1 - this.decay));\n\n const newAccumulatedMoments =\n add(mul(accumulatedMoments, this.momentum),\n div(mul(gradient,\n this.learningRate),\n sqrt(add(newAccumulatedMeanSquare, this.epsilon))));\n\n accumulatedMeanSquare.assign(newAccumulatedMeanSquare);\n accumulatedMoments.assign(newAccumulatedMoments);\n\n const newValue = sub(value,\n newAccumulatedMoments);\n value.assign(newValue);\n }\n });\n });\n this.incrementIterations();\n }\n\n dispose(): void {\n if (this.accumulatedMeanSquares != null) {\n dispose(this.accumulatedMeanSquares.map(v => v.variable));\n }\n if (this.accumulatedMeanGrads != null && this.centered) {\n dispose(this.accumulatedMeanGrads.map(v => v.variable));\n }\n if (this.accumulatedMoments != null) {\n dispose(this.accumulatedMoments.map(v => v.variable));\n }\n }\n\n async getWeights(): Promise<NamedTensor[]> {\n // Order matters for Python compatibility.\n const variables: OptimizerVariable[] =\n [...this.accumulatedMeanSquares, ...this.accumulatedMoments];\n if (this.centered) {\n variables.push(...this.accumulatedMeanGrads);\n }\n return [await this.saveIterations()].concat(\n variables.map(v => ({name: v.originalName, tensor: v.variable})));\n }\n\n async setWeights(weightValues: NamedTensor[]): Promise<void> {\n weightValues = await this.extractIterations(weightValues);\n const variableCount =\n this.centered ? weightValues.length / 3 :\n weightValues.length / 2;\n const trainable = false;\n this.accumulatedMeanSquares =\n weightValues.slice(0, variableCount).map(v => ({\n originalName: v.name,\n variable: v.tensor.variable(\n trainable)\n }));\n this.accumulatedMoments =\n weightValues.slice(variableCount, variableCount * 2)\n .map(v => ({\n originalName: v.name,\n variable: v.tensor.variable(trainable)\n }));\n if (this.centered) {\n this.accumulatedMeanGrads =\n weightValues.slice(variableCount * 2, variableCount * 3)\n .map(v => ({\n originalName: v.name,\n variable: v.tensor.variable(trainable)\n }));\n }\n }\n\n getConfig(): ConfigDict {\n return {\n 'learningRate': this.learningRate,\n 'decay': this.decay,\n 'momentum': this.momentum,\n 'epsilon': this.epsilon,\n 'centered': this.centered\n };\n }\n\n /** @nocollapse */\n static fromConfig<T extends Serializable>(\n cls: SerializableConstructor<T>, config: ConfigDict): T {\n return new cls(\n config['learningRate'], config['decay'], config['momentum'],\n config['epsilon'], config['centered']);\n }\n}\nregisterClass(RMSPropOptimizer);\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {AdadeltaOptimizer} from './adadelta_optimizer';\nimport {AdagradOptimizer} from './adagrad_optimizer';\nimport {AdamOptimizer} from './adam_optimizer';\nimport {AdamaxOptimizer} from './adamax_optimizer';\nimport {MomentumOptimizer} from './momentum_optimizer';\nimport {RMSPropOptimizer} from './rmsprop_optimizer';\nimport {SGDOptimizer} from './sgd_optimizer';\n\nexport class OptimizerConstructors {\n /**\n * Constructs a `tf.SGDOptimizer` that uses stochastic gradient descent.\n *\n * ```js\n * // Fit a quadratic function by learning the coefficients a, b, c.\n * const xs = tf.tensor1d([0, 1, 2, 3]);\n * const ys = tf.tensor1d([1.1, 5.9, 16.8, 33.9]);\n *\n * const a = tf.scalar(Math.random()).variable();\n * const b = tf.scalar(Math.random()).variable();\n * const c = tf.scalar(Math.random()).variable();\n *\n * // y = a * x^2 + b * x + c.\n * const f = x =>

a.mul(x.square()).add(b.mul(x)).add(c);\n * const loss = (pred, label) => pred.sub(label).square().mean();\n *\n * const learningRate = 0.01;\n * const optimizer = tf.train.sgd(learningRate);\n *\n * // Train the model.\n * for (let i = 0; i < 10; i++) {\n * optimizer.minimize(() => loss(f(xs), ys));\n * }\n *\n * // Make predictions.\n * console.log(\n * `a: ${a.dataSync()},
b: ${b.dataSync()}, c: ${c.dataSync()}`);\n * const preds = f(xs).dataSync();\n * preds.forEach((pred, i) => {\n * console.log(`x: ${i}, pred: ${pred}`);\n * });\n * ```\n *\n * @param learningRate The learning rate to use for the SGD algorithm.\n *\n * @doc {heading: 'Training', subheading: 'Optimizers', namespace: 'train'}\n */\n static sgd(learningRate: number): SGDOptimizer {\n return new SGDOptimizer(learningRate);\n }\n\n /**\n * Constructs a `tf.MomentumOptimizer` that uses momentum gradient\n * descent.\n *\n * See\n * [http://proceedings.mlr.press/v28/sutskever13.pdf](\n * http://proceedings.mlr.press/v28/sutskever13.pdf)\n *\n * @param learningRate The learning rate to use for the Momentum gradient\n * descent algorithm.\n * @param momentum The momentum to use for the momentum gradient descent\n * algorithm.\n *\n * @doc {heading: 'Training', subheading: 'Optimizers', namespace: 'train'}\n */\n static momentum(learningRate:
number, momentum: number, useNesterov = false):\n MomentumOptimizer {\n return new MomentumOptimizer(learningRate, momentum, useNesterov);\n }\n\n /**\n * Constructs a `tf.RMSPropOptimizer` that uses RMSProp gradient\n * descent. This implementation uses plain momentum and is not centered\n * version of RMSProp.\n *\n * See\n * [http://www.cs.toronto.edu/~tijmen/csc321/slides/lecture_slides_lec6.pdf](\n * http://www.cs.toronto.edu/~tijmen/csc321/slides/lecture_slides_lec6.pdf)\n *\n * @param learningRate The learning rate to use for the RMSProp gradient\n * descent algorithm.\n * @param decay The discounting factor for the history/coming gradient.\n * @param momentum The momentum to use for the RMSProp gradient descent\n * algorithm.\n * @param epsilon Small value to avoid zero denominator.\n * @param centered If true, gradients are normalized by the estimated\n * variance of the gradient.\n *\n * @doc {heading: 'Training', subheading:
'Optimizers', namespace: 'train'}\n */\n static rmsprop(\n learningRate: number, decay = .9, momentum = 0.0, epsilon: number = null,\n centered = false): RMSPropOptimizer {\n return new RMSPropOptimizer(\n learningRate, decay, momentum, epsilon, centered);\n }\n\n /**\n * Constructs a `tf.AdamOptimizer` that uses the Adam algorithm.\n * See https://arxiv.org/abs/1412.6980\n *\n * @param learningRate The learning rate to use for the Adam gradient\n * descent algorithm.\n * @param beta1 The exponential decay rate for the 1st moment estimates.\n * @param beta2 The exponential decay rate for the 2nd moment estimates.\n * @param epsilon A small constant for numerical stability.\n *\n * @doc {heading: 'Training', subheading: 'Optimizers', namespace: 'train'}\n */\n static adam(\n learningRate = 0.001, beta1 = 0.9, beta2 = 0.999,\n epsilon: number = null): AdamOptimizer {\n return new AdamOptimizer(learningRate,
beta1, beta2, epsilon);\n }\n\n /**\n * Constructs a `tf.AdadeltaOptimizer` that uses the Adadelta algorithm.\n * See https://arxiv.org/abs/1212.5701\n *\n * @param learningRate The learning rate to use for the Adadelta gradient\n * descent algorithm.\n * @param rho The learning rate decay over each update.\n * @param epsilon A constant epsilon used to better condition the grad\n * update.\n *\n * @doc {heading: 'Training', subheading: 'Optimizers', namespace: 'train'}\n */\n static adadelta(learningRate = .001, rho = .95, epsilon: number = null):\n AdadeltaOptimizer {\n return new AdadeltaOptimizer(learningRate, rho, epsilon);\n }\n\n /**\n * Constructs a `tf.AdamaxOptimizer` that uses the Adamax algorithm.\n * See https://arxiv.org/abs/1412.6980\n *\n * @param learningRate The learning rate to use for the Adamax gradient\n * descent algorithm.\n *
@param beta1 The exponential decay rate for the 1st moment estimates.\n * @param beta2 The exponential decay rate for the 2nd moment estimates.\n * @param epsilon A small constant for numerical stability.\n * @param decay The learning rate decay over each update.\n *\n * @doc {heading: 'Training', subheading: 'Optimizers', namespace: 'train'}\n */\n static adamax(\n learningRate = 0.002, beta1 = 0.9, beta2 = 0.999, epsilon: number = null,\n decay = 0.0): AdamaxOptimizer {\n return new AdamaxOptimizer(learningRate, beta1, beta2, epsilon, decay);\n }\n\n /**\n * Constructs a `tf.AdagradOptimizer` that uses the Adagrad algorithm.\n * See\n *

[http://www.jmlr.org/papers/volume12/duchi11a/duchi11a.pdf](\n * http://www.jmlr.org/papers/volume12/duchi11a/duchi11a.pdf)\n * or\n * [http://ruder.io/optimizing-gradient-descent/index.html#adagrad](\n * http://ruder.io/optimizing-gradient-descent/index.html#adagrad)\n *\n * @param learningRate The learning
rate to use for the Adagrad gradient\n * descent algorithm.\n * @param initialAccumulatorValue Starting value for the accumulators, must be\n * positive.\n *\n * @doc {heading: 'Training', subheading: 'Optimizers', namespace: 'train'}\n */\n static adagrad(learningRate: number, initialAccumulatorValue = 0.1):\n AdagradOptimizer {\n return new AdagradOptimizer(learningRate, initialAccumulatorValue);\n }\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\n// So typings can propagate.\nimport {AdadeltaOptimizer} from './optimizers/adadelta_optimizer';\nimport {AdagradOptimizer} from './optimizers/adagrad_optimizer';\nimport {AdamOptimizer} from './optimizers/adam_optimizer';\nimport {AdamaxOptimizer} from './optimizers/adamax_optimizer';\nimport {MomentumOptimizer} from './optimizers/momentum_optimizer';\nimport {OptimizerConstructors} from './optimizers/optimizer_constructors';\nimport {RMSPropOptimizer} from './optimizers/rmsprop_optimizer';\nimport {SGDOptimizer} from './optimizers/sgd_optimizer';\n\n// tslint:disable-next-line:no-unused-expression\n[MomentumOptimizer, SGDOptimizer, AdadeltaOptimizer, AdagradOptimizer,\n RMSPropOptimizer, AdamaxOptimizer, AdamOptimizer];\n\nexport const train = {\n sgd: OptimizerConstructors.sgd,\n momentum: OptimizerConstructors.momentum,\n
adadelta: OptimizerConstructors.adadelta,\n adagrad: OptimizerConstructors.adagrad,\n rmsprop: OptimizerConstructors.rmsprop,\n adamax: OptimizerConstructors.adamax,\n adam: OptimizerConstructors.adam\n};\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nconst delayCallback: Function = (() => {\n if (typeof requestAnimationFrame
!== 'undefined') {\n return requestAnimationFrame;\n } else if (typeof setImmediate !== 'undefined') {\n return setImmediate;\n }\n return (f: Function) => f(); // no delays\n})();\n\n/**\n * Returns a promise that resolve when a requestAnimationFrame has completed.\n *\n * On Node.js this uses setImmediate instead of requestAnimationFrame.\n *\n * This is simply a sugar method so that users can do the following:\n * `await tf.nextFrame();`\n *\n * @doc {heading: 'Performance', subheading: 'Timing'}\n */\nfunction nextFrame(): Promise<void> {\n return new Promise<void>(resolve => delayCallback(() => resolve()));\n}\n\nexport {nextFrame};\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required
by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the

License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport * as util from '../util';\n\nexport function assertParamsConsistent(shapes: number[][], axis: number) {\n const rank = shapes[0].length;\n shapes.forEach((shape, i) => {\n util.assert(\n shape.length === rank,\n () =>\n `Error in concat${rank}D: rank of tensors[${i}] must be the same ` +\n `as the rank of the rest (${rank})`);\n });\n\n util.assert(\n axis >= 0 && axis < rank,\n () => `Error in concat${rank}D: axis must be between 0 and ${rank - 1}.`);\n\n const firstShape = shapes[0];\n shapes.forEach((shape, i) => {\n for (let r = 0; r < rank; r++) {\n util.assert(\n (r === axis) || (shape[r] === firstShape[r]),\n () => `Error in concat${rank}D: Shape of tensors[${i}] (${shape}) ` +\n `does not match the shape of the rest (${firstShape}) ` +\n `along the non-concatenated axis ${i}.`);\n }\n });\n}\n\nexport function computeOutShape(shapes: number[][], axis: number): number[] {\n const outputShape = shapes[0].slice();\n for (let i = 1; i < shapes.length; i++) {\n outputShape[axis] += shapes[i][axis];\n }\n return outputShape;\n}\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\n/**\n * Inputs of size above this threshold will be parallelized by calling multiple\n * shader programs.\n */\nimport {nearestDivisor} from '../util';\n\nexport const PARALLELIZE_THRESHOLD = 30;\n\nexport interface ReduceInfo {\n windowSize: number;\n batchSize: number;\n inSize: number;\n outSize: number;\n}\n\nexport function computeOptimalWindowSize(inSize: number): number {\n if (inSize <= PARALLELIZE_THRESHOLD) {\n return inSize;\n }\n return nearestDivisor(inSize, Math.floor(Math.sqrt(inSize)));\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\n// Returns the image center in pixels.\nexport function getImageCenter(\n center: number|[number, number], imageHeight: number,\n imageWidth: number): [number, number] {\n const centerX =\n imageWidth * (typeof center === 'number' ? center : center[0]);\n const centerY =\n imageHeight * (typeof center === 'number' ? center : center[1]);\n return [centerX, centerY];\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\n/**\n * Gets the new shape of the input Tensor after it's been reshaped\n * to:\n * [blockShape[0], ..., blockShape[M-1], batch / prod(blockShape),\n * inputShape[1], ..., inputShape[N-1]]\n *\n * See step 1: https://www.tensorflow.org/api_docs/python/tf/batch_to_space_nd\n */\nexport function getReshaped(\n

inputShape:
 number[], blockShape: number[], prod: number,\n   batchToSpace = true): number[] {\n let reshaped: number[] = [];\n if (batchToSpace) {\n   reshaped = reshaped.concat(blockShape.slice(0));\n   reshaped.push(inputShape[0] / prod);\n   reshaped = reshaped.concat(inputShape.slice(1));\n } else {\n   reshaped = reshaped.concat(inputShape[0]);\n   const spatialLength = blockShape.length;\n   for (let i = 0; i < spatialLength; ++i) {\n   reshaped =\n   reshaped.concat([inputShape[i + 1] / blockShape[i], blockShape[i]]);\n   }\n   reshaped = reshaped.concat(inputShape.slice(spatialLength + 1));\n }\n return reshaped;\n}\n\n/**\n * Gets the permutation that will transpose the dimensions of the\n * reshaped tensor to shape:\n *\n * [batch / prod(block_shape),inputShape[1], blockShape[0], ...,\n * inputShape[M], blockShape[M-1],inputShape[M+1], ..., inputShape[N-1]]\n *\n * see step 2: https://www.tensorflow.org/api_docs/python/tf/batch_to_space_nd\n */\nexport function getPermuted(\n   reshapedRank: number, blockShapeRank: number,\n   batchToSpace = true): number[] {\n const permuted = [];\n if (batchToSpace) {\n   permuted.push(blockShapeRank);\n   for (let i = blockShapeRank + 1; i < reshapedRank; ++i) {\n   if (i <= 2 * blockShapeRank) {\n   permuted.push(i);\n   permuted.push(i - (blockShapeRank + 1));\n   } else {\n   permuted.push(i);\n   }\n   }\n } else {\n   const permutedBeforeBatch = [];\n   const permutedAfterBatch = [];\n   for (let i = 1; i < reshapedRank; ++i) {\n   if (i >= blockShapeRank * 2 + 1 || i % 2 === 1) {\n   permutedAfterBatch.push(i);\n   } else {\n   permutedBeforeBatch.push(i);\n   }\n   }\n   permuted.push(...permutedBeforeBatch);\n   permuted.push(0);\n   permuted.push(...permutedAfterBatch);\n }\n return permuted;\n}\n\n/**\n * Gets the shape of the reshaped and permuted input Tensor before any cropping\n * is applied. The new shape will be:\n *\n * [batch / prod(blockShape),inputShape[1]
 * blockShape[0], ...,\n * inputShape[M] * blockShape[M-1],inputShape[M+1], ..., inputShape[N-1]]\n *\n * See step 3: https://www.tensorflow.org/api_docs/python/tf/batch_to_space_nd\n */\nexport function getReshapedPermuted(\n   inputShape: number[], blockShape: number[], prod: number,\n   batchToSpace = true): number[] {\n const reshapedPermuted = [];\n\n if (batchToSpace) {\n   reshapedPermuted.push(inputShape[0] / prod);\n } else {\n   reshapedPermuted.push(inputShape[0] * prod);\n }\n\n for (let i = 1; i < inputShape.length; ++i) {\n   if (i <= blockShape.length) {\n   if (batchToSpace) {\n   reshapedPermuted.push(blockShape[i - 1] * inputShape[i]);\n   } else {\n   reshapedPermuted.push(inputShape[i] / blockShape[i - 1]);\n   }\n   } else {\n   reshapedPermuted.push(inputShape[i]);\n   }\n }\n\n return reshapedPermuted;\n}\n\n/**\n * Converts the crops argument into the beginning coordinates of a slice\n * operation.\n
 */\nexport function getSliceBeginCoords(\n   crops: number[][], blockShape: number): number[] {\n const sliceBeginCoords = [0];\n for (let i = 0; i < blockShape; ++i) {\n   sliceBeginCoords.push(crops[i][0]);\n }\n return sliceBeginCoords;\n}\n\n/**\n * Converts the crops argument into the size of a slice operation. When\n * combined with getSliceBeginCoords this function allows the reshaped and\n * permuted Tensor to be cropped to its final output shape of:\n *\n * inputShape[1] * blockShape[0] - crops[0,0] - crops[0,1], ...,\n * inputShape[M] * blockShape[M-1] -crops[M-1,0] -\n * crops[M-1,1],inputShape[M+1], ..., inputShape[N-1]]\n *\n * See step 4: https://www.tensorflow.org/api_docs/python/tf/batch_to_space_nd\n */\nexport function getSliceSize(\n uncroppedShape: number[], crops: number[][], blockShape: number): number[] {\n const sliceSize = uncroppedShape.slice(0, 1);\n for (let i = 0; i < blockShape; ++i) {\n   sliceSize.push(uncroppedShape[i + 1] - crops[i][0]
 - crops[i][1]);\n }\n\n return sliceSize;\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nexport const SELU_SCALEALPHA = 1.758099340847376859940217520812 3;\nexport const SELU_SCALE = 1.050700987355480493419334985294 6;\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
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==========\n
*/\n\nexport const ERF_P = 0.3275911;\nexport const ERF_A1 = 0.254829592;\nexport const ERF_A2 = -0.284496736;\nexport const ERF_A3 = 1.421413741;\nexport const ERF_A4 = -1.453152027;\nexport const ERF_A5 = 1.061405429;\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may
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==========\n
*/\n\nimport {env} from './environment';\n\nexport function warn(...msg: Array<{}>): void {\n if (!env().getBool('IS_TEST')) {\n console.warn(...msg);\n }\n}\n\nexport function log(...msg: Array<{}>): void {\n if (!env().getBool('IS_TEST')) {\n console.log(...msg);\n }\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n *
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==========\n
*/\n\nimport {TypedArray} from '../types';\n/**\n * Merges real and imaginary Float32Arrays into a single complex Float32Array.\n *\n * The memory layout is interleaved as follows:\n * real: [r0, r1, r2]\n * imag: [i0, i1, i2]\n * complex: [r0, i0, r1, i1, r2, i2]\n *\n * This is the inverse of splitRealAndImagArrays.\n *\n * @param real The real values of the complex tensor values.\n * @param imag The imag values of the
complex tensor values.\n * @returns A complex tensor as a Float32Array with merged values.\n */\nexport function mergeRealAndImagArrays(\n real: Float32Array, imag: Float32Array): Float32Array {\n if (real.length !== imag.length) {\n throw new Error(\n `Cannot merge real and imag arrays of different lengths. real:` +\n `${real.length}, imag: ${imag.length}.`);\n }\n const result = new Float32Array(real.length * 2);\n for (let i = 0; i < result.length; i += 2) {\n result[i] = real[i / 2];\n result[i + 1] = imag[i / 2];\n }\n return result;\n}\n\n/**\n * Splits a complex Float32Array into real and imag parts.\n *\n * The memory layout is interleaved as follows:\n * complex: [r0, i0, r1, i1, r2, i2]\n * real: [r0, r1, r2]\n * imag: [i0, i1, i2]\n *\n * This is the inverse of mergeRealAndImagArrays.\n *\n * @param complex The complex tensor values.\n * @returns An object with real and imag Float32Array components of the complex\n * tensor.\n */\nexport
function splitRealAndImagArrays(complex: Float32Array):\n {real: Float32Array, imag: Float32Array} {\n const real = new Float32Array(complex.length / 2);\n const imag = new Float32Array(complex.length / 2);\n for (let i = 0; i < complex.length; i += 2) {\n real[i / 2] = complex[i];\n imag[i / 2] = complex[i + 1];\n }\n return {real, imag};\n}\n\n/**\n * Extracts even indexed complex values in the given array.\n * @param complex The complex tensor values\n */\nexport function complexWithEvenIndex(complex: Float32Array):\n {real:

Float32Array, imag: Float32Array} {\n const len = Math.ceil(complex.length / 4);\n const real = new Float32Array(len);\n const imag = new Float32Array(len);\n for (let i = 0; i < complex.length; i += 4) {\n real[Math.floor(i / 4)] = complex[i];\n   imag[Math.floor(i / 4)] = complex[i + 1];\n }\n return {real, imag};\n}\n\n/**\n * Extracts odd indexed comple values in the given array.\n * @param complex The complex tensor values\n */\nexport
 function complexWithOddIndex(complex: Float32Array):\n   {real: Float32Array, imag: Float32Array} {\n const len = Math.floor(complex.length / 4);\n const real = new Float32Array(len);\n const imag = new Float32Array(len);\n for (let i = 2; i < complex.length; i += 4) {\n   real[Math.floor(i / 4)] = complex[i];\n imag[Math.floor(i / 4)] = complex[i + 1];\n }\n return {real, imag};\n}\n\n/**\n * Get the map representing a complex value in the given array.\n * @param complex The complex tensor values.\n * @param index An index of the target complex value.\n */\nexport function getComplexWithIndex(\n   complex: Float32Array, index: number): {real: number, imag: number} {\n const real = complex[index * 2];\n const imag = complex[index * 2 + 1];\n return {real, imag};\n}\n\n/**\n * Insert a given complex value into the TypedArray.\n * @param data The array in which the complex value is inserted.\n * @param c The complex value to be inserted.\n * @param index An index of
 the target complex value.\n */\nexport function assignToTypedArray(\n   data: TypedArray, real: number, imag: number, index: number) {\n data[index * 2] = real;\n data[index * 2 + 1] = imag;\n}\n\n/**\n * Make the list of exponent terms used by FFT.\n */\nexport function exponents(\n   n: number, inverse: boolean): {real: Float32Array, imag: Float32Array} {\n const real = new Float32Array(n / 2);\n const imag = new Float32Array(n / 2);\n for (let i = 0; i < Math.ceil(n / 2); i++) {\n   const x = (inverse ? 2 : -2) * Math.PI * (i / n);\n   real[i] = Math.cos(x);\n   imag[i] = Math.sin(x);\n }\n return {real, imag};\n}\n\n/**\n * Make the exponent term used by FFT.\n */\nexport function exponent(\n   k: number, n: number, inverse: boolean): {real: number, imag: number} {\n const x = (inverse ? 2 : -2) * Math.PI * (k / n);\n const real = Math.cos(x);\n const imag = Math.sin(x);\n return {real, imag};\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n
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==\n
*/\nimport {TensorInfo} from '../kernel_registry';\nimport {Tensor} from '../tensor';\nimport {assert} from '../util';\n\n/**\n * Prepare the split size array. When the input is a number, the axis is evenly\n * divided among the split size. When the input contains the negative value, the\n * rest of the axis is allocated toward that.\n */\nexport
 function prepareSplitSize(\n   x: Tensor|TensorInfo, numOrSizeSplits: number[]|number,\n   axis = 0): number[] {\n let splitSizes = [];\n if (typeof (numOrSizeSplits) === 'number') {\n   assert(\n   x.shape[axis] % numOrSizeSplits === 0,\n   () => 'Number of splits must evenly divide the axis.');\n   splitSizes =\n   new Array(numOrSizeSplits).fill(x.shape[axis] / numOrSizeSplits);\n } else {\n   const numOfNegs = numOrSizeSplits.reduce((count, value) => {\n   if (value === -1) {\n   count += 1;\n   }\n   return count;\n   }, 0);\n   assert(\n   numOfNegs <= 1,\n   () => 'There should be only one negative value in split array.');\n   const negIndex = numOrSizeSplits.indexOf(-1);\n   // Allow the number of split array to be -1, which indicates the rest\n   // of dimension is allocated to that split.\n   if (negIndex !== -1) {\n   const total = numOrSizeSplits.reduce((a, b) => b > 0 ? a + b : a);\n   numOrSizeSplits[negIndex]
 = x.shape[axis] - total;\n   }\n   assert(\n   x.shape[axis] === numOrSizeSplits.reduce((a, b) => a + b),\n   () => 'The sum of sizes must match the size of the axis dimension.');\n   splitSizes = numOrSizeSplits;\n }\n\n return splitSizes;\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *

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==========\n */\n\nimport {TensorInfo} from '../kernel_registry';\nimport {nearestDivisor} from '../util';\n\nimport {PARALLELIZE_THRESHOLD} from './reduce_util';\n\nexport interface SegOpInfo {\n windowSize: number;\n batchSize: number;\n inSize: number;\n numSegments: number;\n}\n\nexport function segOpComputeOptimalWindowSize(\n inSize: number, numSegments: number): number {\n let done = false;\n let res;\n\n if (inSize <= PARALLELIZE_THRESHOLD) {\n res = inSize;\n done = true;\n } else {\n res = nearestDivisor(inSize, Math.floor(Math.sqrt(inSize)));\n }\n\n while (!done) {\n if (res > numSegments || res === inSize) {\n done = true;\n } else {\n res = nearestDivisor(inSize, res + 1);\n }\n }\n return res;\n}\n\nexport function computeOutShape(\n aShape: number[], axis: number, numSegments: number): number[] {\n const outShape = [];\n const rank = aShape.length;\n for (let dim = 0; dim < rank; dim++) {\n if (dim !== axis) {\n outShape.push(aShape[dim]);\n

} else {\n outShape.push(numSegments);\n }\n }\n return outShape;\n}\n\nexport interface GatherOpShapeInfo {\n batchSize: number;\n sliceSize: number;\n outerSize: number;\n dimSize: number;\n outputShape: number[];\n}\n\nexport function collectGatherOpShapeInfo(\n x: TensorInfo, indices: TensorInfo, axis: number,\n batchDims: number): GatherOpShapeInfo {\n const indicesRank = indices.shape.length;\n const xRank = x.shape.length;\n\n if (batchDims !== 0) {\n if (batchDims < -indicesRank || batchDims > indicesRank) {\n throw new Error(`Expect batchDims in the range of [-${indicesRank}, ${\n indicesRank}], but got ${batchDims}`);\n }\n }\n\n if (batchDims < 0) {\n batchDims += indicesRank;\n }\n\n if (batchDims > xRank) {\n throw new Error(`batchDims (${batchDims}) must be less than rank(x) (\n ${xRank}).`);\n }\n\n if (axis < batchDims) {\n throw new Error(`batchDims (${\n batchDims}) must be less than or equal to axis (${axis}).`);\n }\n\n for (let i = 0; i < batchDims; ++i) {\n if (x.shape[i] !== indices.shape[i]) {\n throw new Error(\n `x.shape[${i}]: ${x.shape[i]} should be equal to indices.shape[${\n i}]: ${indices.shape[i]}.`);\n }\n }\n const dimSize = x.shape[axis];\n\n const outputShape: number[] = [];\n let batchSize = 1;\n let outerSize = 1;\n let sliceSize = 1;\n\n for (let i = 0; i < batchDims; ++i) {\n outputShape.push(x.shape[i]);\n batchSize *= x.shape[i];\n }\n\n for (let i = batchDims; i < axis; i++) {\n outputShape.push(x.shape[i]);\n outerSize *= x.shape[i];\n }\n\n for (let i = batchDims; i < indicesRank; i++) {\n outputShape.push(indices.shape[i]);\n }\n\n for (let i = axis + 1; i < xRank; i++) {\n outputShape.push(x.shape[i]);\n sliceSize *= x.shape[i];\n }\n\n return {batchSize, sliceSize, outerSize, dimSize, outputShape};\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {decodeString, encodeString} from '../util';\n\n// Utilities needed by backend consumers of tf-core.\nexport * from '../ops/axis_util';\nexport * from '../ops/broadcast_util';\nexport * from '../ops/concat_util';\nexport * from '../ops/conv_util';\nexport * from '../ops/fused_util';\nexport * from '../ops/fused_types';\nexport * from '../ops/reduce_util';\n\nimport * as slice_util from '../ops/slice_util';\nexport {slice_util};\n\nexport {BackendValues, TypedArray, upcastType, PixelData} from '../types';\nexport {MemoryInfo, TimingInfo} from '../engine';\nexport * from '../ops/rotate_util';\nexport * from '../ops/array_ops_util';\nexport * from '../ops/gather_nd_util';\nexport * from

'../ops/scatter_nd_util';\nexport * from '../ops/selu_util';\nexport * from '../ops/fused_util';\nexport * from '../ops/erf_util';\nexport * from '../log';\nexport * from '../backends/complex_util';\nexport * from '../ops/split_util';\n\nimport * as segment_util from '../ops/segment_util';\nexport {segment_util};\n\nexport function fromUint8ToStringArray(vals: Uint8Array[]) {\n try {\n   // Decode the bytes into string.\n   return vals.map(val => decodeString(val));\n } catch (err) {\n   throw new Error(\n   `Failed to decode encoded string bytes into utf-8, error: ${err}`);\n }\n}\n\nexport function fromStringArrayToUint8(strings: string[]) {\n return strings.map(s => encodeString(s));\n}\n\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ==\n */\n\nexport {nonMaxSuppressionV3Impl, nonMaxSuppressionV4Impl, nonMaxSuppressionV5Impl} from './non_max_suppression_impl';\nexport {whereImpl} from './where_impl';\n","/**\n * @license\n * Copyright 2020 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ==\n */\n\n// base.ts is tfjs-core without auto registration of things like flags,\n// gradients, chained ops or the opHandler. See base_side_effects.ts for parts\n// tfjs core that are required side effects.\n\n/**\n * @fileoverview\n * @suppress {partialAlias} Optimization disabled due to passing the module\n * object into a function below:\n *\n *   import * as ops from './ops/ops';\n *   setOpHandler(ops);\n */\n\n// Serialization.\nimport * as io from './io/io';\nimport * as math from './math';\nimport * as browser from './ops/browser';\nimport * as gather_util from './ops/gather_nd_util';\nimport * as scatter_util from './ops/scatter_nd_util';\nimport * as slice_util from './ops/slice_util';\nimport * as serialization from './serialization';\nimport * as tensor_util from './tensor_util';\nimport * as test_util from './test_util';\nimport * as util from './util';\nimport {version} from './version';\n\nexport {InferenceModel, MetaGraph, MetaGraphInfo, ModelPredictConfig, ModelTensorInfo, SavedModelTensorInfo, SignatureDef, SignatureDefEntry, SignatureDefInfo} from './model_types';\n// Optimizers.\nexport {AdadeltaOptimizer} from './optimizers/adadelta_optimizer';\nexport {AdagradOptimizer} from './optimizers/adagrad_optimizer';\nexport {AdamOptimizer} from './optimizers/adam_optimizer';\nexport {AdamaxOptimizer} from './optimizers/adamax_optimizer';\nexport {MomentumOptimizer} from './optimizers/momentum_optimizer';\nexport {Optimizer} from './optimizers/optimizer';\nexport {RMSPropOptimizer} from './optimizers/rmsprop_optimizer';\nexport {SGDOptimizer} from './optimizers/sgd_optimizer';\nexport {Scalar, Tensor, Tensor1D, Tensor2D, Tensor3D, Tensor4D, Tensor5D, TensorBuffer, Variable} from './tensor';\nexport {GradSaveFunc, NamedTensorMap, TensorContainer, TensorContainerArray, TensorContainerObject} from './tensor_types';\nexport {BackendValues, DataType, DataTypeMap, DataValues, NumericDataType, PixelData, Rank, RecursiveArray, ScalarLike, ShapeMap, sumOutType, TensorLike, TypedArray, upcastType} from './types';\n\nexport * from './ops/ops';\nexport {Reduction} from './ops/loss_ops_utils';\n\nexport * from './train';\nexport * from './globals';\nexport * from './kernel_registry';\nexport {customGrad, grad, grads, valueAndGrad, valueAndGrads, variableGrads} from './gradients';\n\nexport {TimingInfo,

MemoryInfo, ForwardFunc} from './engine';\nexport {Environment, env, ENV} from './environment';\nexport {Platform} from './platforms/platform';\n\nexport {version as version_core};\n\n// Top-level method exports.\nexport {nextFrame} from './browser_util';\n\n// Second level exports.\nimport * as backend_util from './backends/backend_util';\nimport * as device_util from './device_util';\nexport {\n browser,\n io,\n math,\n serialization,\n test_util,\n util,\n backend_util,\n tensor_util,\n slice_util,\n gather_util,\n scatter_util,\n device_util\n};\n\nimport * as kernel_impls from './backends/kernel_impls';\nexport {kernel_impls};\n// Backend specific.\nexport {KernelBackend, BackendTimingInfo, DataMover, DataStorage} from './backends/backend';\n\n// Export all kernel names / info.\nexport * from './kernel_names';\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\n// Required side effectful code.\nimport './base_side_effects';\n// All exports from this package should be in base.\nexport * from './base';\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nconst contexts: {[key: string]: WebGLRenderingContext} = {};\n\nconst WEBGL_ATTRIBUTES: WebGLContextAttributes = {\n alpha: false,\n antialias: false,\n premultipliedAlpha: false,\n preserveDrawingBuffer: false,\n depth: false,\n stencil: false,\n failIfMajorPerformanceCaveat: true\n};\n\nexport function clearWebGLContext(webGLVersion: number) {\n delete contexts[webGLVersion];\n}\n\nexport function setWebGLContext(\n webGLVersion: number, gl: WebGLRenderingContext) {\n contexts[webGLVersion] = gl;\n}\n\nexport function getWebGLContext(webGLVersion:\n number): WebGLRenderingContext {\n if (!(webGLVersion in contexts)) {\n const newCtx = getWebGLRenderingContext(webGLVersion);\n if (newCtx !== null) {\n contexts[webGLVersion] = newCtx;\n } else {\n console.log('Could not get context for WebGL version', webGLVersion);\n return null;\n }\n }\n const gl = contexts[webGLVersion];\n if (gl.isContextLost()) {\n delete contexts[webGLVersion];\n return getWebGLContext(webGLVersion);\n }\n\n gl.disable(gl.DEPTH_TEST);\n gl.disable(gl.STENCIL_TEST);\n gl.disable(gl.BLEND);\n gl.disable(gl.DITHER);\n gl.disable(gl.POLYGON_OFFSET_FILL);\n gl.disable(gl.SAMPLE_COVERAGE);\n gl.enable(gl.SCISSOR_TEST);\n gl.enable(gl.CULL_FACE);\n gl.cullFace(gl.BACK);\n\n return contexts[webGLVersion];\n}\n\nfunction createCanvas(webGLVersion: number) {\n if (typeof OffscreenCanvas !== 'undefined' && webGLVersion === 2) {\n return new OffscreenCanvas(300, 150);\n } else if (typeof document !==\n 'undefined') {\n return document.createElement('canvas');\n } else {\n throw new Error('Cannot create a canvas in this context');\n }\n}\n\nfunction getWebGLRenderingContext(webGLVersion: number): WebGLRenderingContext {\n if (webGLVersion !== 1 && webGLVersion !== 2) {\n throw new Error('Cannot get WebGL rendering context, WebGL is disabled.');\n }\n const canvas = createCanvas(webGLVersion);\n\n canvas.addEventListener('webglcontextlost', (ev: Event) => {\n ev.preventDefault();\n delete contexts[webGLVersion];\n }, false);\n if (webGLVersion === 1) {\n return (canvas.getContext('webgl',

```
WEBGL_ATTRIBUTES) ||\n            canvas.getContext('experimental-webgl', WEBGL_ATTRIBUTES)) as\n
WebGLRenderingContext;\n  }\n  return canvas.getContext('webgl2', WEBGL_ATTRIBUTES) as
WebGLRenderingContext;\n}\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not
 use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {backend_util, DataId, DataType, env, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nexport enum
PackingScheme {\n  /**\n   * All values in a single texel are densely packed without any constraints.\n   *\n   * This
is how the shader encodes a tensor with shape = [2, 3, 4]\n   * (indices are [batch, row, col]).\n   *\n   * 000|001
010|011   020|021\n   * -------  -------  -------\n   * 002|003   012|013   022|023\n
   *\n   * 100|101   110|111   120|121\n   * -------  -------  -------\n   * 102|103   112|113   122|123\n   *\n   */\n
DENSE,\n\n  /**\n   * Single texels contain only values from the same batch, and from adjacent\n   * rows and
columns.\n   *\n   * This is how the shader encodes a tensor with shape = [2, 3, 5]\n   * (indices are [batch, row,
col]).\n   *\n   * 000|001   002|003   004|xxx   020|021   022|023   024|xxx\n   * -------  -------  -------  -------  -------
-------\n   * 010|011   012|013   014|xxx   xxx|xxx   xxx|xxx   xxx|xxx\n   *\n   * 100|101   102|103   104|xxx
120|121   122|123   124|xxx\n   * -------  -------  -------  -------  -------  -------\n   * 110|111   112|113   114|xxx
xxx|xxx   xxx|xxx   xxx|xxx\n   *\n   */\n  SHARED_BATCH\n}\n\nexport enum TextureUsage {\n  RENDER,\n
UPLOAD,\n  PIXELS,\n  DOWNLOAD\n}\n\nexport enum PhysicalTextureType {\n  UNPACKED_FLOAT16,\n
UNPACKED_FLOAT32,\n  PACKED_4X1_UNSIGNED_BYTE,\n  PACKED_2X2_FLOAT32,\n
PACKED_2X2_FLOAT16\n}\n\nexport
 interface TextureData {\n  // Required.\n  shape: number[];\n  dtype: DataType;\n\n  // Optional.\n  values?:
backend_util.BackendValues;\n  texture?: WebGLTexture;\n  // For complex numbers, the real and imaginary parts
are stored as their own\n  // individual tensorInfos, with a parent joining the two with the\n  // complexTensors field.
When this is defined, texture will be null.\n  complexTensorInfos?: {real: TensorInfo, imag: TensorInfo};\n  /**
[rows, columns] shape of the texture. */\n  texShape?: [number, number];\n  usage?: TextureUsage;\n  isPacked?:
boolean;\n\n  refCount: number;\n\n  // Available when the tensor has been sliced.\n  slice?: {\n    // Offset in the 'flat
index' space.\n    flatOffset: number;\n    // Used for counting how many sliced tensors point to the same texture.\n
origDataId: DataId;\n  };\n}\n\nexport function getUnpackedMatrixTextureShapeWidthHeight(\n    rows: number,
columns: number): [number, number] {\n  return [columns,
 rows];\n}\n\nexport function getUnpackedArraySizeFromMatrixSize(\n    matrixSize: number, channelsPerTexture:
number): number {\n  return matrixSize * channelsPerTexture;\n}\n\nexport function
getColorMatrixTextureShapeWidthHeight(\n    rows: number, columns: number): [number, number] {\n  return
[columns * 4, rows];\n}\n\n/**\n * Get shape for densely packed RGBA texture.\n */\nexport function
getDenseTexShape(shape: number[]): [number, number] {\n  const size = util.sizeFromShape(shape);\n  const
texelsNeeded = Math.ceil(size / 4);\n  return util.sizeToSquarishShape(texelsNeeded);\n}\n\nexport function
getMatrixSizeFromUnpackedArraySize(\n    unpackedSize: number, channelsPerTexture: number): number {\n  if
(unpackedSize % channelsPerTexture !== 0) {\n    throw new Error(\n        `unpackedSize (${unpackedSize}) must
be a multiple of ` +\n        `${channelsPerTexture}`);\n  }\n  return unpackedSize / channelsPerTexture;\n}\n\nexport
function decodeMatrixFromUnpackedColorRGBAArray(\n
   unpackedArray: Float32Array, matrix: Float32Array, channels: number) {\n  const requiredSize =
unpackedArray.length * channels / 4;\n  if (matrix.length < requiredSize) {\n    throw new Error(\n        `matrix
length (${matrix.length}) must be >= ${requiredSize}`);\n  }\n  let dst = 0;\n  for (let src = 0; src <
unpackedArray.length; src += 4) {\n    for (let c = 0; c < channels; c++) {\n      matrix[dst++] = unpackedArray[src +
c];\n    }\n  }\n}\n\nexport function getPackedMatrixTextureShapeWidthHeight(\n    rows: number, columns:
```

number): [number, number] {\n return [\n   Math.max(1, Math.ceil(columns / 2)), Math.max(1, Math.ceil(rows / 2))\n];\n}\n\nexport function getPackedRGBAArraySizeFromMatrixShape(\n   rows: number, columns: number): number {\n const [w, h] = getPackedMatrixTextureShapeWidthHeight(rows, columns);\n return w * h * 4;\n}\n\nexport interface TextureConfig {\n internalFormatFloat: number;\n textureFormatFloat: number;\n internalFormatPackedHalfFloat:
 number;\n internalFormatHalfFloat: number;\n internalFormatPackedFloat: number;\n\n // The format to use during a gl.readPixels call.\n downloadTextureFormat: number;\n // How many channels need to be unpacked after a gl.readPixels call.\n downloadUnpackNumChannels: number;\n\n defaultNumChannels: number;\n textureTypeHalfFloat: number;\n textureTypeFloat: number;\n}\n\nexport function getTextureConfig(\n   // tslint:disable-next-line:no-any\n   gl: WebGLRenderingContext, textureHalfFloatExtension?: any): TextureConfig {\n // tslint:disable-next-line:no-any\n const glany = gl as any;\n\n let internalFormatFloat: number;\n let internalFormatHalfFloat: number;\n let internalFormatPackedHalfFloat: number;\n let internalFormatPackedFloat: number;\n let textureFormatFloat: number;\n\n let downloadTextureFormat: number;\n let downloadUnpackNumChannels: number;\n\n let defaultNumChannels: number;\n let textureTypeHalfFloat: number;\n let textureTypeFloat: number;\n\n
  if (env().getNumber('WEBGL_VERSION') === 2) {\n   internalFormatFloat = glany.R32F;\n
internalFormatHalfFloat = glany.R16F;\n   internalFormatPackedHalfFloat = glany.RGBA16F;\n
internalFormatPackedFloat = glany.RGBA32F;\n   textureFormatFloat = glany.RED;\n
downloadUnpackNumChannels = 4;\n   defaultNumChannels = 1;\n   textureTypeHalfFloat =
glany.HALF_FLOAT;\n   textureTypeFloat = glany.FLOAT;\n } else {\n   internalFormatFloat = gl.RGBA;\n
internalFormatHalfFloat = gl.RGBA;\n   internalFormatPackedHalfFloat = gl.RGBA;\n
internalFormatPackedFloat = glany.RGBA;\n   textureFormatFloat = gl.RGBA;\n   downloadUnpackNumChannels
= 4;\n   defaultNumChannels = 4;\n   textureTypeHalfFloat = textureHalfFloatExtension != null ?\n
textureHalfFloatExtension.HALF_FLOAT_OES :\n   null;\n   textureTypeFloat = gl.FLOAT;\n }\n
downloadTextureFormat = gl.RGBA;\n\n return {\n   internalFormatFloat,\n   internalFormatHalfFloat,\n
internalFormatPackedHalfFloat,\n
    internalFormatPackedFloat,\n   textureFormatFloat,\n   downloadTextureFormat,\n
downloadUnpackNumChannels,\n   defaultNumChannels,\n   textureTypeHalfFloat,\n   textureTypeFloat\n
};\n}\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache
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by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {env, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport
 {getWebGLContext} from './canvas_util';\nimport {getTextureConfig} from './tex_util';\n\nexport function
callAndCheck<T>(gl: WebGLRenderingContext, func: () => T): T {\n const returnValue = func();\n if
(env().getBool('DEBUG')) {\n   checkWebGLError(gl);\n }\n return returnValue;\n}\n\nfunction
checkWebGLError(gl: WebGLRenderingContext) {\n const error = gl.getError();\n if (error !== gl.NO_ERROR)
{\n   throw new Error('WebGL Error: ' + getWebGLErrorMessage(gl, error));\n }\n}\n\n//
https://en.wikipedia.org/wiki/Half-precision_floating-point_format\nconst MIN_FLOAT16 = 5.96e-8;\nconst
MAX_FLOAT16 = 65504;\n\nexport function canBeRepresented(num: number): boolean {\n if
(env().getBool('WEBGL_RENDER_FLOAT32_ENABLED') || num === 0 ||\n   (MIN_FLOAT16 <
Math.abs(num) && Math.abs(num) < MAX_FLOAT16)) {\n   return true;\n }\n return false;\n}\n\nexport
function getWebGLErrorMessage(\n   gl: WebGLRenderingContext, status: number): string {\n switch (status) {\n
    case gl.NO_ERROR:\n   return 'NO_ERROR';\n   case gl.INVALID_ENUM:\n   return
'INVALID_ENUM';\n   case gl.INVALID_VALUE:\n   return 'INVALID_VALUE';\n   case

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gl.INVALID_OPERATION:\n      return 'INVALID_OPERATION';\n    case
gl.INVALID_FRAMEBUFFER_OPERATION:\n      return 'INVALID_FRAMEBUFFER_OPERATION';\n    case
gl.OUT_OF_MEMORY:\n      return 'OUT_OF_MEMORY';\n    case gl.CONTEXT_LOST_WEBGL:\n      return
'CONTEXT_LOST_WEBGL';\n    default:\n      return `Unknown error code ${status}`;\n  }\n}\n\nexport function
getExtensionOrThrow(\n    gl: WebGLRenderingContext, extensionName: string): {} {\n  return
throwIfNull<{}>(\n      gl, () => gl.getExtension(extensionName),\n      'Extension \"' + extensionName + '\" not
supported on this browser.');\n}\n\nexport function createVertexShader(\n    gl: WebGLRenderingContext,
vertexShaderSource: string): WebGLShader {\n  const vertexShader: WebGLShader =
throwIfNull<WebGLShader>(\n      gl, () => gl.createShader(gl.VERTEX_SHADER),\n
    'Unable to create vertex WebGLShader.');\n  callAndCheck(gl, () => gl.shaderSource(vertexShader,
vertexShaderSource));\n  callAndCheck(gl, () => gl.compileShader(vertexShader));\n  if
(gl.getShaderParameter(vertexShader, gl.COMPILE_STATUS) === false) {\n
console.log(gl.getShaderInfoLog(vertexShader));\n    throw new Error('Failed to compile vertex shader.');\n  }\n
return vertexShader;\n}\n\nexport function createFragmentShader(\n    gl: WebGLRenderingContext,
fragmentShaderSource: string): WebGLShader {\n  const fragmentShader: WebGLShader =
throwIfNull<WebGLShader>(\n      gl, () => gl.createShader(gl.FRAGMENT_SHADER),\n      'Unable to create
fragment WebGLShader.');\n  callAndCheck(gl, () => gl.shaderSource(fragmentShader, fragmentShaderSource));\n
callAndCheck(gl, () => gl.compileShader(fragmentShader));\n  if (gl.getShaderParameter(fragmentShader,
gl.COMPILE_STATUS) === false) {\n    logShaderSourceAndInfoLog(\n        fragmentShaderSource,
gl.getShaderInfoLog(fragmentShader));\n
   throw new Error('Failed to compile fragment shader.');\n  }\n  return fragmentShader;\n}\n\nconst
lineNumberRegex = /ERROR: [0-9]+:([0-9]+):/g;\nfunction logShaderSourceAndInfoLog(\n    shaderSource: string,
shaderInfoLog: string) {\n  const lineNumberRegexResult = lineNumberRegex.exec(shaderInfoLog);\n  if
(lineNumberRegexResult == null) {\n    console.log(`Couldn't parse line number in error: ${shaderInfoLog}`);\n
console.log(shaderSource);\n    return;\n  }\n\n  const lineNumber = +lineNumberRegexResult[1];\n\n  const
shaderLines = shaderSource.split('\\n');\n  const pad = shaderLines.length.toString().length + 2;\n  const
linesWithLineNumbers = shaderLines.map(\n      (line, lineNumber) =>\n          util.rightPad((lineNumber +
1).toString(), pad) + line);\n  let maxLineLength = 0;\n  for (let i = 0; i < linesWithLineNumbers.length; i++) {\n
maxLineLength = Math.max(linesWithLineNumbers[i].length, maxLineLength);\n  }\n\n  const beforeErrorLines =
linesWithLineNumbers.slice(0,
 lineNumber - 1);\n  const errorLine = linesWithLineNumbers.slice(lineNumber - 1, lineNumber);\n  const
afterErrorLines = linesWithLineNumbers.slice(lineNumber);\n\n  console.log(beforeErrorLines.join('\\n'));\n
console.log(shaderInfoLog.split('\\n')[0]);\n  console.log(\n      `%c ${util.rightPad(errorLine[0],
maxLineLength)}`,\n      'border:1px solid red; background-color:#e3d2d2; color:#a61717');\n
console.log(afterErrorLines.join('\\n'));\n}\n\nexport function createProgram(gl: WebGLRenderingContext):
WebGLProgram {\n  return throwIfNull<WebGLProgram>(\n      gl, () => gl.createProgram(), 'Unable to create
WebGLProgram.');\n}\n\nexport function linkProgram(gl: WebGLRenderingContext, program: WebGLProgram)
{\n  callAndCheck(gl, () => gl.linkProgram(program));\n  if (gl.getProgramParameter(program, gl.LINK_STATUS)
=== false) {\n    console.log(gl.getProgramInfoLog(program));\n    throw new Error('Failed to link vertex and
fragment shaders.');\n  }\n}\n\nexport
 function validateProgram(\n    gl: WebGLRenderingContext, program: WebGLProgram) {\n  callAndCheck(gl, ()
=> gl.validateProgram(program));\n  if (gl.getProgramParameter(program, gl.VALIDATE_STATUS) === false) {\n
  console.log(gl.getProgramInfoLog(program));\n    throw new Error('Shader program validation failed.');\n
}\n}\n\nexport function createStaticVertexBuffer(\n    gl: WebGLRenderingContext, data: Float32Array):
WebGLBuffer {\n  const buffer: WebGLBuffer = throwIfNull<WebGLBuffer>(\n      gl, () => gl.createBuffer(),
'Unable to create WebGLBuffer');\n  callAndCheck(gl, () => gl.bindBuffer(gl.ARRAY_BUFFER, buffer));\n
callAndCheck(gl, () => gl.bufferData(gl.ARRAY_BUFFER, data, gl.STATIC_DRAW));\n  return
buffer;\n}\n\nexport function createStaticIndexBuffer(\n    gl: WebGLRenderingContext, data: Uint16Array):
```

WebGLBuffer {\n const buffer: WebGLBuffer = throwIfNull<WebGLBuffer>(\n   gl, () => gl.createBuffer(),
'Unable to create WebGLBuffer');\n callAndCheck(gl, () => gl.bindBuffer(gl.ELEMENT_ARRAY_BUFFER,
 buffer));\n callAndCheck(\n   gl, () => gl.bufferData(gl.ELEMENT_ARRAY_BUFFER, data,
gl.STATIC_DRAW));\n return buffer;\n}\n\nexport function getNumChannels(): number {\n if
(env().getNumber('WEBGL_VERSION') === 2) {\n   return 1;\n }\n return 4;\n}\n\nexport function
createTexture(gl: WebGLRenderingContext): WebGLTexture {\n return throwIfNull<WebGLTexture>(\n   gl, ()
=> gl.createTexture(), 'Unable to create WebGLTexture.');\n}\n\nexport function validateTextureSize(width:
number, height: number) {\n const maxTextureSize = env().getNumber('WEBGL_MAX_TEXTURE_SIZE');\n if
((width <= 0) || (height <= 0)) {\n   const requested = `[${width}x${height}]`;\n   throw new Error('Requested
texture size ' + requested + ' is invalid.');\n }\n if ((width > maxTextureSize) || (height > maxTextureSize)) {\n
const requested = `[${width}x${height}]`;\n   const max = `[${maxTextureSize}x${maxTextureSize}]`;\n   throw
new Error(\n   'Requested
 texture size ' + requested +\n   ' greater than WebGL maximum on this browser / GPU ' + max + '.');\n
}\n}\n\nexport function createFramebuffer(gl: WebGLRenderingContext): WebGLFramebuffer {\n return
throwIfNull<WebGLFramebuffer>(\n   gl, () => gl.createFramebuffer(), 'Unable to create
WebGLFramebuffer.');\n}\n\nexport function bindVertexBufferToProgramAttribute(\n   gl:
WebGLRenderingContext, program: WebGLProgram, attribute: string,\n   buffer: WebGLBuffer,
arrayEntriesPerItem: number, itemStrideInBytes: number,\n   itemOffsetInBytes: number): boolean {\n const loc =
gl.getAttribLocation(program, attribute);\n if (loc === -1) {\n   // The GPU compiler decided to strip out this
attribute because it's unused,\n   // thus no need to bind.\n   return false;\n }\n callAndCheck(gl, () =>
gl.bindBuffer(gl.ARRAY_BUFFER, buffer));\n callAndCheck(\n   gl,\n   () => gl.vertexAttribPointer(\n
loc, arrayEntriesPerItem, gl.FLOAT, false, itemStrideInBytes,\n
        itemOffsetInBytes));\n callAndCheck(gl, () => gl.enableVertexAttribArray(loc));\n return true;\n}\n\nexport
function bindTextureUnit(\n   gl: WebGLRenderingContext, texture: WebGLTexture, textureUnit: number) {\n
validateTextureUnit(gl, textureUnit);\n callAndCheck(gl, () => gl.activeTexture(gl.TEXTURE0 + textureUnit));\n
callAndCheck(gl, () => gl.bindTexture(gl.TEXTURE_2D, texture));\n}\n\nexport function unbindTextureUnit(\n
gl: WebGLRenderingContext, textureUnit: number) {\n validateTextureUnit(gl, textureUnit);\n callAndCheck(gl,
() => gl.activeTexture(gl.TEXTURE0 + textureUnit));\n callAndCheck(gl, () => gl.bindTexture(gl.TEXTURE_2D,
null));\n}\n\nexport function getProgramUniformLocationOrThrow(\n   gl: WebGLRenderingContext, program:
WebGLProgram,\n   uniformName: string): WebGLUniformLocation {\n return
throwIfNull<WebGLUniformLocation>(\n   gl, () => gl.getUniformLocation(program, uniformName),\n
'uniform \"' + uniformName + '\" not present in
 program.');\n}\n\nexport function getProgramUniformLocation(\n   gl: WebGLRenderingContext, program:
WebGLProgram,\n   uniformName: string): WebGLUniformLocation {\n return gl.getUniformLocation(program,
uniformName);\n}\n\nexport function bindTextureToProgramUniformSampler(\n   gl: WebGLRenderingContext,
texture: WebGLTexture,\n   uniformSamplerLocation: WebGLUniformLocation, textureUnit: number) {\n
callAndCheck(gl, () => bindTextureUnit(gl, texture, textureUnit));\n callAndCheck(gl, () =>
gl.uniform1i(uniformSamplerLocation, textureUnit));\n}\n\nexport function bindCanvasToFramebuffer(gl:
WebGLRenderingContext) {\n callAndCheck(gl, () => gl.bindFramebuffer(gl.FRAMEBUFFER, null));\n
callAndCheck(gl, () => gl.viewport(0, 0, gl.canvas.width, gl.canvas.height));\n callAndCheck(gl, () => gl.scissor(0,
0, gl.canvas.width, gl.canvas.height));\n}\n\nexport function bindColorTextureToFramebuffer(\n   gl:
WebGLRenderingContext, texture: WebGLTexture,\n   framebuffer: WebGLFramebuffer)
 {\n callAndCheck(gl, () => gl.bindFramebuffer(gl.FRAMEBUFFER, framebuffer));\n callAndCheck(\n   gl,\n
() => gl.framebufferTexture2D(\n   gl.FRAMEBUFFER, gl.COLOR_ATTACHMENT0, gl.TEXTURE_2D,
texture, 0));\n}\n\nexport function unbindColorTextureFromFramebuffer(\n   gl: WebGLRenderingContext,
framebuffer: WebGLFramebuffer) {\n callAndCheck(gl, () => gl.bindFramebuffer(gl.FRAMEBUFFER,
framebuffer));\n callAndCheck(\n   gl,\n   () => gl.framebufferTexture2D(\n   gl.FRAMEBUFFER,
gl.COLOR_ATTACHMENT0, gl.TEXTURE_2D, null, 0));\n}\n\nexport function validateFramebuffer(gl:

```
WebGLRenderingContext) {\n  const status = gl.checkFramebufferStatus(gl.FRAMEBUFFER);\n  if (status !==
gl.FRAMEBUFFER_COMPLETE) {\n    throw new Error(\n        'Error binding framebuffer: ' +
getFramebufferErrorMessage(gl, status));\n  }\n}\n\nexport function getFramebufferErrorMessage(\n    gl:
WebGLRenderingContext, status: number): string {\n  switch (status) {\n    case
gl.FRAMEBUFFER_INCOMPLETE_ATTACHMENT:\n
      return 'FRAMEBUFFER_INCOMPLETE_ATTACHMENT';\n    case
gl.FRAMEBUFFER_INCOMPLETE_MISSING_ATTACHMENT:\n      return
'FRAMEBUFFER_INCOMPLETE_MISSING_ATTACHMENT';\n    case
gl.FRAMEBUFFER_INCOMPLETE_DIMENSIONS:\n      return
'FRAMEBUFFER_INCOMPLETE_DIMENSIONS';\n    case gl.FRAMEBUFFER_UNSUPPORTED:\n      return
'FRAMEBUFFER_UNSUPPORTED';\n    default:\n      return `unknown error ${status}`;\n  }\n}\n\nfunction
throwIfNull<T>(\n    gl: WebGLRenderingContext, returnTOrNull: () => T | null,\n    failureMessage: string): T {\n
const tOrNull: T|null = callAndCheck(gl, () => returnTOrNull());\n  if (tOrNull == null) {\n    throw new
Error(failureMessage);\n  }\n  return tOrNull;\n}\n\nfunction validateTextureUnit(gl: WebGLRenderingContext,
textureUnit: number) {\n  const maxTextureUnit = gl.MAX_COMBINED_TEXTURE_IMAGE_UNITS - 1;\n
const glTextureUnit = textureUnit + gl.TEXTURE0;\n  if (glTextureUnit < gl.TEXTURE0 || glTextureUnit >
maxTextureUnit) {\n    const
  textureUnitRange = `[gl.TEXTURE0, gl.TEXTURE${maxTextureUnit}]`;\n    throw new Error(`textureUnit must
be in ${textureUnitRange}.`);\n  }\n}\n\nexport function getBatchDim(shape: number[], dimsToSkip = 2): number
{\n  return util.sizeFromShape(shape.slice(0, shape.length - dimsToSkip));\n}\n\nexport function
getRowsCols(shape: number[]): [number, number] {\n  if (shape.length === 0) {\n    throw Error('Cannot get rows
and columns of an empty shape array.');\n  }\n\n  return [\n    shape.length > 1 ? shape[shape.length - 2] : 1,
shape[shape.length - 1]\n  ];\n}\n\nexport function getShapeAs3D(shape: number[]): [number, number, number] {\n
let shapeAs3D: [number, number, number] = [1, 1, 1];\n  const isScalar = shape.length === 0 || (shape.length === 1
&& shape[0] === 1);\n  if (!isScalar) {\n    shapeAs3D =\n        [getBatchDim(shape), ...getRowsCols(shape)] as
[number, number, number];\n  }\n  return shapeAs3D;\n}\n\nexport function getTextureShapeFromLogicalShape(\n
  logShape:
  number[], isPacked = false): [number, number] {\n  let maxTexSize =
env().getNumber('WEBGL_MAX_TEXTURE_SIZE');\n  if (isPacked) {\n    maxTexSize = maxTexSize * 2;\n\n
// This logic ensures we accurately count the number of packed texels needed\n    // to accommodate the tensor. We
can only pack values in the same texel if\n    // they are from adjacent pairs of rows/cols within the same batch. So if
a\n    // tensor has 3 rows, we pretend it has 4 rows in order to account for the\n    // fact that the texels containing the
third row are half empty.\n    logShape = logShape.map(\n        (d, i) => i >= logShape.length - 2 ?\n
util.nearestLargerEven(logShape[i]) :\n            logShape[i]);\n\n    // Packed texture height is at least 2 (the channel
height of a single\n    // texel).\n    if (logShape.length === 1) {\n      logShape = [2, logShape[0]];\n    }\n  }\n\n  // If
logical shape is 2, we don't squeeze, since we want to match physical.\n  if (logShape.length !==
  2) {\n    const squeezeResult = util.squeezeShape(logShape);\n    logShape = squeezeResult.newShape;\n  }\n\n  let
size = util.sizeFromShape(logShape);\n  if (logShape.length <= 1 && size <= maxTexSize) {\n    return [1, size];\n
} else if (\n      logShape.length === 2 && logShape[0] <= maxTexSize &&\n      logShape[1] <= maxTexSize) {\n
return logShape as [number, number];\n  } else if (\n      logShape.length === 3 && logShape[0] * logShape[1] <=
maxTexSize &&\n      logShape[2] <= maxTexSize) {\n    return [logShape[0] * logShape[1], logShape[2]];\n  } else
if (\n      logShape.length === 3 && logShape[0] <= maxTexSize &&\n      logShape[1] * logShape[2] <=
maxTexSize) {\n    return [logShape[0], logShape[1] * logShape[2]];\n  } else if (\n      logShape.length === 4 &&\n
    logShape[0] * logShape[1] * logShape[2] <= maxTexSize &&\n      logShape[3] <= maxTexSize) {\n    return
[logShape[0] * logShape[1] * logShape[2], logShape[3]];\n  } else if (\n      logShape.length === 4
  && logShape[0] <= maxTexSize &&\n      logShape[1] * logShape[2] * logShape[3] <= maxTexSize) {\n    return
[logShape[0], logShape[1] * logShape[2] * logShape[3]];\n  } else {\n    if (isPacked) {\n      // For packed textures
size equals the number of channels required to\n      // accommodate the texture data. However in order to squarify
```

such that\n // inner dimensions stay even, we rewrite size to equal the number of\n // texels. Then in the return statement we rehydrate the squarified\n // dimensions to channel units.\n\n const batchDim = getBatchDim(logShape);\n let rows = 2, cols = 2;\n if (logShape.length) {\n [rows, cols] = getRowsCols(logShape);\n }\n size = batchDim * (rows / 2) * (cols / 2);\n return util.sizeToSquarishShape(size).map(d => d * 2) as [number, number];\n }\n return util.sizeToSquarishShape(size);\n }\n}\n\nfunction isEven(n: number): boolean {\n return n % 2 === 0;\n}\n\n/**\n * This determines whether
reshaping a packed texture requires rearranging\n * the data within the texture, assuming 2x2 packing.\n */\nexport function isReshapeFree(shape1: number[], shape2: number[]): boolean {\n shape1 = shape1.slice(-2);\n shape2 = shape2.slice(-2);\n\n if (util.arraysEqual(shape1, shape2)) {\n return true;\n }\n\n if (!shape1.length || !shape2.length) { // One of the shapes is a scalar.\n return true;\n }\n\n if (shape1[0] === 0 || shape1[1] === 0 || shape2[0] === 0 ||\n shape2[1] === 0) {\n return true;\n }\n\n if (shape1.length !== shape2.length) { // One of the shapes is a vector.\n const shape1Cols = shape1.slice(-1)[0];\n const shape2Cols = shape2.slice(-1)[0];\n if (shape1Cols === shape2Cols) {\n return true;\n }\n\n if (isEven(shape1Cols) && isEven(shape2Cols) &&\n (shape1[0] === 1 || shape2[0] === 1)) {\n return true;\n }\n }\n return shape1[1] === shape2[1] && isEven(shape1[0]) && isEven(shape2[0]);\n}\n\n// We cache
webgl params because the environment gets reset between\n// unit tests and we don't want to constantly query the WebGLContext for\n// MAX_TEXTURE_SIZE.\nlet MAX_TEXTURE_SIZE: number;\nlet MAX_TEXTURES_IN_SHADER: number;\n\nexport function getWebGLMaxTextureSize(webGLVersion: number): number {\n if (MAX_TEXTURE_SIZE == null) {\n const gl = getWebGLContext(webGLVersion);\n MAX_TEXTURE_SIZE = gl.getParameter(gl.MAX_TEXTURE_SIZE);\n }\n return MAX_TEXTURE_SIZE;\n}\n\nexport function resetMaxTextureSize() {\n MAX_TEXTURE_SIZE = null;\n}\nexport function resetMaxTexturesInShader() {\n MAX_TEXTURES_IN_SHADER = null;\n}\n\nexport function getMaxTexturesInShader(webGLVersion: number): number {\n if (MAX_TEXTURES_IN_SHADER == null) {\n const gl = getWebGLContext(webGLVersion);\n MAX_TEXTURES_IN_SHADER = gl.getParameter(gl.MAX_TEXTURE_IMAGE_UNITS);\n }\n // We cap at 16 to avoid spurious runtime \"memory exhausted\" error.\n return Math.min(16, MAX_TEXTURES_IN_SHADER);\n}\n\nexport
function getWebGLDisjointQueryTimerVersion(webGLVersion: number):\n number {\n if (webGLVersion === 0) {\n return 0;\n }\n\n let queryTimerVersion: number;\n const gl = getWebGLContext(webGLVersion);\n\n if (hasExtension(gl, 'EXT_disjoint_timer_query_webgl2') &&\n webGLVersion === 2) {\n queryTimerVersion = 2;\n } else if (hasExtension(gl, 'EXT_disjoint_timer_query')) {\n queryTimerVersion = 1;\n } else {\n queryTimerVersion = 0;\n }\n return queryTimerVersion;\n}\n\nexport function hasExtension(gl: WebGLRenderingContext, extensionName: string) {\n const ext = gl.getExtension(extensionName);\n return ext != null;\n}\n\nexport function isWebGLVersionEnabled(webGLVersion: 1|2) {\n try {\n const gl = getWebGLContext(webGLVersion);\n if (gl != null) {\n return true;\n }\n } catch (e) {\n console.log('Error when getting WebGL context: ', e);\n return false;\n }\n return false;\n}\n\nexport function isCapableOfRenderingToFloatTexture(webGLVersion:
number):\n boolean {\n if (webGLVersion === 0) {\n return false;\n }\n\n const gl = getWebGLContext(webGLVersion);\n\n if (webGLVersion === 1) {\n if (!hasExtension(gl, 'OES_texture_float')) {\n return false;\n }\n } else {\n if (!hasExtension(gl, 'EXT_color_buffer_float')) {\n return false;\n }\n }\n\n const isFrameBufferComplete = createFloatTextureAndBindToFramebuffer(gl);\n return isFrameBufferComplete;\n}\n\n/**\n * Check if we can download values from a float/half-float texture.\n *\n * Note that for performance reasons we use binding a texture to a framebuffer\n * as a proxy for ability to download float values later using readPixels. The\n * texture params of this texture will not match those in readPixels exactly\n * but if we are unable to bind some kind of float texture to the frameBuffer\n * then we definitely will not be able to read float values from it.\n */\nexport function isDownloadFloatTextureEnabled(webGLVersion:
number): boolean {\n if (webGLVersion === 0) {\n return false;\n }\n\n const gl = getWebGLContext(webGLVersion);\n\n if (webGLVersion === 1) {\n if (!hasExtension(gl, 'OES_texture_float'))

{\n return false;\n }\n if (!hasExtension(gl, 'WEBGL_color_buffer_float')) {\n return false;\n }\n } else {\n if (hasExtension(gl, 'EXT_color_buffer_float')) {\n return createFloatTextureAndBindToFramebuffer(gl);\n }\n\n const COLOR_BUFFER_HALF_FLOAT = 'EXT_color_buffer_half_float';\n if (hasExtension(gl, COLOR_BUFFER_HALF_FLOAT)) {\n const textureHalfFloatExtension =\n gl.getExtension(COLOR_BUFFER_HALF_FLOAT);\n return createHalfFloatTextureAndBindToFramebuffer(\n gl, textureHalfFloatExtension);\n }\n\n return false;\n}\n\n const isFrameBufferComplete = createFloatTextureAndBindToFramebuffer(gl);\n return isFrameBufferComplete;\n}\n\nfunction createFloatTextureAndBindToFramebuffer(gl: WebGLRenderingContext):\n boolean {\n const texConfig = getTextureConfig(gl);\n\n const texture = gl.createTexture();\n gl.bindTexture(gl.TEXTURE_2D, texture);\n\n const width = 1;\n const height = 1;\n gl.texImage2D(\n gl.TEXTURE_2D, 0, texConfig.internalFormatFloat, width, height, 0,\n texConfig.textureFormatFloat, texConfig.textureTypeFloat, null);\n\n const frameBuffer = gl.createFramebuffer();\n gl.bindFramebuffer(gl.FRAMEBUFFER, frameBuffer);\n gl.framebufferTexture2D(\n gl.FRAMEBUFFER, gl.COLOR_ATTACHMENT0, gl.TEXTURE_2D, texture, 0);\n\n const isFrameBufferComplete =\n gl.checkFramebufferStatus(gl.FRAMEBUFFER) === gl.FRAMEBUFFER_COMPLETE;\n\n gl.bindTexture(gl.TEXTURE_2D, null);\n gl.bindFramebuffer(gl.FRAMEBUFFER, null);\n gl.deleteTexture(texture);\n gl.deleteFramebuffer(frameBuffer);\n\n return isFrameBufferComplete;\n}\n\nfunction createHalfFloatTextureAndBindToFramebuffer(\n // tslint:disable-next-line:no-any\n gl: WebGLRenderingContext, textureHalfFloatExtension:\n any): boolean {\n const texConfig = getTextureConfig(gl, textureHalfFloatExtension);\n const texture = gl.createTexture();\n gl.bindTexture(gl.TEXTURE_2D, texture);\n\n const width = 1;\n const height = 1;\n gl.texImage2D(\n gl.TEXTURE_2D, 0, texConfig.internalFormatHalfFloat, width, height, 0,\n texConfig.textureFormatFloat, texConfig.textureTypeHalfFloat, null);\n\n const frameBuffer = gl.createFramebuffer();\n gl.bindFramebuffer(gl.FRAMEBUFFER, frameBuffer);\n gl.framebufferTexture2D(\n gl.FRAMEBUFFER, gl.COLOR_ATTACHMENT0, gl.TEXTURE_2D, texture, 0);\n\n const isFrameBufferComplete =\n gl.checkFramebufferStatus(gl.FRAMEBUFFER) === gl.FRAMEBUFFER_COMPLETE;\n\n gl.bindTexture(gl.TEXTURE_2D, null);\n gl.bindFramebuffer(gl.FRAMEBUFFER, null);\n gl.deleteTexture(texture);\n gl.deleteFramebuffer(frameBuffer);\n\n return isFrameBufferComplete;\n}\n\nexport function isWebGLFenceEnabled(webGLVersion: number) {\n if (webGLVersion !== 2) {\n return false;\n }\n const gl = getWebGLContext(webGLVersion);\n\n // tslint:disable-next-line:no-any\n const isEnabled = (gl as any).fenceSync != null;\n return isEnabled;\n}\n\nexport function assertNotComplex(\n tensor: TensorInfo|TensorInfo[], opName: string): void {\n if (!Array.isArray(tensor)) {\n tensor = [tensor];\n }\n tensor.forEach(t => {\n if (t != null) {\n util.assert(\n t.dtype !== 'complex64',\n () => `${opName} does not support complex64 tensors ` +\n 'in the WebGL backend.');\n }\n });\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ===\n */\n\nimport {device_util, env} from '@tensorflow/tfjs-core';\n\nimport {getMaxTexturesInShader, getWebGLDisjointQueryTimerVersion, getWebGLMaxTextureSize, isCapableOfRenderingToFloatTexture, isDownloadFloatTextureEnabled, isWebGLFenceEnabled, isWebGLVersionEnabled} from './webgl_util';\n\nconst ENV = env();\n\n/**\n * This file contains WebGL-specific flag registrations.\n */\n\n/**\n * True if WebGL is supported.\n */\nENV.registerFlag('HAS_WEBGL', () => ENV.getNumber('WEBGL_VERSION') > 0);\n\n/** 0:

No WebGL, 1: WebGL 1.0, 2: WebGL 2.0. */\nENV.registerFlag('WEBGL_VERSION', () => {\n if (isWebGLVersionEnabled(2)) {\n   return 2;\n } else if (isWebGLVersionEnabled(1)) {\n   return 1;\n }\n return 0;\n});\n\n/** Whether to check for numerical representation problems. */\nENV.registerFlag('WEBGL_CHECK_NUMERICAL_PROBLEMS', () => false);\n\nENV.registerFlag(\n'WEBGL_BUFFER_SUPPORTED', () => ENV.get('WEBGL_VERSION') === 2);\n\n/** Whether the WebGL backend will sometimes forward ops to the CPU. */\nENV.registerFlag('WEBGL_CPU_FORWARD', () => true);\n\n/** Whether the WebGL backend will always use f16 textures for rendering. */\nENV.registerFlag('WEBGL_FORCE_F16_TEXTURES', () => false);\n\n/** Whether to turn all packing related flags on. */\nENV.registerFlag('WEBGL_PACK', () => ENV.getBool('HAS_WEBGL'));\n\n/** Whether we will pack the batchnormalization op. */\nENV.registerFlag('WEBGL_PACK_NORMALIZATION', () => ENV.getBool('WEBGL_PACK'));\n\n/** Whether we will pack the clip op. */\nENV.registerFlag('WEBGL_PACK_CLIP', () => ENV.getBool('WEBGL_PACK'));\n\n/** Whether we will pack the depthwise conv op. */\n// TODO: https://github.com/tensorflow/tfjs/issues/1679\nENV.registerFlag('WEBGL_PACK_DEPTHWISECONV', () => false);\n\n/** Whether we will pack binary ops. */\nENV.registerFlag(\n'WEBGL_PACK_BINARY_OPERATIONS', () => ENV.getBool('WEBGL_PACK'));\n\n/** Whether we will pack unary ops. */\nENV.registerFlag(\n   'WEBGL_PACK_UNARY_OPERATIONS', () => ENV.getBool('WEBGL_PACK'));\n\n/** Whether we will pack array ops. */\nENV.registerFlag(\n'WEBGL_PACK_ARRAY_OPERATIONS', () => ENV.getBool('WEBGL_PACK'));\n\n/** Whether we will pack image ops. */\nENV.registerFlag(\n   'WEBGL_PACK_IMAGE_OPERATIONS', () => ENV.getBool('WEBGL_PACK'));\n\n/** Whether we will pack reduce ops. */\nENV.registerFlag('WEBGL_PACK_REDUCE', () => ENV.getBool('WEBGL_PACK'));\n\n/** Whether packed WebGL kernels lazily unpack their outputs. */\nENV.registerFlag('WEBGL_LAZILY_UNPACK', () => ENV.getBool('WEBGL_PACK'));\n\n/** Whether we will use the im2col algorithm to speed up convolutions. */\nENV.registerFlag('WEBGL_CONV_IM2COL', () => ENV.getBool('WEBGL_PACK'));\n\n/** The maximum texture
 dimension. */\nENV.registerFlag(\n   'WEBGL_MAX_TEXTURE_SIZE',\n   () => getWebGLMaxTextureSize(ENV.getNumber('WEBGL_VERSION')));\n\n/** The maximum texture dimension. */\nENV.registerFlag(\n   'WEBGL_MAX_TEXTURES_IN_SHADER',\n   () => getMaxTexturesInShader(ENV.getNumber('WEBGL_VERSION')));\n\n/**\n * The disjoint_query_timer extension version.\n * 0: disabled, 1: EXT_disjoint_timer_query, 2:\n * EXT_disjoint_timer_query_webgl2.\n * In Firefox with WebGL 2.0,\n * EXT_disjoint_timer_query_webgl2 is not available, so we must use the\n * WebGL 1.0 extension.\n */\nENV.registerFlag('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_VERSION', () => {\n const webGLVersion = ENV.getNumber('WEBGL_VERSION');\n\n if (webGLVersion === 0) {\n   return 0;\n }\n return getWebGLDisjointQueryTimerVersion(webGLVersion);\n});\n\n/**\n * Whether the timer object from the disjoint_query_timer extension gives\n * timing information that is reliable.\n */\nENV.registerFlag(\n'WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_RELIABLE',\n
    () => ENV.getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_VERSION') > 0 &&\n!device_util.isMobile());\n\n/**\n * Whether the device is physically capable of rendering to float32 textures.\n */\nENV.registerFlag(\n   'WEBGL_RENDER_FLOAT32_CAPABLE',\n   () => isCapableOfRenderingToFloatTexture(ENV.getNumber('WEBGL_VERSION')));\n\n/**\n * Whether rendering to float32 textures is enabled. If disabled, renders to\n * float16 textures.\n */\nENV.registerFlag('WEBGL_RENDER_FLOAT32_ENABLED', () => {\n return ENV.getBool('WEBGL_FORCE_F16_TEXTURES') ?\n   false :\n   ENV.getBool('WEBGL_RENDER_FLOAT32_CAPABLE');\n});\n\n/**\n * Whether downloading float textures is enabled (16 or 32 bit). If disabled,\n * uses IEEE 754 encoding of the float32 values to 4 uint8 when downloading.\n */\nENV.registerFlag(\n   'WEBGL_DOWNLOAD_FLOAT_ENABLED',\n   () => isDownloadFloatTextureEnabled(ENV.getNumber('WEBGL_VERSION')));\n\n/** Whether the fence API is

available.
*/\nENV.registerFlag(\n 'WEBGL_FENCE_API_ENABLED',\n () => isWebGLFenceEnabled(ENV.getNumber('WEBGL_VERSION')));\n\n/**\n * Tensors with size <= than this will be uploaded as uniforms, not textures.\n */\nENV.registerFlag('WEBGL_SIZE_UPLOAD_UNIFORM', () => {\n // Use uniform uploads only when 32bit floats are supported. In\n // 16bit\n // environments there are problems with comparing a 16bit texture value\n // with a 32bit uniform value.\n const useUniforms = ENV.getBool('WEBGL_RENDER_FLOAT32_ENABLED');\n return useUniforms ? 4 : 0;\n});\n\n/**\n * If the total number of bytes allocated on the GPU is greater than this\n * number, we will aggressively delete textures upon disposal with\n * gl.deleteMatrixTexture, rather than making them available for reuse.\n *\n * Default value -1 indicates that we will never aggressively delete textures.\n */\nENV.registerFlag('WEBGL_DELETE_TEXTURE_THRESHOLD',\n () => {\n return -1;\n },\n threshold => {\n if (threshold < 0 && threshold !== -1) {\n throw new Error(\n `WEBGL_DELETE_TEXTURE_THRESHOLD must be -1 (indicating never ` +\n `delete) or at least 0, but got ${threshold}.`);\n }\n });\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\nimport {env} from '@tensorflow/tfjs-core';\n\nexport type GLSL = {\n version: string,\n attribute: string,\n varyingVs: string,\n varyingFs: string,\n texture2D: string,\n output: string,\n defineOutput: string,\n defineSpecialNaN: string,\n defineSpecialInf: string,\n defineRound: string\n};\n\nexport function getGlslDifferences(): GLSL {\n let version: string;\n let attribute: string;\n let varyingVs: string;\n let varyingFs: string;\n let texture2D: string;\n let output: string;\n let defineOutput: string;\n let defineSpecialNaN: string;\n let defineSpecialInf: string;\n let defineRound: string;\n\n if (env().getNumber('WEBGL_VERSION') === 2) {\n version = '#version 300 es';\n attribute = 'in';\n varyingVs = 'out';\n varyingFs = 'in';\n texture2D = 'texture';\n output = 'outputColor';\n defineOutput = 'out vec4 outputColor;';\n\n // Use custom isnan definition to work across differences between\n // implementations on various platforms. While this should happen in ANGLE\n // we still see differences between android and windows (on chrome) when\n // using isnan directly.\n defineSpecialNaN = `\n bool isnan_custom(float val) {\n return (val > 0.0 || val < 0.0) ? false : val != 0.0;\n }\n\n bvec4 isnan_custom(vec4 val) {\n return bvec4(isnan_custom(val.x),\n isnan_custom(val.y), isnan_custom(val.z), isnan_custom(val.w));\n }\n\n #define isnan(value) isnan_custom(value)\n `;\n // In webgl 2 we do not need to specify a custom isinf so there is no\n // need for a special INFINITY constant.\n defineSpecialInf = ``;\n defineRound = `\n #define round(value) newRound(value)\n int newRound(float value) {\n return int(floor(value + 0.5));\n }\n\n ivec4 newRound(vec4 value) {\n return ivec4(floor(value + vec4(0.5)));\n }\n `;\n } else {\n version = '';\n attribute = 'attribute';\n varyingVs = 'varying';\n varyingFs = 'varying';\n texture2D = 'texture2D';\n output = 'gl_FragColor';\n defineOutput = '';\n // WebGL1 has no built in isnan so we define one here.\n defineSpecialNaN = `\n #define isnan(value) isnan_custom(value)\n bool isnan_custom(float val) {\n return (val > 0. || val < 1. || val == 0.) ? false : true;\n }\n bvec4 isnan_custom(vec4 val) {\n return bvec4(isnan(val.x), isnan(val.y), isnan(val.z), isnan(val.w));\n }\n `;\n defineSpecialInf = `\n uniform float INFINITY;\n\n bool isinf(float val) {\n return abs(val) == INFINITY;\n }\n bvec4 isinf(vec4 val) {\n return equal(abs(val), vec4(INFINITY));\n }\n `;\n defineRound = `\n int round(float value) {\n return int(floor(value + 0.5));\n }\n\n ivec4 round(vec4 value) {\n return ivec4(floor(value + vec4(0.5)));\n }\n `;\n }\n\n return {\n version,\n attribute,\n varyingVs,\n varyingFs,\n texture2D,\n

output,\n defineOutput,\n
  defineSpecialNaN,\n defineSpecialInf,\n defineRound\n };\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {util} from '@tensorflow/tfjs-core';\n\n/**\n * Produces GLSL code that derives logical coordinates from a flat\n * index. The code performs integer division with each stride and decrements\n
 * the index until the index equals the final dimension coordinate.\n */\nexport function getLogicalCoordinatesFromFlatIndex(\n coords: string[], shape: number[], index = 'index'): string {\n const strides = util.computeStrides(shape);\n return strides\n .map((stride, i) => {\n const line1 = `int ${coords[i]} = ${index} / ${stride}`;\n const line2 = i === strides.length - 1 ?\n `int ${coords[i + 1]} = ${index} - ${coords[i]} * ${stride}` :\n `index -= ${coords[i]} * ${stride}`;\n return `${line1}; ${line2};`;\n })\n
  .join('');\n}\n\nfunction buildVec(x: string[]): string {\n if (x.length === 1) {\n return `${x[0]}`;\n }\n return `vec${x.length}(${x.join(',')})`;\n}\n\n/**\n * Produces GLSL code that computes the dot product of the input x and y\n * vectors. Handles splitting inputs into increments of vec4s when necessary.\n */\nexport function dotify(x: string[], y: string[]): string {\n if (x.length !== y.length)
 {\n throw new Error(\n `Vectors to be dotted must be of the same length -` +\n `got ${x.length} and ${y.length}`);\n }\n\n const slices: string[] = [];\n const nearestVec4 = Math.floor(x.length / 4);\n const nearestVec4Remainder = x.length % 4;\n\n for (let i = 0; i < nearestVec4; i++) {\n const xSlice = x.slice(i * 4, i * 4 + 4);\n const ySlice = y.slice(i * 4, i * 4 + 4);\n slices.push(`${buildVec(xSlice)}, ${buildVec(ySlice)}`);\n }\n\n if (nearestVec4Remainder !== 0) {\n let xSlice = x.slice(nearestVec4 * 4);\n let ySlice = y.slice(nearestVec4 * 4);\n if (xSlice.length === 1) {\n xSlice = xSlice.map(d => `float(${d})`);\n ySlice = ySlice.map(d => `float(${d})`);\n }\n slices.push(`${buildVec(xSlice)}, ${buildVec(ySlice)}`);\n }\n\n return slices.map((d, i) => `dot(${d})`).join('+');\n}\n\n/**\n * Produces GLSL that computes the flat index from 3D coordinates.\n */\nexport function getFlatIndexFrom3D(shape: [number, number,
 number]): string {\n const strides = util.computeStrides(shape).map(d => d.toString());\n\n return `\n int getFlatIndex(ivec3 coords) {\n  return coords.x * ${strides[0]} + coords.y * ${strides[1]} + coords.z;\n }\n`;\n}\n\nexport const ENCODE_FLOAT_SNIPPET = `\n const float FLOAT_MAX = 1.70141184e38;\n const float FLOAT_MIN = 1.17549435e-38;\n\n lowp vec4 encode_float(highp float v) {\n if (isnan(v)) {\n return vec4(255, 255, 255, 255);\n }\n\n highp float av = abs(v);\n\n if(av < FLOAT_MIN) {\n return vec4(0.0, 0.0, 0.0, 0.0);\n } else if(v > FLOAT_MAX) {\n return vec4(0.0, 0.0, 128.0, 127.0) / 255.0;\n } else if(v < -FLOAT_MAX) {\n return vec4(0.0, 0.0, 128.0, 255.0) / 255.0;\n }\n\n highp vec4 c = vec4(0,0,0,0);\n\n highp float e = floor(log2(av));\n highp float m = exp2(fract(log2(av))) - 1.0;\n\n c[2] = floor(128.0 * m);\n m -= c[2] / 128.0;\n c[1] = floor(32768.0 * m);\n m -= c[1] / 32768.0;\n c[0] = floor(8388608.0 * m);\n\n highp float ebias = e + 127.0;\n c[3] = floor(ebias / 2.0);\n ebias -= c[3] * 2.0;\n c[2] += floor(ebias) * 128.0;\n\n c[3] += 128.0 * step(0.0, -v);\n\n return c / 255.0;\n }\n`;\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {getGlslDifferences} from './glsl_version';\nimport

{GPGPUProgram} from './gpgpu_math';\nimport * as shader_util from './shader_compiler_util';\nimport {getDenseTexShape, PackingScheme} from './tex_util';\n\nexport class DecodeMatrixProgram implements GPGPUProgram {\n variableNames = ['A'];\n userCode: string;\n outputShape: [number, number, number];\n packedInputs = false;\n packedOutput = true;\n outPackingScheme = PackingScheme.DENSE;\n\n constructor(outputShape: [number, number, number]) {\n const texShape = getDenseTexShape(outputShape);\n const glsl = getGlslDifferences();\n this.outputShape = outputShape;\n\n this.userCode = `\n ivec3 outCoordsFromFlatIndex(int index) {\n ${\n shader_util.getLogicalCoordinatesFromFlatIndex(\n ['r', 'c', 'd'], outputShape)}\n return ivec3(r, c, d);\n }\n\n void main() {\n ivec2 resTexRC = ivec2(resultUV.yx *\n vec2(${texShape[0]}, ${texShape[1]}));\n int index = 4 * (resTexRC.x * ${texShape[1]} +
resTexRC.y);\n\n vec4 result = vec4(0.);\n\n for (int i=0; i<4; i++) {\n int flatIndex = index + i;\n ivec3 rc = outCoordsFromFlatIndex(flatIndex);\n result[i] = getA(rc.x, rc.y, rc.z);\n }\n\n ${glsl.output} = result;\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {getGlslDifferences} from './glsl_version';\nimport {GPGPUProgram} from './gpgpu_math';\nimport * as shader_util from './shader_compiler_util';\nimport {getDenseTexShape, PackingScheme} from './tex_util';\n\nexport class DecodeMatrixPackedProgram implements GPGPUProgram {\n variableNames = ['A'];\n userCode: string;\n packedInputs = true;\n packedOutput = true;\n outputShape: [number, number, number];\n outPackingScheme = PackingScheme.DENSE;\n\n constructor(outputShape: [number, number, number]) {\n const texShape = getDenseTexShape(outputShape);\n const glsl = getGlslDifferences();\n this.outputShape = outputShape;\n\n this.userCode = `\n ivec3 outCoordsFromFlatIndex(int index) {\n ${\n shader_util.getLogicalCoordinatesFromFlatIndex(\n ['r', 'c', 'd'], outputShape)}\n return ivec3(r, c, d);\n }\n\n void main() {\n ivec2 resTexRC = ivec2(resultUV.yx *\n vec2(${texShape[0]}, ${texShape[1]}));\n int index = 4 * (resTexRC.x * ${texShape[1]} + resTexRC.y);\n\n vec4 result = vec4(0.);\n\n for (int i=0; i<4; i++) {\n int flatIndex = index + i;\n ivec3 rc = outCoordsFromFlatIndex(flatIndex);\n result[i] = getChannel(getA(rc.x, rc.y, rc.z), vec2(rc.y, rc.z));\n }\n\n ${glsl.output} = result;\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions
and\n * limitations under the License.\n *
==\n
*/\n\nimport {getGlslDifferences} from './glsl_version';\nimport {GPGPUProgram} from './gpgpu_math';\nimport {ENCODE_FLOAT_SNIPPET} from './shader_compiler_util';\nimport {TextureUsage} from './tex_util';\n\nexport class EncodeFloatProgram implements GPGPUProgram {\n variableNames = ['A'];\n userCode: string;\n outputShape: number[];\n outTexUsage = TextureUsage.DOWNLOAD;\n\n constructor(outputShape: number[]) {\n const glsl = getGlslDifferences();\n this.outputShape = outputShape;\n this.userCode = `\n ${ENCODE_FLOAT_SNIPPET}\n\n void main() {\n float x = getAAtOutCoords();\n ${glsl.output} = encode_float(x);\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n

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==========\n */\n\nimport {getGlslDifferences} from './glsl_version';\nimport {GPGPUProgram} from './gpgpu_math';\nimport {ENCODE_FLOAT_SNIPPET} from './shader_compiler_util';\nimport {TextureUsage} from './tex_util';\n\nexport class EncodeFloatPackedProgram implements GPGPUProgram {\n variableNames = ['A'];\n userCode: string;\n outputShape: number[];\n packedInputs = true;\n packedOutput = false;\n outTexUsage = TextureUsage.DOWNLOAD;\n\n constructor(outputShape:
[number, number, number]) {\n const glsl = getGlslDifferences();\n this.outputShape = outputShape;\n this.userCode = `\n ${ENCODE_FLOAT_SNIPPET}\n\n void main() {\n ivec3 coords = getOutputCoords();\n float x = getChannel(getAAtOutCoords(), vec2(coords.y, coords.z));\n ${glsl.output} = encode_float(x);\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n
* ==========\n */\n\nimport {getGlslDifferences} from './glsl_version';\nimport {GPGPUProgram} from './gpgpu_math';\nimport * as shader_util from './shader_compiler_util';\n\nexport class EncodeMatrixProgram implements GPGPUProgram {\n variableNames = ['A'];\n userCode: string;\n outputShape: number[];\n\n constructor(\n outputShape: [number, number, number], texShape: [number, number],\n inputIsUnsignedByte = false) {\n const glsl = getGlslDifferences();\n const [height, width] = texShape;\n this.outputShape = outputShape;\n\n let output = `result`;\n if (inputIsUnsignedByte) {\n output = `floor(result * 255. + 0.5)`;\n }\n\n this.userCode = `\n ${shader_util.getFlatIndexFrom3D(outputShape)}\n\n void main() {\n ivec3 coords = getOutputCoords();\n\n int flatIndex = getFlatIndex(coords);\n int offset = imod(flatIndex, 4);\n\n flatIndex
= idiv(flatIndex, 4, 1.);\n\n int r = flatIndex / ${width};\n int c = imod(flatIndex, ${width});\n vec2 uv = (vec2(c, r) + halfCR) / vec2(${width}.0, ${height}.0);\n vec4 values = ${glsl.texture2D}(A, uv);\n\n float result;\n\n if(offset == 0) {\n result = values[0];\n } else if(offset == 1) {\n result = values[1];\n } else if(offset == 2) {\n result = values[2];\n } else {\n result = values[3];\n }\n\n ${glsl.output} = vec4(${output}, 0., 0., 0.);\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the
License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {getGlslDifferences} from './glsl_version';\nimport {GPGPUProgram} from './gpgpu_math';\nimport * as shader_util from './shader_compiler_util';\n\n/*\nThis is how the shader encodes a tensor with shape = [2, 3,

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5]\n(indices are [batch, row, col]).\n\n000|001 002|003 004|xxx 020|021 022|023 024|xxx\n------- ------- ------- ------- ------- -------\n010|011 012|013 014|xxx xxx|xxx xxx|xxx xxx|xxx\n\n100|101 102|103 104|xxx 120|121 122|123 124|xxx\n------- ------- ------- ------- ------- -------\n110|111 112|113 114|xxx xxx|xxx xxx|xxx xxx|xxx\n\nSingle texels contain only values from the same batch, and from adjacent rows\nand columns.\n */\n\nexport class EncodeMatrixPackedProgram implements GPGPUProgram {\n variableNames = ['A'];\n userCode: string;\n outputShape: number[];\n packedInputs = false;\n packedOutput = true;\n\n constructor(\n outputShape: [number, number, number], texShape: [number, number],\n inputIsUnsignedByte = false) {\n const glsl = getGlslDifferences();\n const [height, width] = texShape;\n this.outputShape = outputShape;\n\n let mainLoop = '';\n let output = 'result';\n if (inputIsUnsignedByte) {\n output = 'floor(result * 255. + 0.5)';\n }\n\n for (let row = 0; row <= 1; row++) {\n for (let col = 0; col <= 1; col++) {\n const channel = row * 2 + col;\n\n mainLoop += `\n localCoords = coords;\n if(localCoords[2] + ${col} < ${outputShape[2]}) {\n localCoords[2] += ${col};\n if(localCoords[1] + ${row} < ${outputShape[1]}) {\n localCoords[1] += ${row};\n\n flatIndex = getFlatIndex(localCoords);\n offset = imod(flatIndex, 4);\n\n flatIndex = idiv(flatIndex, 4, 1.);\n\n r = flatIndex / ${width};\n c = imod(flatIndex, ${width});\n uv = (vec2(c, r) + halfCR) / vec2(${width}.0, ${height}.0);\n values = ${glsl.texture2D}(A, uv);\n\n if(offset == 0) {\n result[${channel}] = values[0];\n } else if(offset == 1) {\n result[${channel}] = values[1];\n } else if(offset == 2) {\n result[${channel}] = values[2];\n } else {\n result[${channel}] = values[3];\n }\n }\n }\n `;\n }\n }\n\n this.userCode = `\n ${shader_util.getFlatIndexFrom3D(outputShape)}\n\n void main() {\n ivec3 coords = getOutputCoords();\n\n vec4 result = vec4(0.);\n int flatIndex, r, c, offset;\n ivec3 localCoords;\n vec2 uv;\n vec4 values;\n\n ${mainLoop}\n\n ${glsl.output} = ${output};\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========================================================================\n */\n\nimport {PixelData, TypedArray} from '@tensorflow/tfjs-core';\n\nimport {getGlslDifferences} from './glsl_version';\nimport * as tex_util from './tex_util';\nimport {TextureConfig} from './tex_util';\nimport * as webgl_util from './webgl_util';\n\nexport function createVertexShader(gl: WebGLRenderingContext): WebGLShader {\n const glsl = getGlslDifferences();\n const vertexShaderSource = `${glsl.version}\n precision highp float;\n ${glsl.attribute} vec3 clipSpacePos;\n ${glsl.attribute} vec2 uv;\n ${glsl.varyingVs} vec2 resultUV;\n\n void main() {\n gl_Position = vec4(clipSpacePos, 1);\n resultUV = uv;\n }`;\n return webgl_util.createVertexShader(gl, vertexShaderSource);\n}\n\nexport function createVertexBuffer(gl: WebGLRenderingContext): WebGLBuffer {\n // [x y z u v] * [upper-left, lower-left, upper-right, lower-right]\n const vertexArray = new Float32Array(\n [-1, 1, 0, 0, 1, -1, -1, 0, 0, 0, 1, 1, 0, 1, 1, 1, -1, 0, 1, 0]);\n return webgl_util.createStaticVertexBuffer(gl, vertexArray);\n}\n\nexport function createIndexBuffer(gl: WebGLRenderingContext): WebGLBuffer {\n // OpenGL (and WebGL) have \"CCW == front\" winding\n const triangleVertexIndices = new Uint16Array([0, 1, 2, 2, 1, 3]);\n return webgl_util.createStaticIndexBuffer(gl, triangleVertexIndices);\n}\n\nfunction createAndConfigureTexture(\n gl: WebGLRenderingContext, width: number, height: number,\n internalFormat: number, textureFormat: number,\n textureType: number): WebGLTexture {\n webgl_util.validateTextureSize(width, height);\n const texture = webgl_util.createTexture(gl);\n\n const tex2d = gl.TEXTURE_2D;\n webgl_util.callAndCheck(gl, () =>
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gl.bindTexture(tex2d, texture));\n  webgl_util.callAndCheck(\n      gl, () => gl.texParameteri(tex2d,
gl.TEXTURE_WRAP_S, gl.CLAMP_TO_EDGE));\n  webgl_util.callAndCheck(\n      gl, () =>
gl.texParameteri(tex2d, gl.TEXTURE_WRAP_T, gl.CLAMP_TO_EDGE));\n  webgl_util.callAndCheck(\n      gl, ()
=> gl.texParameteri(tex2d, gl.TEXTURE_MIN_FILTER, gl.NEAREST));\n  webgl_util.callAndCheck(\n      gl, ()
=> gl.texParameteri(tex2d, gl.TEXTURE_MAG_FILTER,
 gl.NEAREST));\n  webgl_util.callAndCheck(\n      gl,\n      () => gl.texImage2D(\n          tex2d, 0, internalFormat,
width, height, 0, textureFormat,\n          textureType, null));\n  webgl_util.callAndCheck(gl, () =>
gl.bindTexture(gl.TEXTURE_2D, null));\n  return texture;\n}\n\nexport function
getInternalFormatForFloat32MatrixTexture(\n    textureConfig: TextureConfig) {\n  return
textureConfig.internalFormatFloat;\n}\n\nexport function createFloat32MatrixTexture(\n    gl:
WebGLRenderingContext, rows: number, columns: number,\n    textureConfig: TextureConfig): WebGLTexture {\n
const [width, height] =\n      tex_util.getUnpackedMatrixTextureShapeWidthHeight(rows, columns);\n  return
createAndConfigureTexture(\n      gl, width, height,\n
getInternalFormatForFloat32MatrixTexture(textureConfig),\n      textureConfig.textureFormatFloat,
gl.FLOAT);\n}\n\nexport function getInternalFormatForFloat16MatrixTexture(\n    textureConfig: TextureConfig)
{\n  return textureConfig.internalFormatHalfFloat;\n}\n\nexport
 function createFloat16MatrixTexture(\n    gl: WebGLRenderingContext, rows: number, columns: number,\n
textureConfig: TextureConfig): WebGLTexture {\n  const [width, height] =\n
tex_util.getUnpackedMatrixTextureShapeWidthHeight(rows, columns);\n  return createAndConfigureTexture(\n
gl, width, height,\n      getInternalFormatForFloat16MatrixTexture(textureConfig),\n
textureConfig.textureFormatFloat, textureConfig.textureTypeHalfFloat);\n}\n\nexport function
getInternalFormatForUnsignedBytesMatrixTexture(\n    textureConfig: TextureConfig) {\n  return
textureConfig.downloadTextureFormat;\n}\n\nexport function createUnsignedBytesMatrixTexture(\n    gl:
WebGLRenderingContext, rows: number, columns: number,\n    textureConfig: TextureConfig): WebGLTexture {\n
const [width, height] =\n      tex_util.getUnpackedMatrixTextureShapeWidthHeight(rows, columns);\n  return
createAndConfigureTexture(\n      gl, width, height,\n
getInternalFormatForUnsignedBytesMatrixTexture(textureConfig),
 gl.RGBA,\n      gl.UNSIGNED_BYTE);\n}\n\nexport function getInternalFormatForPackedMatrixTexture(\n
textureConfig: TextureConfig) {\n  return textureConfig.internalFormatPackedFloat;\n}\n\nexport function
createPackedMatrixTexture(\n    gl: WebGLRenderingContext, rows: number, columns: number,\n    textureConfig:
TextureConfig): WebGLTexture {\n  const [width, height] =\n
tex_util.getPackedMatrixTextureShapeWidthHeight(rows, columns);\n  return createAndConfigureTexture(\n      gl,
width, height, getInternalFormatForPackedMatrixTexture(textureConfig),\n      gl.RGBA, gl.FLOAT);\n}\n\nexport
function getInternalFormatForFloat16PackedMatrixTexture(\n    textureConfig: TextureConfig) {\n  return
textureConfig.internalFormatPackedHalfFloat;\n}\n\nexport function createFloat16PackedMatrixTexture(\n    gl:
WebGLRenderingContext, rows: number, columns: number,\n    textureConfig: TextureConfig): WebGLTexture {\n
const [width,
 height] =\n      tex_util.getPackedMatrixTextureShapeWidthHeight(rows, columns);\n  return
createAndConfigureTexture(\n      gl, width, height,\n
getInternalFormatForFloat16PackedMatrixTexture(textureConfig), gl.RGBA,\n
textureConfig.textureTypeHalfFloat);\n}\n\nexport function bindVertexProgramAttributeStreams(\n    gl:
WebGLRenderingContext, program: WebGLProgram,\n    vertexBuffer: WebGLBuffer): boolean {\n  const
posOffset = 0;               // x is the first buffer element\n  const uvOffset = 3 * 4;           // uv comes after [x y z]\n
const stride = (3 * 4) + (2 * 4);  // xyz + uv, each entry is 4-byte float.\n  webgl_util.callAndCheck(\n      gl, () =>
gl.bindBuffer(gl.ARRAY_BUFFER, vertexBuffer));\n  const success =
webgl_util.bindVertexBufferToProgramAttribute(\n      gl, program, 'clipSpacePos', vertexBuffer, 3, stride,
posOffset);\n  return success &&\n      webgl_util.bindVertexBufferToProgramAttribute(\n          gl, program, 'uv',
vertexBuffer, 2, stride, uvOffset);\n}\n\nexport
```

```
 function uploadDenseMatrixToTexture(\n    gl: WebGLRenderingContext, texture: WebGLTexture, width:
number,\n    height: number, data: TypedArray, textureConfig: TextureConfig) {\n  webgl_util.callAndCheck(gl, ()
=> gl.bindTexture(gl.TEXTURE_2D, texture));\n\n  let dataForUpload: TypedArray, texelDataType: number,
internalFormat: number;\n  if (data instanceof Uint8Array) {\n    dataForUpload = new Uint8Array(width * height *
4);\n    texelDataType = gl.UNSIGNED_BYTE;\n    internalFormat = gl.RGBA;\n  } else {\n    dataForUpload =
new Float32Array(width * height * 4);\n    texelDataType = gl.FLOAT;\n    internalFormat =
textureConfig.internalFormatPackedFloat;\n  }\n\n  dataForUpload.set(data);\n\n  webgl_util.callAndCheck(\n
gl,\n      () => gl.texImage2D(\n          gl.TEXTURE_2D, 0, internalFormat, width, height, 0, gl.RGBA,\n
texelDataType, dataForUpload));\n\n  webgl_util.callAndCheck(gl, () => gl.bindTexture(gl.TEXTURE_2D,
null));\n}\n\nexport function
 uploadPixelDataToTexture(\n    gl: WebGLRenderingContext, texture: WebGLTexture,\n    pixels:
PixelData|ImageData|HTMLImageElement|HTMLCanvasElement|\n    HTMLVideoElement) {\n
webgl_util.callAndCheck(gl, () => gl.bindTexture(gl.TEXTURE_2D, texture));\n  if ((pixels as PixelData).data
instanceof Uint8Array) {\n    webgl_util.callAndCheck(\n        gl,\n        () => gl.texImage2D(\n
gl.TEXTURE_2D, 0, gl.RGBA, pixels.width, pixels.height, 0, gl.RGBA,\n            gl.UNSIGNED_BYTE, (pixels as
PixelData).data));\n  } else {\n    webgl_util.callAndCheck(\n        gl,\n        () => gl.texImage2D(\n
gl.TEXTURE_2D, 0, gl.RGBA, gl.RGBA, gl.UNSIGNED_BYTE,\n            pixels as ImageData |
HTMLImageElement | HTMLCanvasElement |\n                HTMLVideoElement));\n  }\n\n
webgl_util.callAndCheck(gl, () => gl.bindTexture(gl.TEXTURE_2D, null));\n}\n\nexport function
createBufferFromOutputTexture(\n    gl2: WebGL2RenderingContext, rows: number, columns: number,\n
  textureConfig: TextureConfig): WebGLBuffer {\n  // Create and bind the buffer.\n  const buffer =
gl2.createBuffer();\n  webgl_util.callAndCheck(\n      gl2, () => gl2.bindBuffer(gl2.PIXEL_PACK_BUFFER,
buffer));\n\n  // Initialize the buffer to the size of the texture in bytes.\n  const bytesPerFloat = 4;\n  const
valuesPerTexel = 4;\n  const bufferSizeBytes = bytesPerFloat * valuesPerTexel * rows * columns;\n\n
webgl_util.callAndCheck(\n      gl2,\n      () => gl2.bufferData(\n          gl2.PIXEL_PACK_BUFFER,
bufferSizeBytes, gl2.STREAM_READ));\n\n  // Enqueue a command on the GPU command queue to copy of
texture into the\n  // buffer.\n  webgl_util.callAndCheck(\n      gl2, () => gl2.readPixels(0, 0, columns, rows,
gl2.RGBA, gl2.FLOAT, 0));\n\n  webgl_util.callAndCheck(\n      gl2, () =>
gl2.bindBuffer(gl2.PIXEL_PACK_BUFFER, null));\n\n  return buffer;\n}\n\nexport function
downloadFloat32MatrixFromBuffer(\n    gl: WebGLRenderingContext, buffer: WebGLBuffer,\n    size: number):
Float32Array
 {\n  const gl2 = gl as WebGL2RenderingContext;\n\n  const downloadTarget = new Float32Array(size);\n\n
gl2.bindBuffer(gl2.PIXEL_PACK_BUFFER, buffer);\n  gl2.getBufferSubData(gl2.PIXEL_PACK_BUFFER, 0,
downloadTarget);\n  gl2.bindBuffer(gl2.PIXEL_PACK_BUFFER, null);\n\n  return downloadTarget;\n}\n\nexport
function downloadByteEncodedFloatMatrixFromOutputTexture(\n    gl: WebGLRenderingContext, rows: number,
columns: number,\n    textureConfig: TextureConfig) {\n  const [w, h] =\n
tex_util.getUnpackedMatrixTextureShapeWidthHeight(rows, columns);\n\n  const numChannels = 4;\n  const
downloadTarget = new Uint8Array(\n      tex_util.getUnpackedArraySizeFromMatrixSize(rows * columns,
numChannels));\n\n  webgl_util.callAndCheck(\n      gl,\n      () => gl.readPixels(\n          0, 0, w, h,
textureConfig.downloadTextureFormat, gl.UNSIGNED_BYTE,\n          downloadTarget));\n\n  // By wrapping the
buffer in a Float32Array, we use native browser IEEE 754\n  // decoding of the 4 bytes
 that back each 32 bit float.\n  return new Float32Array(downloadTarget.buffer);\n}\n\nexport function
downloadPackedMatrixFromBuffer(\n    gl: WebGLRenderingContext, buffer: WebGLBuffer, batch: number, rows:
number,\n    cols: number, physicalRows: number, physicalCols: number,\n    textureConfig: TextureConfig):
Float32Array {\n  const gl2 = gl as WebGL2RenderingContext;\n\n  const downloadTarget =\n      new
Float32Array(tex_util.getPackedRGBAArraySizeFromMatrixShape(\n          physicalRows, physicalCols));\n\n
gl2.bindBuffer(gl2.PIXEL_PACK_BUFFER, buffer);\n  gl2.getBufferSubData(gl2.PIXEL_PACK_BUFFER, 0,
downloadTarget);\n  gl2.bindBuffer(gl2.PIXEL_PACK_BUFFER, null);\n\n  return downloadTarget;\n}\n\nexport
```

function downloadMatrixFromPackedOutputTexture(\n   gl: WebGLRenderingContext, physicalRows: number,\n physicalCols: number): Float32Array {\n const packedRGBA = new Float32Array(physicalRows * physicalCols * 4);\n webgl_util.callAndCheck(\n   gl,\n   () => gl.readPixels(\n
        0, 0, physicalCols, physicalRows, gl.RGBA, gl.FLOAT, packedRGBA));\n\n return packedRGBA;\n}\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {env, PixelData, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {getWebGLContext, setWebGLContext} from './canvas_util';\nimport * as
 gpgpu_util from './gpgpu_util';\nimport * as tex_util from './tex_util';\nimport {TextureConfig} from
'./tex_util';\nimport {WebGL1DisjointQueryTimerExtension, WebGL2DisjointQueryTimerExtension} from
'./webgl_types';\nimport * as webgl_util from './webgl_util';\n\nexport interface FenceContext {\n query:
WebGLQuery|WebGLSync;\n isFencePassed(): boolean;\n}\n\nexport class GPGPUContext {\n gl:
WebGLRenderingContext;\n textureFloatExtension: {};\n textureHalfFloatExtension: {};\n
colorBufferFloatExtension: {};\n colorBufferHalfFloatExtension: {};\n disjointQueryTimerExtension:
WebGL2DisjointQueryTimerExtension|\n   WebGL1DisjointQueryTimerExtension;\n vertexBuffer:
WebGLBuffer;\n indexBuffer: WebGLBuffer;\n framebuffer: WebGLFramebuffer;\n outputTexture:
WebGLTexture|null = null;\n program: WebGLProgram|null = null;\n private disposed = false;\n private disjoint:
boolean;\n textureConfig: TextureConfig;\n\n constructor(gl?: WebGLRenderingContext) {\n   const glVersion
 = env().getNumber('WEBGL_VERSION');\n   if (gl != null) {\n   this.gl = gl;\n   setWebGLContext(glVersion,
gl);\n   } else {\n   this.gl = getWebGLContext(glVersion);\n   }\n   // WebGL 2.0 enables texture floats without
an extension.\n   let COLOR_BUFFER_FLOAT = 'WEBGL_color_buffer_float';\n   const
COLOR_BUFFER_HALF_FLOAT = 'EXT_color_buffer_half_float';\n   if
(env().getNumber('WEBGL_VERSION') === 1) {\n   const TEXTURE_FLOAT = 'OES_texture_float';\n
const TEXTURE_HALF_FLOAT = 'OES_texture_half_float';\n\n   this.textureFloatExtension =\n
webgl_util.getExtensionOrThrow(this.gl, TEXTURE_FLOAT);\n   if (webgl_util.hasExtension(this.gl,
TEXTURE_HALF_FLOAT)) {\n   this.textureHalfFloatExtension =\n
webgl_util.getExtensionOrThrow(this.gl, TEXTURE_HALF_FLOAT);\n   } else if
(env().get('WEBGL_FORCE_F16_TEXTURES')) {\n   throw new Error(\n   'GL context does not support
half float textures, yet the ' +\n   'environment
 flag WEBGL_FORCE_F16_TEXTURES is set to true.');\n   }\n\n   this.colorBufferFloatExtension =
this.gl.getExtension(COLOR_BUFFER_FLOAT);\n   if (webgl_util.hasExtension(this.gl,
COLOR_BUFFER_HALF_FLOAT)) {\n   this.colorBufferHalfFloatExtension =\n
webgl_util.getExtensionOrThrow(this.gl, COLOR_BUFFER_HALF_FLOAT);\n   } else if
(env().get('WEBGL_FORCE_F16_TEXTURES')) {\n   throw new Error(\n   'GL context does not support
color renderable half floats, yet ' +\n   'the environment flag WEBGL_FORCE_F16_TEXTURES is set to
true.');\n   }\n   } else {\n   COLOR_BUFFER_FLOAT = 'EXT_color_buffer_float';\n   if
(webgl_util.hasExtension(this.gl, COLOR_BUFFER_FLOAT)) {\n   this.colorBufferFloatExtension =\n
this.gl.getExtension(COLOR_BUFFER_FLOAT);\n   } else if (webgl_util.hasExtension(this.gl,
COLOR_BUFFER_HALF_FLOAT)) {\n   this.colorBufferHalfFloatExtension =\n
this.gl.getExtension(COLOR_BUFFER_HALF_FLOAT);\n
    } else {\n   throw new Error('GL context does not support color renderable floats');\n   }\n   }\n\n
this.vertexBuffer = gpgpu_util.createVertexBuffer(this.gl);\n   this.indexBuffer =

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gpgpu_util.createIndexBuffer(this.gl);\n    this.framebuffer = webgl_util.createFramebuffer(this.gl);\n\n
this.textureConfig =\n        tex_util.getTextureConfig(this.gl, this.textureHalfFloatExtension);\n  }\n\n  private get
debug(): boolean {\n    return env().getBool('DEBUG');\n  }\n\n  public dispose() {\n    if (this.disposed) {\n
return;\n    }\n    if (this.program != null) {\n      console.warn(\n          'Disposing a GPGPUContext that still has a
bound WebGLProgram.' +\n          ' This is probably a resource leak, delete the program with ' +\n
'GPGPUContext.deleteProgram before disposing.');\n    }\n    if (this.outputTexture != null) {\n      console.warn(\n
    'Disposing a GPGPUContext that still has a bound output matrix ' +\n
      'texture.  This is probably a resource leak, delete the output ' +\n          'matrix texture with
GPGPUContext.deleteMatrixTexture before ' +\n          'disposing.');\n    }\n    const gl = this.gl;\n
webgl_util.callAndCheck(gl, () => gl.finish());\n    webgl_util.callAndCheck(gl, () =>
gl.bindFramebuffer(gl.FRAMEBUFFER, null));\n    webgl_util.callAndCheck(gl, () =>
gl.deleteFramebuffer(this.framebuffer));\n    webgl_util.callAndCheck(gl, () =>
gl.bindBuffer(gl.ARRAY_BUFFER, null));\n    webgl_util.callAndCheck(\n        gl, () =>
gl.bindBuffer(gl.ELEMENT_ARRAY_BUFFER, null));\n    webgl_util.callAndCheck(gl, () =>
gl.deleteBuffer(this.indexBuffer));\n    this.disposed = true;\n  }\n\n  public createFloat32MatrixTexture(rows:
number, columns: number):\n      WebGLTexture {\n    this.throwIfDisposed();\n    return
gpgpu_util.createFloat32MatrixTexture(\n        this.gl, rows, columns, this.textureConfig);\n  }\n\n  public
createFloat16MatrixTexture(rows: number, columns: number):\n
    WebGLTexture {\n    this.throwIfDisposed();\n    return gpgpu_util.createFloat16MatrixTexture(\n        this.gl,
rows, columns, this.textureConfig);\n  }\n\n  public createUnsignedBytesMatrixTexture(rows: number, columns:
number):\n      WebGLTexture {\n    this.throwIfDisposed();\n    return
gpgpu_util.createUnsignedBytesMatrixTexture(\n        this.gl, rows, columns, this.textureConfig);\n  }\n\n  public
uploadPixelDataToTexture(\n      texture: WebGLTexture,\n      pixels:
PixelData|ImageData|HTMLImageElement|HTMLCanvasElement) {\n    this.throwIfDisposed();\n
gpgpu_util.uploadPixelDataToTexture(this.gl, texture, pixels);\n  }\n\n  public uploadDenseMatrixToTexture(\n
texture: WebGLTexture, width: number, height: number, data: TypedArray) {\n    this.throwIfDisposed();\n
gpgpu_util.uploadDenseMatrixToTexture(\n        this.gl, texture, width, height, data, this.textureConfig);\n  }\n\n
public createFloat16PackedMatrixTexture(rows: number, columns: number):\n
    WebGLTexture {\n    this.throwIfDisposed();\n    return gpgpu_util.createFloat16PackedMatrixTexture(\n
this.gl, rows, columns, this.textureConfig);\n  }\n\n  public createPackedMatrixTexture(rows: number, columns:
number):\n      WebGLTexture {\n    this.throwIfDisposed();\n    return gpgpu_util.createPackedMatrixTexture(\n
 this.gl, rows, columns, this.textureConfig);\n  }\n\n  public deleteMatrixTexture(texture: WebGLTexture) {\n
this.throwIfDisposed();\n    if (this.outputTexture === texture) {\n
webgl_util.unbindColorTextureFromFramebuffer(this.gl, this.framebuffer);\n      this.outputTexture = null;\n    }\n
webgl_util.callAndCheck(this.gl, () => this.gl.deleteTexture(texture));\n  }\n\n  public
downloadByteEncodedFloatMatrixFromOutputTexture(\n      texture: WebGLTexture, rows: number, columns:
number): Float32Array {\n    return this.downloadMatrixDriver(\n        texture,\n        () =>
gpgpu_util.downloadByteEncodedFloatMatrixFromOutputTexture(\n
        this.gl, rows, columns, this.textureConfig));\n  }\n\n  public downloadPackedMatrixFromBuffer(\n      buffer:
WebGLBuffer, batch: number, rows: number, columns: number,\n      physicalRows: number, physicalCols:
number): Float32Array {\n    return gpgpu_util.downloadPackedMatrixFromBuffer(\n        this.gl, buffer, batch,
rows, columns, physicalRows, physicalCols,\n        this.textureConfig);\n  }\n\n  public
downloadFloat32MatrixFromBuffer(buffer: WebGLBuffer, size: number):\n      Float32Array {\n    return
gpgpu_util.downloadFloat32MatrixFromBuffer(this.gl, buffer, size);\n  }\n\n  public createBufferFromTexture(\n
texture: WebGLTexture, rows: number, columns: number): WebGLBuffer {\n
this.bindTextureToFrameBuffer(texture);\n    const result = gpgpu_util.createBufferFromOutputTexture(\n
this.gl as WebGL2RenderingContext, rows, columns, this.textureConfig);\n
this.unbindTextureToFrameBuffer();\n    return result;\n  }\n\n  public createAndWaitForFence():
```

```
 Promise<void> {\n    const fenceContext = this.createFence(this.gl);\n    return this.pollFence(fenceContext);\n
}\n\n  private createFence(gl: WebGLRenderingContext): FenceContext {\n    let query:
WebGLQuery|WebGLSync;\n    let isFencePassed: () => boolean;\n\n    if
(env().getBool('WEBGL_FENCE_API_ENABLED')) {\n      const gl2 = gl as WebGL2RenderingContext;\n\n
const sync = gl2.fenceSync(gl2.SYNC_GPU_COMMANDS_COMPLETE, 0);\n      gl.flush();\n\n
isFencePassed = () => {\n        const status = gl2.clientWaitSync(sync, 0, 0);\n        return status ===
gl2.ALREADY_SIGNALED ||\n            status === gl2.CONDITION_SATISFIED;\n      };\n\n      query = sync;\n
} else if (\n        env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_VERSION') > 0) {\n
query = this.beginQuery();\n      this.endQuery();\n      isFencePassed = () => this.isQueryAvailable(\n          query,\n
        env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_VERSION'));\n    } else {\n
    // If we have no way to fence, return true immediately. This will fire in\n      // WebGL 1.0 when there is no
disjoint query timer. In this case, because\n      // the fence passes immediately, we'll immediately ask for a
download of\n      // the texture, which will cause the UI thread to hang.\n      isFencePassed = () => true;\n    }\n\n
return {query, isFencePassed};\n  }\n\n  public downloadMatrixFromPackedTexture(\n      texture: WebGLTexture,
physicalRows: number,\n      physicalCols: number): Float32Array {\n    return this.downloadMatrixDriver(\n
texture,\n        () => gpgpu_util.downloadMatrixFromPackedOutputTexture(\n            this.gl, physicalRows,
physicalCols));\n  }\n\n  private vertexAttrsAreBound = false;\n\n  public createProgram(fragmentShaderSource:
string): WebGLProgram {\n    this.throwIfDisposed();\n    const gl = this.gl;\n    const fragmentShader:
WebGLShader =\n        webgl_util.createFragmentShader(gl, fragmentShaderSource);\n    const vertexShader:
 WebGLShader = gpgpu_util.createVertexShader(gl);\n    const program: WebGLProgram =
webgl_util.createProgram(gl);\n    webgl_util.callAndCheck(gl, () => gl.attachShader(program, vertexShader));\n
webgl_util.callAndCheck(gl, () => gl.attachShader(program, fragmentShader));\n    webgl_util.linkProgram(gl,
program);\n    if (this.debug) {\n      webgl_util.validateProgram(gl, program);\n    }\n    if
(!this.vertexAttrsAreBound) {\n      this.setProgram(program);\n      this.vertexAttrsAreBound =
gpgpu_util.bindVertexProgramAttributeStreams(\n          gl, this.program, this.vertexBuffer);\n    }\n    return
program;\n  }\n\n  public deleteProgram(program: WebGLProgram) {\n    this.throwIfDisposed();\n    if (program
=== this.program) {\n      this.program = null;\n    }\n    if (program != null) {\n      webgl_util.callAndCheck(this.gl,
() => this.gl.deleteProgram(program));\n    }\n  }\n\n  public setProgram(program: WebGLProgram|null) {\n
this.throwIfDisposed();\n    this.program
 = program;\n    if ((this.program != null) && this.debug) {\n      webgl_util.validateProgram(this.gl,
this.program);\n    }\n    webgl_util.callAndCheck(this.gl, () => this.gl.useProgram(program));\n  }\n\n  public
getUniformLocation(\n      program: WebGLProgram, uniformName: string,\n      shouldThrow = true):
WebGLUniformLocation {\n    this.throwIfDisposed();\n    if (shouldThrow) {\n      return
webgl_util.getProgramUniformLocationOrThrow(\n          this.gl, program, uniformName);\n    } else {\n      return
webgl_util.getProgramUniformLocation(\n          this.gl, program, uniformName);\n    }\n  }\n\n  public
getAttributeLocation(program: WebGLProgram, attribute: string):\n      number {\n    this.throwIfDisposed();\n
return webgl_util.callAndCheck(\n        this.gl, () => this.gl.getAttribLocation(program, attribute));\n  }\n\n  public
getUniformLocationNoThrow(program: WebGLProgram, uniformName: string):\n      WebGLUniformLocation {\n
  this.throwIfDisposed();\n
    return this.gl.getUniformLocation(program, uniformName);\n  }\n\n  public setInputMatrixTexture(\n
inputMatrixTexture: WebGLTexture, uniformLocation: WebGLUniformLocation,\n      textureUnit: number) {\n
this.throwIfDisposed();\n    this.throwIfNoProgram();\n    webgl_util.bindTextureToProgramUniformSampler(\n
this.gl, inputMatrixTexture, uniformLocation, textureUnit);\n  }\n\n  public setOutputMatrixTexture(\n
outputMatrixTexture: WebGLTexture, rows: number, columns: number) {\n
this.setOutputMatrixTextureDriver(outputMatrixTexture, columns, rows);\n  }\n\n  public
setOutputPackedMatrixTexture(\n      outputPackedMatrixTexture: WebGLTexture, rows: number, columns:
number) {\n    this.throwIfDisposed();\n    const [width, height] =\n
tex_util.getPackedMatrixTextureShapeWidthHeight(rows, columns);\n
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this.setOutputMatrixTextureDriver(outputPackedMatrixTexture, width, height);\n  }\n\n  public
setOutputMatrixWriteRegion(\n      startRow: number, numRows:
 number, startColumn: number,\n      numColumns: number) {\n    this.setOutputMatrixWriteRegionDriver(\n
startColumn, startRow, numColumns, numRows);\n  }\n\n  public setOutputPackedMatrixWriteRegion(\n
startRow: number, numRows: number, startColumn: number,\n      numColumns: number) {\n    throw new
Error('setOutputPackedMatrixWriteRegion not implemented.');\n  }\n\n  public debugValidate() {\n    if
(this.program != null) {\n      webgl_util.validateProgram(this.gl, this.program);\n    }\n
webgl_util.validateFramebuffer(this.gl);\n  }\n\n  public executeProgram() {\n    this.throwIfDisposed();\n
this.throwIfNoProgram();\n    const gl = this.gl;\n    if (this.debug) {\n      this.debugValidate();\n    }\n
webgl_util.callAndCheck(\n        gl, () => gl.drawElements(gl.TRIANGLES, 6, gl.UNSIGNED_SHORT, 0));\n
}\n\n  public blockUntilAllProgramsCompleted() {\n    this.throwIfDisposed();\n    webgl_util.callAndCheck(this.gl,
() => this.gl.finish());\n  }\n\n  private
 getQueryTimerExtension(): WebGL1DisjointQueryTimerExtension\n      |WebGL2DisjointQueryTimerExtension
{\n    if (this.disjointQueryTimerExtension == null) {\n      this.disjointQueryTimerExtension =\n
webgl_util.getExtensionOrThrow(\n            this.gl,\n            env().getNumber(\n
'WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_VERSION') === 2 ?\n
'EXT_disjoint_timer_query_webgl2' :\n                'EXT_disjoint_timer_query') as\n
WebGL1DisjointQueryTimerExtension |\n          WebGL2DisjointQueryTimerExtension;\n    }\n    return
this.disjointQueryTimerExtension;\n  }\n\n  private getQueryTimerExtensionWebGL2():
WebGL2DisjointQueryTimerExtension {\n    return this.getQueryTimerExtension();\n  }\n\n  private
getQueryTimerExtensionWebGL1(): WebGL1DisjointQueryTimerExtension {\n    return
this.getQueryTimerExtension() as WebGL1DisjointQueryTimerExtension;\n  }\n\n  beginQuery(): WebGLQuery
{\n    if (env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_VERSION')
 === 2) {\n      const gl2 = this.gl as WebGL2RenderingContext;\n      const ext =
this.getQueryTimerExtensionWebGL2();\n\n      const query = gl2.createQuery();\n
gl2.beginQuery(ext.TIME_ELAPSED_EXT, query);\n      return query;\n    }\n    const ext =
this.getQueryTimerExtensionWebGL1();\n    const query = ext.createQueryEXT() as WebGLQuery;\n
ext.beginQueryEXT(ext.TIME_ELAPSED_EXT, query);\n    return query;\n  }\n\n  endQuery() {\n    if
(env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_VERSION') === 2) {\n      const gl2 =
this.gl as WebGL2RenderingContext;\n      const ext = this.getQueryTimerExtensionWebGL2();\n
gl2.endQuery(ext.TIME_ELAPSED_EXT);\n      return;\n    }\n    const ext =
this.getQueryTimerExtensionWebGL1();\n    ext.endQueryEXT(ext.TIME_ELAPSED_EXT);\n  }\n\n  public async
waitForQueryAndGetTime(query: WebGLQuery): Promise<number> {\n    await util.repeatedTry(\n        () =>
this.disposed ||  // while testing
 contexts are created / disposed\n                          // in rapid succession, so without this check we\n
      // may poll for the query timer indefinitely\n          this.isQueryAvailable(\n              query,\n
env().getNumber(\n                  'WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_VERSION')));\n    return
this.getQueryTime(\n        query,
env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_VERSION'));\n  }\n\n  private
getQueryTime(query: WebGLQuery, queryTimerVersion: number): number {\n    if (queryTimerVersion === 0) {\n
    return null;\n    }\n\n    if (queryTimerVersion === 2) {\n      const gl2 = this.gl as WebGL2RenderingContext;\n\n
    const timeElapsedNanos = gl2.getQueryParameter(query, gl2.QUERY_RESULT);\n      // Return milliseconds.\n
   return timeElapsedNanos / 1000000;\n    } else {\n      const ext = this.getQueryTimerExtensionWebGL1();\n\n
const timeElapsedNanos =\n          ext.getQueryObjectEXT(query,
 ext.QUERY_RESULT_EXT);\n      // Return milliseconds.\n      return timeElapsedNanos / 1000000;\n    }\n  }\n\n
private isQueryAvailable(query: WebGLQuery, queryTimerVersion: number):\n      boolean {\n    if
(queryTimerVersion === 0) {\n      return true;\n    }\n\n    if (queryTimerVersion === 2) {\n      const gl2 = this.gl
as WebGL2RenderingContext;\n      const ext = this.getQueryTimerExtensionWebGL2();\n\n      const available =\n
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gl2.getQueryParameter(query, gl2.QUERY_RESULT_AVAILABLE);\n      if (this.disjoint == null) {\n
this.disjoint = this.gl.getParameter(ext.GPU_DISJOINT_EXT);\n      }\n\n      return available && !this.disjoint;\n
} else {\n      const ext = this.getQueryTimerExtensionWebGL1();\n\n      const available =\n
ext.getQueryObjectEXT(query, ext.QUERY_RESULT_AVAILABLE_EXT);\n      if (this.disjoint == null) {\n
this.disjoint = this.gl.getParameter(ext.GPU_DISJOINT_EXT);\n      }\n\n      return available && !this.disjoint;\n
    }\n  }\n\n  pollFence(fenceContext: FenceContext) {\n    return new Promise<void>(resolve => {\n
this.addItemToPoll(() => fenceContext.isFencePassed(), () => resolve());\n    });\n  }\n\n  private itemsToPoll:
PollItem[] = [];\n\n  pollItems(): void {\n    // Find the last query that has finished.\n    const index =
linearSearchLastTrue(this.itemsToPoll.map(x => x.isDoneFn));\n    for (let i = 0; i <= index; ++i) {\n      const
{resolveFn} = this.itemsToPoll[i];\n      resolveFn();\n    }\n    this.itemsToPoll = this.itemsToPoll.slice(index +
1);\n  }\n\n  private addItemToPoll(isDoneFn: () => boolean, resolveFn: () => void) {\n
this.itemsToPoll.push({isDoneFn, resolveFn});\n    if (this.itemsToPoll.length > 1) {\n      // We already have a
running loop that polls.\n      return;\n    }\n    // Start a new loop that polls.\n    util.repeatedTry(() => {\n
this.pollItems();\n      // End the loop if no more items to poll.\n      return this.itemsToPoll.length ===
 0;\n    });\n  }\n\n  private bindTextureToFrameBuffer(texture: WebGLTexture) {\n    this.throwIfDisposed();\n
webgl_util.bindColorTextureToFramebuffer(\n        this.gl, texture, this.framebuffer);\n    if (this.debug) {\n
webgl_util.validateFramebuffer(this.gl);\n    }\n  }\n\n  private unbindTextureToFrameBuffer() {\n    if
(this.outputTexture != null) {\n      webgl_util.bindColorTextureToFramebuffer(\n          this.gl, this.outputTexture,
this.framebuffer);\n      if (this.debug) {\n        webgl_util.validateFramebuffer(this.gl);\n      }\n    } else {\n
webgl_util.unbindColorTextureFromFramebuffer(this.gl, this.framebuffer);\n    }\n  }\n\n  private
downloadMatrixDriver(\n      texture: WebGLTexture,\n      downloadAndDecode: () => Float32Array):
Float32Array {\n    this.bindTextureToFrameBuffer(texture);\n    const result = downloadAndDecode();\n
this.unbindTextureToFrameBuffer();\n\n    return result;\n  }\n\n  private setOutputMatrixTextureDriver(\n
outputMatrixTextureMaybePacked:
 WebGLTexture, width: number,\n      height: number) {\n    this.throwIfDisposed();\n    const gl = this.gl;\n
webgl_util.bindColorTextureToFramebuffer(\n        gl, outputMatrixTextureMaybePacked, this.framebuffer);\n    if
(this.debug) {\n      webgl_util.validateFramebuffer(gl);\n    }\n    this.outputTexture =
outputMatrixTextureMaybePacked;\n    webgl_util.callAndCheck(gl, () => gl.viewport(0, 0, width, height));\n
webgl_util.callAndCheck(gl, () => gl.scissor(0, 0, width, height));\n  }\n\n  private
setOutputMatrixWriteRegionDriver(\n      x: number, y: number, width: number, height: number) {\n
this.throwIfDisposed();\n    webgl_util.callAndCheck(\n        this.gl, () => this.gl.scissor(x, y, width, height));\n
}\n\n  private throwIfDisposed() {\n    if (this.disposed) {\n      throw new Error('Attempted to use disposed
GPGPUContext.');\n    }\n  }\n\n  private throwIfNoProgram() {\n    if (this.program == null) {\n      throw new
Error('No
 GPU program is currently set.');\n    }\n  }\n}\n\ntype PollItem = {\n  isDoneFn: () => boolean,\n  resolveFn: () =>
void\n};\n\n/**\n * Finds the index of the last true element using linear search.\n * Note: We can't do binary search
because Chrome expects us to explicitly\n * test all fences before download:\n *
https://github.com/tensorflow/tfjs/issues/1145\n */\nexport function linearSearchLastTrue(arr: Array<() =>
boolean>): number {\n  let i = 0;\n  for (; i < arr.length; ++i) {\n    const isDone = arr[i]();\n    if (!isDone) {\n
break;\n    }\n  }\n  return i - 1;\n}\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n *
Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in
compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License
 is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either
express or implied.\n * See the License for the specific language governing permissions and\n * limitations under
the License.\n *
==========================================================================\n
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*/\n\nimport {backend_util, util} from '@tensorflow/tfjs-core';\nconst {getBroadcastDims} = backend_util;\nimport {getGlslDifferences, GLSL} from './glsl_version';\nimport * as shader_util from './shader_compiler_util';\n\nexport type ShapeInfo = {\n  logicalShape: number[],\n  texShape: [number, number],\n  isUniform: boolean,\n  isPacked: boolean,\n  flatOffset: number\n};\n\nexport type InputInfo = {\n  name: string,\n  shapeInfo: ShapeInfo\n};\n\nexport function makeShader(\n    inputsInfo: InputInfo[], outputShape: ShapeInfo, userCode: string,\n    usesPackedTextures: boolean): string {\n  const prefixSnippets: string[] = [];\n  inputsInfo.forEach(x => {\n    const size = util.sizeFromShape(x.shapeInfo.logicalShape);\n\n
    // Snippet when we decided to upload the values as uniform.\n    if (x.shapeInfo.isUniform) {\n
prefixSnippets.push(\n          `uniform float ${x.name}${size > 1 ? `[${size}]` : ''};`);\n    } else {\n
prefixSnippets.push(`uniform sampler2D ${x.name};`);\n      prefixSnippets.push(`uniform int offset${x.name};`);\n
  }\n  });\n  const inputPrefixSnippet = prefixSnippets.join('\\n');\n\n  const inputSamplingSnippet =\n
inputsInfo\n          .map(x => getInputSamplingSnippet(x, outputShape, usesPackedTextures))\n          .join('\\n');\n
const outTexShape = outputShape.texShape;\n  const glsl = getGlslDifferences();\n  const
floatTextureSampleSnippet = getFloatTextureSampleSnippet(glsl);\n  let outputSamplingSnippet: string;\n  let
floatTextureSetOutputSnippet: string;\n  let shaderPrefix = getShaderPrefix(glsl);\n\n  if (outputShape.isPacked) {\n
 outputSamplingSnippet =\n        getPackedOutputSamplingSnippet(outputShape.logicalShape,
 outTexShape);\n    floatTextureSetOutputSnippet = getFloatTextureSetRGBASnippet(glsl);\n  } else {\n
outputSamplingSnippet =\n        getOutputSamplingSnippet(outputShape.logicalShape, outTexShape);\n
floatTextureSetOutputSnippet = getFloatTextureSetRSnippet(glsl);\n  }\n\n  if (usesPackedTextures) {\n
shaderPrefix += SHADER_PACKED_PREFIX;\n  }\n\n  const source = [\n    shaderPrefix,
floatTextureSampleSnippet, floatTextureSetOutputSnippet,\n    inputPrefixSnippet, outputSamplingSnippet,
inputSamplingSnippet, userCode\n  ].join('\\n');\n  return source;\n}\n\nfunction getSamplerFromInInfo(inInfo:
InputInfo): string {\n  const shape = inInfo.shapeInfo.logicalShape;\n  switch (shape.length) {\n    case 0:\n      return
getSamplerScalar(inInfo);\n    case 1:\n      return getSampler1D(inInfo);\n    case 2:\n      return
getSampler2D(inInfo);\n    case 3:\n      return getSampler3D(inInfo);\n    case 4:\n      return
getSampler4D(inInfo);\n    case 5:\n      return
 getSampler5D(inInfo);\n    case 6:\n      return getSampler6D(inInfo);\n    default:\n      throw new Error(\n
`${shape.length}-D input sampling` +\n          ` is not yet supported`);\n  }\n}\n\nfunction
getPackedSamplerFromInInfo(inInfo: InputInfo): string {\n  const shape = inInfo.shapeInfo.logicalShape;\n  switch
(shape.length) {\n    case 0:\n      return getPackedSamplerScalar(inInfo);\n    case 1:\n      return
getPackedSampler1D(inInfo);\n    case 2:\n      return getPackedSampler2D(inInfo);\n    case 3:\n      return
getPackedSampler3D(inInfo);\n    default:\n      return getPackedSamplerND(inInfo);\n  }\n}\n\nfunction
getInputSamplingSnippet(\n    inInfo: InputInfo, outShapeInfo: ShapeInfo,\n    usesPackedTextures = false): string
{\n  let res = '';\n  if (usesPackedTextures) {\n    res += getPackedSamplerFromInInfo(inInfo);\n  } else {\n    res +=
getSamplerFromInInfo(inInfo);\n  }\n\n  const inShape = inInfo.shapeInfo.logicalShape;\n  const outShape =
outShapeInfo.logicalShape;\n
  if (inShape.length <= outShape.length) {\n    if (usesPackedTextures) {\n      res +=
getPackedSamplerAtOutputCoords(inInfo, outShapeInfo);\n    } else {\n      res +=
getSamplerAtOutputCoords(inInfo, outShapeInfo);\n    }\n  }\n  return res;\n}\n\nfunction
getPackedOutputSamplingSnippet(\n    outShape: number[], outTexShape: [number, number]): string {\n  switch
(outShape.length) {\n    case 0:\n      return getOutputScalarCoords();\n    case 1:\n      return
getOutputPacked1DCoords(outShape as [number], outTexShape);\n    case 2:\n      return
getOutputPacked2DCoords(outShape as [number, number], outTexShape);\n    case 3:\n      return
getOutputPacked3DCoords(\n          outShape as [number, number, number], outTexShape);\n    default:\n      return
getOutputPackedNDCoords(outShape, outTexShape);\n  }\n}\n\nfunction getOutputSamplingSnippet(\n
outShape: number[], outTexShape: [number, number]): string {\n  switch (outShape.length) {\n    case 0:\n      return
 getOutputScalarCoords();\n    case 1:\n      return getOutput1DCoords(outShape as [number], outTexShape);\n
case 2:\n      return getOutput2DCoords(outShape as [number, number], outTexShape);\n    case 3:\n      return
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getOutput3DCoords(\n      outShape as [number, number, number], outTexShape);\n    case 4:\n      return
getOutput4DCoords(\n      outShape as [number, number, number, number], outTexShape);\n    case 5:\n      return
getOutput5DCoords(\n      outShape as [number, number, number, number, number], outTexShape);\n    case 6:\n
  return getOutput6DCoords(\n      outShape as [number, number, number, number, number, number],\n
outTexShape);\n    default:\n      throw new Error(\n      `${outShape.length}-D output sampling is not yet
supported`);\n  }\n}\n\nfunction getFloatTextureSampleSnippet(glsl: GLSL): string {\n  return `\n    float
sampleTexture(sampler2D textureSampler, vec2 uv) {\n      return ${glsl.texture2D}(textureSampler, uv).r;\n
  }\n  `;\n}\n\nfunction getFloatTextureSetRSnippet(glsl: GLSL): string {\n  return `\n    void setOutput(float val)
{\n      ${glsl.output} = vec4(val, 0, 0, 0);\n    }\n  `;\n}\n\nfunction getFloatTextureSetRGBASnippet(glsl: GLSL):
string {\n  return `\n    void setOutput(vec4 val) {\n      ${glsl.output} = val;\n    }\n  `;\n}\n\nfunction
getShaderPrefix(glsl: GLSL): string {\n  const SHADER_PREFIX = `${glsl.version}\n    precision highp float;\n
precision highp int;\n    precision highp sampler2D;\n    ${glsl.varyingFs} vec2 resultUV;\n
${glsl.defineOutput}\n    const vec2 halfCR = vec2(0.5, 0.5);\n\n    struct ivec5\n    {\n      int x;\n      int y;\n      int
z;\n      int w;\n      int u;\n    };\n\n    struct ivec6\n    {\n      int x;\n      int y;\n      int z;\n      int w;\n      int u;\n
int v;\n    };\n\n    uniform float NAN;\n    ${glsl.defineSpecialNaN}\n    ${glsl.defineSpecialInf}\n
${glsl.defineRound}\n\n    int imod(int x, int y) {\n      return
 x - y * (x / y);\n    }\n\n    int idiv(int a, int b, float sign) {\n      int res = a / b;\n      int mod = imod(a, b);\n      if
(sign < 0. && mod != 0) {\n        res -= 1;\n      }\n      return res;\n    }\n\n    //Based on the work of Dave Hoskins\n
 //https://www.shadertoy.com/view/4djSRW\n    #define HASHSCALE1 443.8975\n    float random(float seed){\n
 vec2 p = resultUV * seed;\n      vec3 p3  = fract(vec3(p.xyx) * HASHSCALE1);\n      p3 += dot(p3, p3.yzx +
19.19);\n      return fract((p3.x + p3.y) * p3.z);\n    }\n\n    ${SAMPLE_1D_SNIPPET}\n
${SAMPLE_2D_SNIPPET}\n    ${SAMPLE_3D_SNIPPET}\n  `;\n\n  return SHADER_PREFIX;\n}\n\nconst
SAMPLE_1D_SNIPPET = `\nvec2 uvFromFlat(int texNumR, int texNumC, int index) {\n  int texR = index /
texNumC;\n  int texC = index - texR * texNumC;\n  return (vec2(texC, texR) + halfCR) / vec2(texNumC,
texNumR);\n}\nvec2 packedUVfrom1D(int texNumR, int texNumC, int index) {\n  int texelIndex = index / 2;\n  int
texR = texelIndex / texNumC;\n
  int texC = texelIndex - texR * texNumC;\n  return (vec2(texC, texR) + halfCR) / vec2(texNumC,
texNumR);\n}\n`;\n\nconst SAMPLE_2D_SNIPPET = `\nvec2 packedUVfrom2D(int texelsInLogicalRow, int
texNumR,\n  int texNumC, int row, int col) {\n  int texelIndex = (row / 2) * texelsInLogicalRow + (col / 2);\n  int
texR = texelIndex / texNumC;\n  int texC = texelIndex - texR * texNumC;\n  return (vec2(texC, texR) + halfCR) /
vec2(texNumC, texNumR);\n}\n`;\n\nconst SAMPLE_3D_SNIPPET = `\nvec2 packedUVfrom3D(int texNumR, int
texNumC,\n    int texelsInBatch, int texelsInLogicalRow, int b,\n    int row, int col) {\n  int index = b * texelsInBatch
+ (row / 2) * texelsInLogicalRow + (col / 2);\n  int texR = index / texNumC;\n  int texC = index - texR *
texNumC;\n  return (vec2(texC, texR) + halfCR) / vec2(texNumC, texNumR);\n}\n`;\n\nconst
SHADER_PACKED_PREFIX = `\n  float getChannel(vec4 frag, vec2 innerDims) {\n    vec2 modCoord =
mod(innerDims, 2.);\n    return modCoord.x == 0. ?\n      (modCoord.y
 == 0. ? frag.r : frag.g) :\n      (modCoord.y == 0. ? frag.b : frag.a);\n  }\n  float getChannel(vec4 frag, int dim) {\n
float modCoord = mod(float(dim), 2.);\n    return modCoord == 0. ? frag.r : frag.g;\n  }\n`;\n\nfunction
getOutputScalarCoords() {\n  return `\n    int getOutputCoords() {\n      return 0;\n    }\n  `;\n}\n\nfunction
getOutputPacked1DCoords(\n    shape: [number], texShape: [number, number]): string {\n  const packedTexShape
=\n      [Math.ceil(texShape[0] / 2), Math.ceil(texShape[1] / 2)];\n  if (packedTexShape[0] === 1) {\n    return `\n
int getOutputCoords() {\n        return 2 * int(resultUV.x * ${packedTexShape[1]}.0);\n      }\n    `;\n  }\n\n  if
(packedTexShape[1] === 1) {\n    return `\n      int getOutputCoords() {\n        return 2 * int(resultUV.y *
${packedTexShape[0]}.0);\n      }\n    `;\n  }\n\n  return `\n    int getOutputCoords() {\n      ivec2 resTexRC =
ivec2(resultUV.yx *\n                             vec2(${packedTexShape[0]}, ${packedTexShape[1]}));\n
    return 2 * (resTexRC.x * ${packedTexShape[1]} + resTexRC.y);\n    }\n  `;\n}\n\nfunction
getOutput1DCoords(\n    shape: [number], texShape: [number, number]): string {\n  if (texShape[0] === 1) {\n
return `\n      int getOutputCoords() {\n        return int(resultUV.x * ${texShape[1]}.0);\n      }\n    `;\n  }\n  if
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(texShape[1] === 1) {\n    return `\n      int getOutputCoords() {\n        return int(resultUV.y * ${texShape[0]}.0);\n
  }\n    `;\n  }\n  return `\n    int getOutputCoords() {\n      ivec2 resTexRC = ivec2(resultUV.yx *\n
vec2(${texShape[0]}, ${texShape[1]}));\n      return resTexRC.x * ${texShape[1]} + resTexRC.y;\n    }\n
`;\n}\n\nfunction getOutputPacked3DCoords(\n    shape: [number, number, number], texShape: [number, number]):
string {\n  const packedTexShape =\n      [Math.ceil(texShape[0] / 2), Math.ceil(texShape[1] / 2)];\n  const
texelsInLogicalRow = Math.ceil(shape[2] / 2);\n  const texelsInBatch = texelsInLogicalRow
 * Math.ceil(shape[1] / 2);\n\n  return `\n    ivec3 getOutputCoords() {\n      ivec2 resTexRC = ivec2(resultUV.yx *\n
                vec2(${packedTexShape[0]}, ${packedTexShape[1]}));\n      int index = resTexRC.x *
${packedTexShape[1]} + resTexRC.y;\n\n      int b = index / ${texelsInBatch};\n      index -= b *
${texelsInBatch};\n\n      int r = 2 * (index / ${texelsInLogicalRow});\n      int c = imod(index,
${texelsInLogicalRow}) * 2;\n\n      return ivec3(b, r, c);\n    }\n  `;\n}\n\nfunction getOutput3DCoords(\n    shape:
[number, number, number], texShape: [number, number]): string {\n  const coordsFromIndexSnippet =\n
shader_util.getLogicalCoordinatesFromFlatIndex(['r', 'c', 'd'], shape);\n\n  return `\n    ivec3 getOutputCoords() {\n
 ivec2 resTexRC = ivec2(resultUV.yx *\n                vec2(${texShape[0]}, ${texShape[1]}));\n      int index
= resTexRC.x * ${texShape[1]} + resTexRC.y;\n      ${coordsFromIndexSnippet}\n      return
 ivec3(r, c, d);\n    }\n  `;\n}\n\nfunction getOutputPackedNDCoords(\n    shape: number[], texShape: [number,
number]): string {\n  const packedTexShape =\n      [Math.ceil(texShape[0] / 2), Math.ceil(texShape[1] / 2)];\n\n
const texelsInLogicalRow = Math.ceil(shape[shape.length - 1] / 2);\n  const texelsInBatch =\n
texelsInLogicalRow * Math.ceil(shape[shape.length - 2] / 2);\n  let texelsInBatchN = texelsInBatch;\n  let batches =
``;\n  let coords = 'b, r, c';\n\n  for (let b = 2; b < shape.length - 1; b++) {\n    texelsInBatchN *= shape[shape.length -
b - 1];\n    batches = `\n      int b${b} = index / ${texelsInBatchN};\n      index -= b${b} * ${texelsInBatchN};\n    `
+ batches;\n    coords = `b${b}, ` + coords;\n  }\n\n  return `\n    ivec${shape.length} getOutputCoords() {\n
ivec2 resTexRC = ivec2(resultUV.yx *\n                vec2(${packedTexShape[0]},
${packedTexShape[1]}));\n      int index = resTexRC.x * ${packedTexShape[1]} + resTexRC.y;\n\n
 ${batches}\n\n      int b = index / ${texelsInBatch};\n      index -= b * ${texelsInBatch};\n\n      int r = 2 * (index /
${texelsInLogicalRow});\n      int c = imod(index, ${texelsInLogicalRow}) * 2;\n\n      return
ivec${shape.length}(${coords});\n    }\n  `;\n}\n\nfunction getOutput4DCoords(\n    shape: [number, number,
number, number],\n    texShape: [number, number]): string {\n  const coordsFromIndexSnippet =
shader_util.getLogicalCoordinatesFromFlatIndex(\n      ['r', 'c', 'd', 'd2'], shape);\n\n  return `\n    ivec4
getOutputCoords() {\n      ivec2 resTexRC = ivec2(resultUV.yx *\n        vec2(${texShape[0]}, ${texShape[1]}));\n
 int index = resTexRC.x * ${texShape[1]} + resTexRC.y;\n      ${coordsFromIndexSnippet}\n      return ivec4(r, c,
d, d2);\n    }\n  `;\n}\n\nfunction getOutput5DCoords(\n    shape: [number, number, number, number, number],\n
texShape: [number, number]): string {\n  const coordsFromIndexSnippet =
shader_util.getLogicalCoordinatesFromFlatIndex(\n
    ['r', 'c', 'd', 'd2', 'd3'], shape);\n\n  return `\n    ivec5 getOutputCoords() {\n      ivec2 resTexRC =
ivec2(resultUV.yx * vec2(${texShape[0]},\n                ${texShape[1]}));\n\n      int index = resTexRC.x *
${texShape[1]} + resTexRC.y;\n\n      ${coordsFromIndexSnippet}\n\n      ivec5 outShape = ivec5(r, c, d, d2, d3);\n
  return outShape;\n    }\n  `;\n}\n\nfunction getOutput6DCoords(\n    shape: [number, number, number, number,
number, number],\n    texShape: [number, number]): string {\n  const coordsFromIndexSnippet =
shader_util.getLogicalCoordinatesFromFlatIndex(\n      ['r', 'c', 'd', 'd2', 'd3', 'd4'], shape);\n\n  return `\n    ivec6
getOutputCoords() {\n      ivec2 resTexRC = ivec2(resultUV.yx *\n        vec2(${texShape[0]}, ${texShape[1]}));\n
 int index = resTexRC.x * ${texShape[1]} + resTexRC.y;\n\n      ${coordsFromIndexSnippet}\n\n      ivec6 result =
ivec6(r, c, d, d2, d3, d4);\n      return result;\n    }\n  `;\n}\n\nfunction getOutputPacked2DCoords(\n
    shape: [number, number], texShape: [number, number]): string {\n  const packedTexShape =\n
[Math.ceil(texShape[0] / 2), Math.ceil(texShape[1] / 2)];\n  if (util.arraysEqual(shape, texShape)) {\n    return `\n
ivec2 getOutputCoords() {\n      return 2 * ivec2(resultUV.yx * vec2(${packedTexShape[0]}, ${\n
packedTexShape[1]}));\n    }\n  `;\n  }\n\n  // texels needed to accommodate a logical row\n  const
texelsInLogicalRow = Math.ceil(shape[1] / 2);\n\n  /**\n   * getOutputCoords\n   *\n   * resTexRC: The rows and
```

columns of the texels. If you move over one\n * texel to the right in the packed texture, you are moving over one column\n * (not two).\n *\n * index: The texel index\n */\n return `\n ivec2 getOutputCoords() {\n ivec2 resTexRC = ivec2(resultUV.yx *\n vec2(${packedTexShape[0]}, ${packedTexShape[1]}));\n\n int index = resTexRC.x * ${packedTexShape[1]} + resTexRC.y;\n int r = 2 * (index / ${texelsInLogicalRow});\n int c = imod(index, ${texelsInLogicalRow}) * 2;\n\n return ivec2(r, c);\n }\n `;\n}\n\nfunction getOutput2DCoords(\n shape: [number, number], texShape: [number, number]): string {\n if (util.arraysEqual(shape, texShape)) {\n return `\n ivec2 getOutputCoords() {\n return ivec2(resultUV.yx * vec2(${texShape[0]}, ${texShape[1]}));\n }\n `;\n }\n if (shape[1] === 1) {\n return `\n ivec2 getOutputCoords() {\n ivec2 resTexRC = ivec2(resultUV.yx *\n vec2(${texShape[0]}, ${texShape[1]}));\n int index = resTexRC.x * ${texShape[1]} + resTexRC.y;\n return ivec2(index, 0);\n }\n `;\n }\n if (shape[0] === 1) {\n return `\n ivec2 getOutputCoords() {\n ivec2 resTexRC = ivec2(resultUV.yx *\n vec2(${texShape[0]}, ${texShape[1]}));\n int index = resTexRC.x * ${texShape[1]} + resTexRC.y;\n return ivec2(0, index);\n }\n `;\n }\n return `\n ivec2 getOutputCoords() {\n ivec2 resTexRC = ivec2(resultUV.yx *\n vec2(${texShape[0]}, ${texShape[1]}));\n int index = resTexRC.x * ${texShape[1]} + resTexRC.y;\n int r = index / ${shape[1]};\n int c = index - r * ${shape[1]};\n return ivec2(r, c);\n }\n `;\n}\n\nfunction getFlatOffsetUniformName(texName: string): string {\n return `offset${texName}`;\n}\n\nfunction getPackedSamplerScalar(inputInfo: InputInfo): string {\n const texName = inputInfo.name;\n const funcName = 'get' + texName.charAt(0).toUpperCase() + texName.slice(1);\n const glsl = getGlslDifferences();\n return `\n vec4 ${funcName}() {\n return ${glsl.texture2D}(${texName}, halfCR);\n }\n `;\n}\n\nfunction getSamplerScalar(inputInfo: InputInfo): string {\n const texName = inputInfo.name;\n const funcName = 'get' + texName.charAt(0).toUpperCase() + texName.slice(1);\n if (inputInfo.shapeInfo.isUniform) {\n return `float ${funcName}() {return ${texName};}`;\n }\n const [texNumR, texNumC] = inputInfo.shapeInfo.texShape;\n if (texNumR === 1 && texNumC === 1) {\n return `\n float ${funcName}() {\n return sampleTexture(${texName}, halfCR);\n }\n `;\n }\n\n const [tNumR, tNumC] = inputInfo.shapeInfo.texShape;\n const offset = getFlatOffsetUniformName(texName);\n return `\n float ${funcName}() {\n vec2 uv = uvFromFlat(${tNumR}, ${tNumC}, ${offset});\n return sampleTexture(${texName}, uv);\n }\n `;\n}\n\nfunction getPackedSampler1D(inputInfo: InputInfo): string {\n const texName = inputInfo.name;\n const funcName = 'get' + texName.charAt(0).toUpperCase() + texName.slice(1);\n const texShape = inputInfo.shapeInfo.texShape;\n const packedTexShape =\n [Math.ceil(texShape[0] / 2), Math.ceil(texShape[1] / 2)];\n const glsl = getGlslDifferences();\n\n return `\n vec4 ${funcName}(int index) {\n vec2 uv = packedUVfrom1D(\n ${packedTexShape[0]}, ${packedTexShape[1]}, index);\n return ${glsl.texture2D}(${texName}, uv);\n }\n `;\n}\n\nfunction getSampler1D(inputInfo: InputInfo): string {\n const texName = inputInfo.name;\n const funcName = 'get' + texName.charAt(0).toUpperCase() + texName.slice(1);\n\n if (inputInfo.shapeInfo.isUniform) {\n // Uniform arrays will be less than 65505 (no risk of float16 overflow).\n return `\n float ${funcName}(int index) {\n ${getUniformSampler(inputInfo)}\n }\n `;\n }\n\n const texShape = inputInfo.shapeInfo.texShape;\n const tNumR = texShape[0];\n const tNumC = texShape[1];\n\n if (tNumC === 1 && tNumR === 1) {\n return `\n float ${funcName}(int index) {\n return sampleTexture(${texName}, halfCR);\n }\n `;\n }\n const offset = getFlatOffsetUniformName(texName);\n if (tNumC === 1) {\n return `\n float ${funcName}(int index) {\n vec2 uv = vec2(0.5, (float(index + ${offset}) + 0.5) / ${tNumR}.0);\n return sampleTexture(${texName}, uv);\n }\n `;\n }\n if (tNumR === 1) {\n return `\n float ${funcName}(int index) {\n vec2 uv = vec2((float(index + ${offset}) + 0.5) / ${tNumC}.0, 0.5);\n return sampleTexture(${texName}, uv);\n }\n `;\n }\n return `\n float ${funcName}(int index) {\n vec2 uv = uvFromFlat(${tNumR}, ${tNumC}, index + ${offset});\n return sampleTexture(${texName}, uv);\n }\n `;\n}\n\nfunction getPackedSampler2D(inputInfo: InputInfo): string {\n const shape = inputInfo.shapeInfo.logicalShape;\n const texName = inputInfo.name;\n const funcName = 'get' + texName.charAt(0).toUpperCase() + texName.slice(1);\n const texShape = inputInfo.shapeInfo.texShape;\n\n const

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texNumR = texShape[0];\n  const texNumC = texShape[1];\n  const glsl = getGlslDifferences();\n  if (texShape !=
null && util.arraysEqual(shape, texShape)) {\n    return `\n      vec4 ${funcName}(int row, int col) {\n        vec2 uv
= (vec2(col,
 row) + halfCR) / vec2(${texNumC}.0, ${texNumR}.0);\n\n        return ${glsl.texture2D}(${texName}, uv);\n
}\n    `;\n  }\n\n  const packedTexShape =\n      [Math.ceil(texShape[0] / 2), Math.ceil(texShape[1] / 2)];\n  const
valuesPerRow = Math.ceil(shape[1] / 2);\n\n  return `\n    vec4 ${funcName}(int row, int col) {\n      vec2 uv =
packedUVfrom2D(${valuesPerRow}, ${packedTexShape[0]}, ${\n      packedTexShape[1]}, row, col);\n      return
${glsl.texture2D}(${texName}, uv);\n    }\n  `;\n}\n\nfunction getSampler2D(inputInfo: InputInfo): string {\n  const
shape = inputInfo.shapeInfo.logicalShape;\n  const texName = inputInfo.name;\n  const funcName = 'get' +
texName.charAt(0).toUpperCase() + texName.slice(1);\n  const texShape = inputInfo.shapeInfo.texShape;\n\n  if
(texShape != null && util.arraysEqual(shape, texShape)) {\n    const texNumR = texShape[0];\n    const texNumC =
texShape[1];\n    return `\n    float ${funcName}(int row, int col) {\n      vec2 uv = (vec2(col,
 row) + halfCR) / vec2(${texNumC}.0, ${texNumR}.0);\n      return sampleTexture(${texName}, uv);\n    }\n  `;\n
}\n\n  const {newShape, keptDims} = util.squeezeShape(shape);\n  const squeezedShape = newShape;\n  if
(squeezedShape.length < shape.length) {\n    const newInputInfo = squeezeInputInfo(inputInfo, squeezedShape);\n
const params = ['row', 'col'];\n    return `\n      ${getSamplerFromInInfo(newInputInfo)}\n      float ${funcName}(int
row, int col) {\n        return ${funcName}(${getSqueezedParams(params, keptDims)});\n      }\n    `;\n  }\n\n  if
(inputInfo.shapeInfo.isUniform) {\n    // Uniform arrays will be less than 65505 (no risk of float16 overflow).\n
return `\n      float ${funcName}(int row, int col) {\n        int index = round(dot(vec2(row, col), vec2(${shape[1]},
1)));\n        ${getUniformSampler(inputInfo)}\n      }\n    `;\n  }\n\n  const texNumR = texShape[0];\n  const
texNumC = texShape[1];\n  const offset = getFlatOffsetUniformName(texName);\n  if (texNumC
 === 1) {\n    // index is used directly as physical (no risk of float16 overflow).\n    return `\n    float
${funcName}(int row, int col) {\n      float index = dot(vec3(row, col, ${offset}), vec3(${shape[1]}, 1, 1));\n
vec2 uv = vec2(0.5, (index + 0.5) / ${texNumR}.0);\n      return sampleTexture(${texName}, uv);\n    }\n  `;\n  }\n
if (texNumR === 1) {\n    // index is used directly as physical (no risk of float16 overflow).\n    return `\n    float
${funcName}(int row, int col) {\n      float index = dot(vec3(row, col, ${offset}), vec3(${shape[1]}, 1, 1));\n
vec2 uv = vec2((index + 0.5) / ${texNumC}.0, 0.5);\n      return sampleTexture(${texName}, uv);\n    }\n  `;\n  }\n\n
return `\n  float ${funcName}(int row, int col) {\n    // Explicitly use integer operations as dot() only works on
floats.\n    int index = row * ${shape[1]} + col + ${offset};\n    vec2 uv = uvFromFlat(${texNumR}, ${texNumC},
index);\n    return sampleTexture(${texName}, uv);\n  }\n`;\n}\n\nfunction
 getPackedSampler3D(inputInfo: InputInfo): string {\n  const shape = inputInfo.shapeInfo.logicalShape;\n  const
texName = inputInfo.name;\n  const funcName = 'get' + texName.charAt(0).toUpperCase() + texName.slice(1);\n
const texShape = inputInfo.shapeInfo.texShape;\n  const packedTexShape =\n      [Math.ceil(texShape[0] / 2),
Math.ceil(texShape[1] / 2)];\n\n  if (shape[0] === 1) {\n    const squeezedShape = shape.slice(1);\n    const keptDims
= [1, 2];\n    const newInputInfo = squeezeInputInfo(inputInfo, squeezedShape);\n    const params = ['b', 'row',
'col'];\n    return `\n      ${getPackedSamplerFromInInfo(newInputInfo)}\n      vec4 ${funcName}(int b, int row,
int col) {\n        return ${funcName}(${getSqueezedParams(params, keptDims)});\n      }\n    `;\n  }\n\n  const
texNumR = packedTexShape[0];\n  const texNumC = packedTexShape[1];\n\n  const valuesPerRow =
Math.ceil(shape[2] / 2);\n  const texelsInBatch = valuesPerRow * Math.ceil(shape[1] / 2);\n  const glsl
 = getGlslDifferences();\n\n  return `\n    vec4 ${funcName}(int b, int row, int col) {\n      vec2 uv =
packedUVfrom3D(\n        ${texNumR}, ${texNumC}, ${texelsInBatch}, ${valuesPerRow}, b, row, col);\n
return ${glsl.texture2D}(${texName}, uv);\n    }\n  `;\n}\n\nfunction getSampler3D(inputInfo: InputInfo): string {\n
const shape = inputInfo.shapeInfo.logicalShape;\n  const texName = inputInfo.name;\n  const funcName = 'get' +
texName.charAt(0).toUpperCase() + texName.slice(1);\n  const stride0 = shape[1] * shape[2];\n  const stride1 =
shape[2];\n\n  const {newShape, keptDims} = util.squeezeShape(shape);\n  const squeezedShape = newShape;\n  if
(squeezedShape.length < shape.length) {\n    const newInputInfo = squeezeInputInfo(inputInfo, squeezedShape);\n
const params = ['row', 'col', 'depth'];\n    return `\n      ${getSamplerFromInInfo(newInputInfo)}\n      float
${funcName}(int row, int col, int depth) {\n        return ${funcName}(${getSqueezedParams(params,
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keptDims)});\n
      }\n    `;\n  }\n\n  if (inputInfo.shapeInfo.isUniform) {\n    // Uniform arrays will be less than 65505 (no risk of float16 overflow).\n    return `\n      float ${funcName}(int row, int col, int depth) {\n        int index = round(dot(vec3(row, col, depth),\n                              vec3(${stride0}, ${stride1}, 1)));\n        ${getUniformSampler(inputInfo)}\n      }\n    `;\n  }\n\n  const texShape = inputInfo.shapeInfo.texShape;\n  const texNumR = texShape[0];\n  const texNumC = texShape[1];\n  const flatOffset = inputInfo.shapeInfo.flatOffset;\n  if (texNumC === stride0 && flatOffset == null) {\n    // texC is used directly as physical (no risk of float16 overflow).\n    return `\n      float ${funcName}(int row, int col, int depth) {\n        float texR = float(row);\n        float texC = dot(vec2(col, depth), vec2(${stride1}, 1));\n        vec2 uv = (vec2(texC, texR) + halfCR) /\n                  vec2(${texNumC}.0, ${texNumR}.0);\n        return sampleTexture(${texName},
 uv);\n      }\n    `;\n  }\n\n  if (texNumC === stride1 && flatOffset == null) {\n    // texR is used directly as physical (no risk of float16 overflow).\n    return `\n    float ${funcName}(int row, int col, int depth) {\n      float texR = dot(vec2(row, col), vec2(${shape[1]}, 1));\n      float texC = float(depth);\n      vec2 uv = (vec2(texC, texR) + halfCR) / vec2(${texNumC}.0, ${texNumR}.0);\n      return sampleTexture(${texName}, uv);\n    }\n  `;\n  }\n\n  const offset = getFlatOffsetUniformName(texName);\n  return `\n    float ${funcName}(int row, int col, int depth) {\n      // Explicitly use integer operations as dot() only works on floats.\n      int index = row * ${stride0} + col * ${stride1} + depth + ${offset};\n      vec2 uv = uvFromFlat(${texNumR}, ${texNumC}, index);\n      return sampleTexture(${texName}, uv);\n    }\n  `;\n}\n\nfunction getPackedSamplerND(inputInfo: InputInfo): string {\n  const shape = inputInfo.shapeInfo.logicalShape;\n
  const rank = shape.length;\n  const texName = inputInfo.name;\n  const funcName = 'get' + texName.charAt(0).toUpperCase() + texName.slice(1);\n  const texShape = inputInfo.shapeInfo.texShape;\n  const packedTexShape =\n      [Math.ceil(texShape[0] / 2), Math.ceil(texShape[1] / 2)];\n  const texNumR = packedTexShape[0];\n  const texNumC = packedTexShape[1];\n\n  const valuesPerRow = Math.ceil(shape[rank - 1] / 2);\n  let texelsInBatch = valuesPerRow * Math.ceil(shape[rank - 2] / 2);\n  let params = `int b, int row, int col`;\n  let index = `b * ${texelsInBatch} + (row / 2) * ${valuesPerRow} + (col / 2)`;\n  for (let b = 2; b < rank - 1; b++) {\n    params = `int b${b}, ` + params;\n    texelsInBatch *= shape[rank - b - 1];\n    index = `b${b} * ${texelsInBatch} + ` + index;\n  }\n  const glsl = getGlslDifferences();\n  return `\n    vec4 ${funcName}(${params}) {\n      int index = ${index};\n      int texR = index / ${texNumC};\n      int texC = index - texR * ${texNumC};\n
    vec2 uv = (vec2(texC, texR) + halfCR) / vec2(${texNumC}, ${texNumR});\n      return ${glsl.texture2D}(${texName}, uv);\n    }\n  `;\n}\n\nfunction getSampler4D(inputInfo: InputInfo): string {\n  const shape = inputInfo.shapeInfo.logicalShape;\n  const texName = inputInfo.name;\n  const funcName = 'get' + texName.charAt(0).toUpperCase() + texName.slice(1);\n  const stride2 = shape[3];\n  const stride1 = shape[2] * stride2;\n  const stride0 = shape[1] * stride1;\n\n  const {newShape, keptDims} = util.squeezeShape(shape);\n  if (newShape.length < shape.length) {\n    const newInputInfo = squeezeInputInfo(inputInfo, newShape);\n    const params = ['row', 'col', 'depth', 'depth2'];\n    return `\n      ${getSamplerFromInInfo(newInputInfo)}\n      float ${funcName}(int row, int col, int depth, int depth2) {\n        return ${funcName}(${getSqueezedParams(params, keptDims)});\n      }\n    `;\n  }\n\n  if (inputInfo.shapeInfo.isUniform) {\n    // Uniform arrays will be less than 65505 (no
 risk of float16 overflow).\n    return `\n      float ${funcName}(int row, int col, int depth, int depth2) {\n        int index = round(dot(vec4(row, col, depth, depth2),\n                              vec4(${stride0}, ${stride1}, ${stride2}, 1)));\n
  ${getUniformSampler(inputInfo)}\n      }\n    `;\n  }\n\n  const flatOffset = inputInfo.shapeInfo.flatOffset;\n  const texShape = inputInfo.shapeInfo.texShape;\n  const texNumR = texShape[0];\n  const texNumC = texShape[1];\n\n
  if (texNumC === stride0 && flatOffset == null) {\n    // texC is used directly as physical (no risk of float16 overflow).\n    return `\n      float ${funcName}(int row, int col, int depth, int depth2) {\n        float texR = float(row);\n        float texC =\n            dot(vec3(col, depth, depth2),\n                vec3(${stride1}, ${stride2}, 1));\n
    vec2 uv = (vec2(texC, texR) + halfCR) /\n                  vec2(${texNumC}.0, ${texNumR}.0);\n        return sampleTexture(${texName}, uv);\n      }\n
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  `;\n  }\n  if (texNumC === stride2 && flatOffset == null) {\n    // texR is used directly as physical (no risk of
float16 overflow).\n    return `\n      float ${funcName}(int row, int col, int depth, int depth2) {\n        float texR =
dot(vec3(row, col, depth),\n                      vec3(${shape[1] * shape[2]}, ${shape[2]}, 1));\n        float texC =
float(depth2);\n        vec2 uv = (vec2(texC, texR) + halfCR) /\n                  vec2(${texNumC}.0, ${texNumR}.0);\n
  return sampleTexture(${texName}, uv);\n      }\n    `;\n  }\n\n  const offset =
getFlatOffsetUniformName(texName);\n  return `\n    float ${funcName}(int row, int col, int depth, int depth2) {\n
 // Explicitly use integer operations as dot() only works on floats.\n      int index = row * ${stride0} + col *
${stride1} +\n          depth * ${stride2} + depth2;\n      vec2 uv = uvFromFlat(${texNumR}, ${texNumC}, index +
${offset});\n      return sampleTexture(${texName}, uv);\n    }\n  `;\n}\n\nfunction getSampler5D(inputInfo:
 InputInfo): string {\n  const shape = inputInfo.shapeInfo.logicalShape;\n  const texName = inputInfo.name;\n  const
funcName = 'get' + texName.charAt(0).toUpperCase() + texName.slice(1);\n  const stride3 = shape[4];\n  const
stride2 = shape[3] * stride3;\n  const stride1 = shape[2] * stride2;\n  const stride0 = shape[1] * stride1;\n\n  const
{newShape, keptDims} = util.squeezeShape(shape);\n  if (newShape.length < shape.length) {\n    const
newInputInfo = squeezeInputInfo(inputInfo, newShape);\n    const params = ['row', 'col', 'depth', 'depth2', 'depth3'];\n
  return `\n      ${getSamplerFromInInfo(newInputInfo)}\n      float ${funcName}(int row, int col, int depth, int
depth2, int depth3) {\n        return ${funcName}(${getSqueezedParams(params, keptDims)});\n      }\n    `;\n  }\n\n
if (inputInfo.shapeInfo.isUniform) {\n    // Uniform arrays will be less than 65505 (no risk of float16 overflow).\n
return `\n      float ${funcName}(int row, int col, int depth,
 int depth2, int depth3) {\n        float index = dot(\n          vec4(row, col, depth, depth2),\n          vec4(${stride0},
${stride1}, ${stride2}, ${stride3})) +\n          depth3;\n        ${getUniformSampler(inputInfo)}\n      }\n    `;\n  }\n\n
const flatOffset = inputInfo.shapeInfo.flatOffset;\n  const texShape = inputInfo.shapeInfo.texShape;\n  const
texNumR = texShape[0];\n  const texNumC = texShape[1];\n\n  if (texNumC === stride0 && flatOffset == null) {\n
  // texC is used directly as physical (no risk of float16 overflow).\n    return `\n      float ${funcName}(int row, int
col, int depth, int depth2, int depth3) {\n        int texR = row;\n        float texC = dot(vec4(col, depth, depth2,
depth3),\n                      vec4(${stride1}, ${stride2}, ${stride3}, 1));\n        vec2 uv = (vec2(texC, texR) + halfCR)
/\n                  vec2(${texNumC}.0, ${texNumR}.0);\n        return sampleTexture(${texName}, uv);\n      }\n    `;\n
}\n\n  if (texNumC === stride3 &&
 flatOffset == null) {\n    // texR is used directly as physical (no risk of float16 overflow).\n    return `\n      float
${funcName}(int row, int col, int depth, int depth2, int depth3) {\n        float texR = dot(\n          vec4(row, col,
depth, depth2),\n          vec4(${shape[1] * shape[2] * shape[3]},\n              ${shape[2] * shape[3]}, ${shape[3]},
1));\n        int texC = depth3;\n        vec2 uv = (vec2(texC, texR) + halfCR) /\n                  vec2(${texNumC}.0,
${texNumR}.0);\n        return sampleTexture(${texName}, uv);\n      }\n    `;\n  }\n\n  const offset =
getFlatOffsetUniformName(texName);\n  return `\n    float ${funcName}(int row, int col, int depth, int depth2, int
depth3) {\n      // Explicitly use integer operations as dot() only works on floats.\n      int index = row * ${stride0} +
col * ${stride1} + depth * ${stride2} +\n          depth2 * ${stride3} + depth3 + ${offset};\n      vec2 uv =
uvFromFlat(${texNumR}, ${texNumC}, index);\n      return sampleTexture(${texName},
 uv);\n    }\n  `;\n}\n\nfunction getSampler6D(inputInfo: InputInfo): string {\n  const shape =
inputInfo.shapeInfo.logicalShape;\n  const texName = inputInfo.name;\n  const funcName = 'get' +
texName.charAt(0).toUpperCase() + texName.slice(1);\n\n  const {newShape, keptDims} =
util.squeezeShape(shape);\n  if (newShape.length < shape.length) {\n    const newInputInfo =
squeezeInputInfo(inputInfo, newShape);\n    const params = ['row', 'col', 'depth', 'depth2', 'depth3', 'depth4'];\n
return `\n      ${getSamplerFromInInfo(newInputInfo)}\n      float ${funcName}(int row, int col, int depth,\n
    int depth2, int depth3, int depth4) {\n        return ${funcName}(${getSqueezedParams(params, keptDims)});\n
}\n    `;\n  }\n\n  const stride4 = shape[5];\n  const stride3 = shape[4] * stride4;\n  const stride2 = shape[3] *
stride3;\n  const stride1 = shape[2] * stride2;\n  const stride0 = shape[1] * stride1;\n\n  if
(inputInfo.shapeInfo.isUniform) {\n    //
 Uniform arrays will be less than 65505 (no risk of float16 overflow).\n    return `\n      float ${funcName}(int row,
int col, int depth,\n                  int depth2, int depth3, int depth4) {\n        int index = round(dot(\n          vec4(row,
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col, depth, depth2),\n          vec4(${stride0}, ${stride1}, ${stride2}, ${stride3})) +\n          dot(\n
vec2(depth3, depth4),\n          vec2(${stride4}, 1)));\n        ${getUniformSampler(inputInfo)}\n      }\n    `;\n  }\n\n
const flatOffset = inputInfo.shapeInfo.flatOffset;\n  const texShape = inputInfo.shapeInfo.texShape;\n  const
texNumR = texShape[0];\n  const texNumC = texShape[1];\n  if (texNumC === stride0 && flatOffset == null) {\n
// texC is used directly as physical (no risk of float16 overflow).\n    return `\n      float ${funcName}(int row, int
col, int depth,\n                  int depth2, int depth3, int depth4) {\n        int texR = row;\n        float texC =
dot(vec4(col, depth, depth2, depth3),\n
      vec4(${stride1}, ${stride2}, ${stride3}, ${stride4})) +\n              float(depth4);\n        vec2 uv = (vec2(texC,
texR) + halfCR) /\n                  vec2(${texNumC}.0, ${texNumR}.0);\n        return sampleTexture(${texName},
uv);\n      }\n    `;\n  }\n  if (texNumC === stride4 && flatOffset == null) {\n    // texR is used directly as physical
(no risk of float16 overflow).\n    return `\n      float ${funcName}(int row, int col, int depth,\n                  int
depth2, int depth3, int depth4) {\n        float texR = dot(vec4(row, col, depth, depth2),\n          vec4(${shape[1] *
shape[2] * shape[3] * shape[4]},\n              ${shape[2] * shape[3] * shape[4]},\n              ${shape[3] * shape[4]},\n
          ${shape[4]})) + float(depth3);\n        int texC = depth4;\n        vec2 uv = (vec2(texC, texR) + halfCR) /\n
        vec2(${texNumC}.0, ${texNumR}.0);\n        return sampleTexture(${texName}, uv);\n      }\n    `;\n  }\n
const offset = getFlatOffsetUniformName(texName);\n
  return `\n    float ${funcName}(int row, int col, int depth,\n                  int depth2, int depth3, int depth4) {\n      //
Explicitly use integer operations as dot() only works on floats.\n      int index = row * ${stride0} + col * ${stride1}
+ depth * ${stride2} +\n          depth2 * ${stride3} + depth3 * ${stride4} + depth4 + ${offset};\n      vec2 uv =
uvFromFlat(${texNumR}, ${texNumC}, index);\n      return sampleTexture(${texName}, uv);\n    }\n
`;\n}\n\nfunction getUniformSampler(inputInfo: InputInfo): string {\n  const texName = inputInfo.name;\n  const
inSize = util.sizeFromShape(inputInfo.shapeInfo.logicalShape);\n\n  if (inSize < 2) {\n    return `return
${texName};`;\n  }\n  return `\n    for (int i = 0; i < ${inSize}; i++) {\n      if (i == index) {\n        return
${texName}[i];\n      }\n    }\n  `;\n}\n\nfunction getPackedSamplerAtOutputCoords(\n    inputInfo: InputInfo,
outShapeInfo: ShapeInfo) {\n  const texName = inputInfo.name;\n  const
 texFuncSnippet = texName.charAt(0).toUpperCase() + texName.slice(1);\n  const funcName = 'get' +
texFuncSnippet + 'AtOutCoords';\n  const inRank = inputInfo.shapeInfo.logicalShape.length;\n  const outRank =
outShapeInfo.logicalShape.length;\n\n  const broadcastDims = getBroadcastDims(\n
inputInfo.shapeInfo.logicalShape, outShapeInfo.logicalShape);\n\n  const type = getCoordsDataType(outRank);\n
const rankDiff = outRank - inRank;\n  let coordsSnippet: string;\n  const fields = ['x', 'y', 'z', 'w', 'u', 'v'];\n\n  if
(inRank === 0) {\n    coordsSnippet = '';\n  } else if (outRank < 2 && broadcastDims.length >= 1) {\n
coordsSnippet = 'coords = 0;';\n  } else {\n    coordsSnippet =\n        broadcastDims.map(d => `coords.${fields[d +
rankDiff]} = 0;`)\n            .join('\\n');\n  }\n  let unpackedCoordsSnippet = '';\n  if (outRank < 2 && inRank > 0) {\n
unpackedCoordsSnippet = 'coords';\n  } else {\n    unpackedCoordsSnippet = inputInfo.shapeInfo.logicalShape\n

                .map((s, i) => `coords.${fields[i + rankDiff]}`)\n                            .join(', ');\n  }\n\n  let output =
`return outputValue;`;\n  const inSize = util.sizeFromShape(inputInfo.shapeInfo.logicalShape);\n  const
isInputScalar = inSize === 1;\n  const outSize = util.sizeFromShape(outShapeInfo.logicalShape);\n  const
isOutputScalar = outSize === 1;\n\n  if (inRank === 1 && !isInputScalar && !isOutputScalar) {\n    output = `\n
return vec4(outputValue.xy, outputValue.xy);\n    `;\n  } else if (isInputScalar && !isOutputScalar) {\n    if (outRank
=== 1) {\n      output = `\n        return vec4(outputValue.x, outputValue.x, 0., 0.);\n      `;\n    } else {\n      output =
`\n        return vec4(outputValue.x);\n      `;\n    }\n  } else if (broadcastDims.length) {\n    const rows = inRank - 2;\n
  const cols = inRank - 1;\n\n    if (broadcastDims.indexOf(rows) > -1 && broadcastDims.indexOf(cols) > -1) {\n
output = `return vec4(outputValue.x);`;\n
  } else if (broadcastDims.indexOf(rows) > -1) {\n      output = `return vec4(outputValue.x, outputValue.y, ` +\n
`outputValue.x, outputValue.y);`;\n    } else if (broadcastDims.indexOf(cols) > -1) {\n      output = `return
vec4(outputValue.xx, outputValue.zz);`;\n    }\n  }\n\n  return `\n    vec4 ${funcName}() {\n      ${type} coords =
getOutputCoords();\n      ${coordsSnippet}\n      vec4 outputValue =
```

get${texFuncSnippet}(${unpackedCoordsSnippet});\n ${output}\n }\n `;\n}\n\nfunction getSamplerAtOutputCoords(\n inputInfo: InputInfo, outShapeInfo: ShapeInfo) {\n const texName = inputInfo.name;\n const texFuncSnippet = texName.charAt(0).toUpperCase() + texName.slice(1);\n const funcName = 'get' + texFuncSnippet + 'AtOutCoords';\n const outTexShape = outShapeInfo.texShape;\n const inTexShape = inputInfo.shapeInfo.texShape;\n const inRank = inputInfo.shapeInfo.logicalShape.length;\n const outRank = outShapeInfo.logicalShape.length;\n\n if (!inputInfo.shapeInfo.isUniform && inRank === outRank &&\n inputInfo.shapeInfo.flatOffset == null &&\n util.arraysEqual(inTexShape, outTexShape)) {\n return `\n float ${funcName}() {\n return sampleTexture(${texName}, resultUV);\n }\n `;\n }\n\n const type = getCoordsDataType(outRank);\n const broadcastDims = getBroadcastDims(\n inputInfo.shapeInfo.logicalShape, outShapeInfo.logicalShape);\n const rankDiff = outRank - inRank;\n let coordsSnippet: string;\n const fields = ['x', 'y', 'z', 'w', 'u', 'v'];\n\n if (inRank === 0) {\n coordsSnippet = '';\n } else if (outRank < 2 && broadcastDims.length >= 1) {\n coordsSnippet = 'coords = 0;';\n } else {\n coordsSnippet =\n broadcastDims.map(d => `coords.${fields[d + rankDiff]} = 0;`)\n .join('\\n');\n }\n let unpackedCoordsSnippet = '';\n if (outRank < 2 && inRank > 0) {\n unpackedCoordsSnippet = 'coords';\n } else {\n unpackedCoordsSnippet = inputInfo.shapeInfo.logicalShape\n .map((s, i) => `coords.${fields[i + rankDiff]}`)\n .join(', ');\n }\n\n return `\n float ${funcName}() {\n ${type} coords = getOutputCoords();\n ${coordsSnippet}\n return get${texFuncSnippet}(${unpackedCoordsSnippet});\n }\n `;\n}\n\nexport function getCoordsDataType(rank: number): string {\n if (rank <= 1) {\n return 'int';\n } else if (rank === 2) {\n return 'ivec2';\n } else if (rank === 3) {\n return 'ivec3';\n } else if (rank === 4) {\n return 'ivec4';\n } else if (rank === 5) {\n return 'ivec5';\n } else if (rank === 6) {\n return 'ivec6';\n } else {\n throw Error(`GPU for rank ${rank} is not yet supported`);\n }\n}\n\n/** Returns a new input info (a copy) that has a squeezed logical shape. */\nfunction squeezeInputInfo(\n inInfo: InputInfo, squeezedShape: number[]): InputInfo {\n // Deep copy.\n const newInputInfo: InputInfo = JSON.parse(JSON.stringify(inInfo));\n newInputInfo.shapeInfo.logicalShape = squeezedShape;\n return newInputInfo;\n}\n\nfunction getSqueezedParams(params: string[], keptDims: number[]): string {\n return keptDims.map(d => params[d]).join(', ');\n}\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {env, Tensor, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {GPGPUContext} from './gpgpu_context';\nimport * as shader_compiler from './shader_compiler';\nimport {InputInfo, ShapeInfo} from './shader_compiler';\nimport {PackingScheme, TextureData, TextureUsage} from './tex_util';\n\nexport interface GPGPUProgram {\n variableNames: string[];\n outputShape: number[];\n userCode: string;\n /** If true, this program expects packed input textures. Defaults to false. */\n packedInputs?: boolean;\n /** If true, this program produces a packed texture. Defaults to false. */\n packedOutput?: boolean;\n /**\n * Affects what type of texture we allocate for the output. Defaults to\n * `TextureUsage.RENDER`.\n */\n outTexUsage?: TextureUsage;\n /**\n * The type of scheme to use when packing texels for the output values.\n * See `PackingScheme` for details. Defaults to `PackingScheme.SHARED_BATCH`.\n */\n outPackingScheme?: PackingScheme;\n}\n\nexport interface GPGPUBinary {\n webGLProgram: WebGLProgram;\n program: GPGPUProgram;\n uniformLocations: {[name: string]: WebGLUniformLocation};\n source: string;\n inShapeInfos: ShapeInfo[];\n outShapeInfo: ShapeInfo;\n infLoc: WebGLUniformLocation;\n nanLoc: WebGLUniformLocation;\n}\n\nexport interface TensorData {\n shape: number[];\n texData: TextureData;\n isUniform: boolean;\n // Available when we decide to upload as uniform instead of texture.\n uniformValues?: TypedArray;\n}\n\nexport function compileProgram<T extends Tensor, K extends Tensor>(\n gpgpu:

```
GPGPUContext, program: GPGPUProgram, inputs: TensorData[],\n    output: TensorData): GPGPUBinary {\n
const userCode = program.userCode;\n  const inputInfos: InputInfo[] = inputs.map((input, i) => {\n    const
shapeInfo: ShapeInfo = {\n      logicalShape: input.shape,\n      texShape: input.isUniform ? null :
input.texData.texShape,\n      isUniform: input.isUniform,\n      isPacked: input.isUniform ? false :
input.texData.isPacked,\n      flatOffset: null\n    };\n    if (input.texData
 != null && input.texData.slice != null &&\n        input.texData.slice.flatOffset > 0) {\n      shapeInfo.flatOffset =
input.texData.slice.flatOffset;\n    }\n    return {name: program.variableNames[i], shapeInfo};\n  });\n  const
inShapeInfos = inputInfos.map(x => x.shapeInfo);\n  const outShapeInfo: ShapeInfo = {\n    logicalShape:
output.shape,\n    texShape: output.texData.texShape,\n    isUniform: false,\n    isPacked: output.texData.isPacked,\n
  flatOffset: null\n  };\n  const source = shader_compiler.makeShader(\n      inputInfos, outShapeInfo, userCode,
program.packedInputs);\n\n  const webGLProgram = gpgpu.createProgram(source);\n\n  // Add special uniforms
(NAN, INFINITY)\n  let infLoc: WebGLUniformLocation = null;\n  const nanLoc =
gpgpu.getUniformLocation(webGLProgram, 'NAN', false);\n  if (env().getNumber('WEBGL_VERSION') === 1)
{\n    infLoc = gpgpu.getUniformLocation(webGLProgram, 'INFINITY', false);\n  }\n\n  // Add user-defined
uniforms\n  const uniformLocations:
 {[name: string]: WebGLUniformLocation} = {};\n  for (let i = 0; i < program.variableNames.length; i++) {\n
const varName = program.variableNames[i];\n    const shouldThrow = false;\n    uniformLocations[varName] =\n
 gpgpu.getUniformLocation(webGLProgram, varName, shouldThrow);\n    uniformLocations[`offset${varName}`]
=\n        gpgpu.getUniformLocation(webGLProgram, `offset${varName}`, shouldThrow);\n  }\n\n  return {\n
program,\n    source,\n    webGLProgram,\n    uniformLocations,\n    inShapeInfos,\n    outShapeInfo,\n    infLoc,\n
nanLoc,\n  };\n}\n\nfunction validateBinaryAndProgram(\n    shapeInfos: ShapeInfo[], inputs: TensorData[]) {\n  if
(shapeInfos.length !== inputs.length) {\n    throw Error(\n        `Binary was compiled with ${shapeInfos.length}
inputs, but ` +\n        `was executed with ${inputs.length} inputs`);\n  }\n\n  shapeInfos.forEach((s, i) => {\n    const
shapeA = s.logicalShape;\n    const input = inputs[i];\n    const shapeB = input.shape;\n\n
    if (!util.arraysEqual(shapeA, shapeB)) {\n      throw Error(\n          `Binary was compiled with different shapes
than ` +\n          `the current args. Shapes ${shapeA} and ${shapeB} must match`);\n    }\n    // The input is uploaded
as uniform.\n    if (s.isUniform && input.isUniform) {\n      return;\n    }\n\n    const texShapeA = s.texShape;\n
const texShapeB = input.isUniform ? null : input.texData.texShape;\n    if (!util.arraysEqual(texShapeA,
texShapeB)) {\n      throw Error(\n          `Binary was compiled with different texture shapes than the` +\n          `
current args. Shape ${texShapeA} and ${texShapeB} must match`);\n    }\n  });\n}\n\nexport function
runProgram<T extends Tensor, K extends Tensor>(\n    gpgpu: GPGPUContext, binary: GPGPUBinary, inputs:
TensorData[],\n    output: TensorData,\n    customSetup?: (gpgpu: GPGPUContext, webGLProgram:
WebGLProgram) =>\n        void): void {\n  validateBinaryAndProgram(binary.inShapeInfos, inputs);\n
validateBinaryAndProgram([binary.outShapeInfo],
 [output]);\n\n  const outTex = output.texData.texture;\n  const outTexShape = output.texData.texShape;\n  if
(output.texData.isPacked) {\n    gpgpu.setOutputPackedMatrixTexture(outTex, outTexShape[0], outTexShape[1]);\n
} else {\n    gpgpu.setOutputMatrixTexture(outTex, outTexShape[0], outTexShape[1]);\n  }\n
gpgpu.setProgram(binary.webGLProgram);\n\n  // Set special uniforms (NAN, INFINITY)\n  if
(env().getNumber('WEBGL_VERSION') === 1) {\n    if (binary.infLoc !== null) {\n
gpgpu.gl.uniform1f(binary.infLoc, Infinity);\n    }\n  }\n  if (binary.nanLoc !== null) {\n
gpgpu.gl.uniform1f(binary.nanLoc, NaN);\n  }\n\n  // Set user-defined inputs\n  inputs.forEach((input, i) => {\n
const varName = binary.program.variableNames[i];\n    const varLoc = binary.uniformLocations[varName];\n
const varOffsetLoc = binary.uniformLocations[`offset${varName}`];\n\n    if (varLoc == null) {\n      // The
compiler inferred that this variable is not used
 in this shader.\n      return;\n    }\n\n    if (input.isUniform) {\n      // Upload the values of the tensor as uniform.\n
if (util.sizeFromShape(input.shape) < 2) {\n        gpgpu.gl.uniform1f(varLoc, input.uniformValues[0]);\n      } else
{\n        let vals = input.uniformValues;\n        if (!(vals instanceof Float32Array)) {\n          vals = new
Float32Array(vals);\n        }\n        gpgpu.gl.uniform1fv(varLoc, vals);\n      }\n      return;\n    }\n\n    // If the input
```

was sliced, upload the flat offset index.\n   if (input.texData.slice != null && varOffsetLoc != null) {\n gpgpu.gl.uniform1i(varOffsetLoc, input.texData.slice.flatOffset);\n   }\n\n gpgpu.setInputMatrixTexture(input.texData.texture, varLoc, i);\n });\n\n if (customSetup != null) {\n customSetup(gpgpu, binary.webGLProgram);\n }\n gpgpu.executeProgram();\n}\n\nexport function makeShaderKey(\n   program: GPGPUProgram, inputs: TensorData[], output: TensorData): string {\n let keyInputs =
 ";\n inputs.concat(output).forEach(x => {\n   const hasOffset = x.texData != null && x.texData.slice != null &&\n   x.texData.slice.flatOffset > 0;\n   const texShape = x.isUniform ? 'uniform' : x.texData.texShape;\n   keyInputs += `${x.shape}_${texShape}_${hasOffset}`;\n });\n const keyUserCode = program.userCode;\n let key = program.constructor.name;\n // Fast string concat. See https://jsperf.com/string-concatenation/14.\n key += '_' + keyInputs + '_' + keyUserCode;\n return key;\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF
 ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {TensorInfo, util} from '@tensorflow/tfjs-core';\n\nexport function assertNotComplex(\n   tensor: TensorInfo|TensorInfo[], opName: string): void {\n if (!Array.isArray(tensor)) {\n   tensor = [tensor];\n }\n tensor.forEach(t => {\n   if (t != null) {\n   util.assert(\n   t.dtype !== 'complex64',\n   () => `${\n opName} does not support complex64 tensors in the CPU backend.`);\n   }\n });\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the License);\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required
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==\n */\n\nimport {Abs, AbsInputs, KernelConfig, KernelFunc, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendCPU} from '../backend_cpu';\nimport {assertNotComplex} from '../cpu_util';\n\nexport function simpleAbsImpl(vals: TypedArray): Float32Array {\n const resultValues = new Float32Array(vals.length);\n for (let i = 0; i < vals.length; ++i) {\n   resultValues[i] = Math.abs(vals[i]);\n }\n return resultValues;\n}\n\nexport const abs = (args: {inputs: AbsInputs, backend: MathBackendCPU}) => {\n const {x} = args.inputs;\n const cpuBackend = args.backend;\n\n assertNotComplex(x, 'abs');\n\n\n let resultValues = new Float32Array(util.sizeFromShape(x.shape));\n const values = cpuBackend.data.get(x.dataId).values as TypedArray;\n resultValues = simpleAbsImpl(values);\n\n return cpuBackend.makeOutput(resultValues, x.shape, 'float32');\n};\n\nexport const absConfig: KernelConfig = {\n kernelName: Abs,\n backendName: 'cpu',\n kernelFunc: abs as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n *
 limitations under the License.\n *
==\n

*/\n\nimport {backend_util, DataType, NumericDataType, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {SimpleBinaryKernelImpl, SimpleBinaryOperation} from './binary_types';\n\n/**\n * Template that creates implementation for binary ops. Supports broadcast.\n */\nexport function createSimpleBinaryKernelImpl(op: SimpleBinaryOperation):\n SimpleBinaryKernelImpl {\n return (aShape: number[], bShape: number[], aVals: TypedArray,\n bVals: TypedArray, dtype: DataType): [TypedArray, number[]] => {\n const newShape = backend_util.assertAndGetBroadcastShape(aShape, bShape);\n\n const resultRank = newShape.length;\n const resultStrides = util.computeStrides(newShape);\n const resultSize = util.sizeFromShape(newShape);\n\n const result =\n util.getTypedArrayFromDType(dtype as NumericDataType, resultSize);\n\n const aRank = aShape.length;\n
 const bRank = bShape.length;\n\n const aStrides = util.computeStrides(aShape);\n const bStrides = util.computeStrides(bShape);\n\n const aBroadcastDims = backend_util.getBroadcastDims(aShape, newShape);\n
 const bBroadcastDims = backend_util.getBroadcastDims(bShape, newShape);\n\n if (aBroadcastDims.length + bBroadcastDims.length === 0) {\n for (let i = 0; i < result.length; ++i) {\n result[i] = op(aVals[i % aVals.length], bVals[i % bVals.length]);\n }\n } else {\n for (let i = 0; i < result.length; ++i) {\n const loc = util.indexToLoc(i, resultRank, resultStrides);\n\n const aLoc = loc.slice(-aRank);\n aBroadcastDims.forEach(d => aLoc[d] = 0);\n const aIndex = util.locToIndex(aLoc, aRank, aStrides);\n\n const bLoc = loc.slice(-bRank);\n bBroadcastDims.forEach(d => bLoc[d] = 0);\n const bIndex = util.locToIndex(bLoc, bRank, bStrides);\n\n result[i] = op(aVals[aIndex], bVals[bIndex]);\n
 }\n }\n\n return [result, newShape];\n };\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {Complex, ComplexInputs, KernelConfig, KernelFunc, TensorInfo, TypedArray} from '@tensorflow/tfjs-core';\n\nimport {MathBackendCPU} from '../backend_cpu';\n\nexport function complex(args: {inputs: ComplexInputs,
 backend: MathBackendCPU}):\n TensorInfo {\n const {inputs, backend} = args;\n const {real, imag} = inputs;\n\n const realVals = backend.data.get(real.dataId).values as TypedArray;\n const imagVals = backend.data.get(imag.dataId).values as TypedArray;\n\n const complexInfo = backend.makeTensorInfo(real.shape, 'complex64');\n\n const complex = backend.data.get(complexInfo.dataId);\n\n // The complex tensor owns the underlying real and imag tensorInfos, only the\n // complex tensor tracks refCount, when complexData is disposed the\n // underlying tensorData will be disposed.\n complex.complexTensorInfos = {\n real: backend.makeTensorInfo(real.shape, 'float32', realVals),\n imag: backend.makeTensorInfo(imag.shape, 'float32', imagVals)\n };\n\n return complexInfo;\n}\n\nexport const complexConfig: KernelConfig = {\n kernelName: Complex,\n backendName: 'cpu',\n kernelFunc: complex as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights
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value.\n * @param backend cpu backend.\n * @param shape Shape for the zeros tensor.\n * @param dtype Optional. If set, the
result has this dtype.\n */\nexport function zeros(\n backend: MathBackendCPU, shape: number[],\n dtype: DataType = 'float32'): TensorInfo {\n if (dtype === 'complex64') {\n const real = zeros(backend, shape, 'float32');\n const imag = zeros(backend, shape, 'float32');\n\n return complex({inputs: {real, imag}, backend});\n }\n\n const values = util.makeZerosTypedArray(util.sizeFromShape(shape), dtype);\n\n return backend.makeTensorInfo(shape, dtype, values);\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either
express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {Identity, IdentityInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendCPU} from '../backend_cpu';\n\nexport function identity(\n args: {inputs: IdentityInputs, backend: MathBackendCPU}): TensorInfo {\n const {inputs, backend} = args;\n const {x} = inputs;\n\n backend.incRef(x.dataId);\n\n return {dataId: x.dataId, shape: x.shape, dtype: x.dtype};\n}\n\nexport const identityConfig: KernelConfig = {\n kernelName: Identity,\n backendName: 'cpu',\n kernelFunc: identity as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain
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==========\n */\n\nimport {KernelConfig, KernelFunc, Real, RealInputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendCPU} from '../backend_cpu';\n\nexport function real(args: {inputs: RealInputs, backend: MathBackendCPU}):\n TensorInfo {\n const {inputs, backend} = args;\n const {input} = inputs;\n\n const real = backend.data.get(input.dataId).complexTensorInfos.real;\n const realVal = backend.data.get(real.dataId).values;\n\n // When complex tensor is disposed, its underlying parts will
be disposed too.\n // Make new tensor out of the real value of the complex. This makes sure the\n // value is still accessible even if complex tensor is disposed.\n return backend.makeTensorInfo(real.shape, real.dtype, realVal);\n}\n\nexport const realConfig: KernelConfig = {\n kernelName: Real,\n backendName: 'cpu',\n kernelFunc: real as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
==========\n */\nimport {Cast, CastAttrs, CastInputs, KernelConfig, KernelFunc, TensorInfo, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendCPU} from '../backend_cpu';\nimport {createSimpleBinaryKernelImpl} from '../utils/binary_impl';\nimport {zeros} from '../utils/zeros_impl';\n\nimport

{complex} from './Complex';\nimport {identity} from './Identity';\nimport {real} from './Real';\n\nexport function cast(\n args: {inputs: CastInputs, backend: MathBackendCPU, attrs: CastAttrs}):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {dtype} = attrs;\n\n // Casting to complex64.\n if (dtype === 'complex64') {\n if (x.dtype === 'complex64') {\n   return identity({inputs: {x}, backend});\n }\n\n const zerosTensorInfo = zeros(backend, x.shape, x.dtype);\n const floatX = cast({inputs: {x}, backend, attrs: {dtype: 'float32'}});\n\n const result =\n   complex({inputs: {real: floatX, imag: zerosTensorInfo}, backend});\n\n backend.disposeIntermediateTensorInfo(zerosTensorInfo);\n backend.disposeIntermediateTensorInfo(floatX);\n\n return result;\n }\n\n // Casting from complex64\n if (x.dtype === 'complex64') {\n const realPart = real({inputs: {input: x}, backend});\n const result = cast({inputs: {x: realPart}, backend, attrs: {dtype}});\n\n backend.disposeIntermediateTensorInfo(realPart);\n\n return result;\n }\n\n if (!util.hasEncodingLoss(x.dtype, dtype)) {\n // We don't change the underlying data, since we cast to higher\n // precision.\n const result = identity({inputs: {x}, backend});\n return {dataId: result.dataId, shape: result.shape, dtype};\n }\n\n if (dtype === 'int32') {\n const values = backend.data.get(x.dataId).values as TypedArray;\n const resultValues = Int32Array.from(values);\n return backend.makeTensorInfo(x.shape, 'int32', resultValues);\n }\n\n if (dtype === 'bool') {\n // This is essentially the result of notEqual(x, 0). We avoid using\n // kernel notEqual to avoid circular dependency, i.e. binary_utils ->\n // cast -> notEqual -> binary_utils.\n const xVals = backend.data.get(x.dataId).values as TypedArray;\n const zero = util.toTypedArray([0], x.dtype);\n\n const [resultData, resultShape] = createSimpleBinaryKernelImpl(\n   (a, b) => (a !== b) ? 1 : 0)(x.shape, [], xVals, zero, 'bool');\n\n return backend.makeTensorInfo(resultShape, 'bool', resultData);\n }\n\n throw new Error(`Error in Cast: failed to cast ${x.dtype} to ${dtype}`);\n}\n\nexport const castConfig: KernelConfig = {\n kernelName: Cast,\n backendName: 'cpu',\n kernelFunc: cast as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may
 obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {backend_util, BinaryInputs, DataType, KernelFunc, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendCPU} from '../backend_cpu';\nimport {assertNotComplex} from '../cpu_util';\nimport {cast} from '../kernels/Cast';\nimport {complex} from '../kernels/Complex';\n\nimport {ComplexBinaryKernelImpl, ComplexBinaryOperation, SimpleBinaryKernelImpl} from './binary_types';\n\n/**\n * Template that creates a `KernelFunc` for binary ops.\n * @param name Kernel name.\n * @param
 binaryKernelImpl A `SimpleBinaryKernelImpl` for the kernel.\n * @param binaryKernelComplexImpl Optional. If exists, represents a\n *   `ComplexBinaryKernelImpl` for the kernel, will be used when input dtype\n *   is `complex64`.\n * @param dtype Optional. If set, the result has this dtype. Otherwise, the\n *   result has the same dtype as the first input. This is mainly used in\n *   comparison kernels, such as Equal, Less, Greater, etc.\n */\nexport function binaryKernelFunc(\n name: string, simpleImpl: SimpleBinaryKernelImpl,\n complexImpl?: ComplexBinaryKernelImpl, dtype?: DataType): KernelFunc {\n if (complexImpl == null) {\n return ({inputs, backend}) => {\n   const {a, b} = inputs as BinaryInputs;\n   const cpuBackend = backend as MathBackendCPU;\n\n   assertNotComplex([a, b], name);\n\n   const aVals = cpuBackend.data.get(a.dataId).values as TypedArray;\n   const bVals = cpuBackend.data.get(b.dataId).values as TypedArray;\n\n   const $dtype
 = dtype || a.dtype;\n\n   const [resultData, resultShape] =\n   simpleImpl(a.shape, b.shape, aVals, bVals, $dtype);\n\n   return cpuBackend.makeTensorInfo(resultShape, $dtype, resultData);\n };\n }\n\n return ({inputs, backend}) => {\n const {a, b} = inputs as BinaryInputs;\n const cpuBackend = backend as MathBackendCPU;\n\n if (a.dtype === 'complex64' || b.dtype === 'complex64') {\n   const $aComplex = cast(\n

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{inputs: {x: a}, backend: cpuBackend, attrs: {dtype: 'complex64'}});\n\n      const $aComplexVals = cpuBackend.data.get($aComplex.dataId);\n\n      const aReal = $aComplexVals.complexTensorInfos.real;\n      const aImag = $aComplexVals.complexTensorInfos.imag;\n\n      const aRealVals =\n cpuBackend.data.get(aReal.dataId).values as Float32Array;\n      const aImagVals =\n cpuBackend.data.get(aImag.dataId).values as Float32Array;\n\n      const $bComplex = cast(\n          {inputs: {x: b}, backend: cpuBackend, attrs: {dtype:
 'complex64'}});\n\n      const $bComplexVals = cpuBackend.data.get($bComplex.dataId);\n\n      const bReal = $bComplexVals.complexTensorInfos.real;\n      const bImag = $bComplexVals.complexTensorInfos.imag;\n\n      const bRealVals =\n          cpuBackend.data.get(bReal.dataId).values as Float32Array;\n      const bImagVals =\n        cpuBackend.data.get(bImag.dataId).values as Float32Array;\n\n      const [resultRealData, resultImagData, resultShape] = complexImpl(\n          a.shape, b.shape, aRealVals, aImagVals, bRealVals, bImagVals);\n\n      const resultReal =\n          cpuBackend.makeTensorInfo(resultShape, 'float32', resultRealData);\n\n      const resultImag =\n          cpuBackend.makeTensorInfo(resultShape, 'float32', resultImagData);\n\n      const result = complex(\n {inputs: {real: resultReal, imag: resultImag}, backend: cpuBackend});\n\n cpuBackend.disposeIntermediateTensorInfo($aComplex);\n cpuBackend.disposeIntermediateTensorInfo($bComplex);\n      cpuBackend.disposeIntermediateTensorInfo(resultReal);\n cpuBackend.disposeIntermediateTensorInfo(resultImag);\n\n      return result;\n    } else {\n      const aVals = cpuBackend.data.get(a.dataId).values as TypedArray;\n      const bVals = cpuBackend.data.get(b.dataId).values as TypedArray;\n\n      const $dtype = dtype || a.dtype;\n\n      const [resultData, resultShape] =\n simpleImpl(a.shape, b.shape, aVals, bVals, $dtype);\n\n      return cpuBackend.makeTensorInfo(resultShape, $dtype, resultData);\n    }\n  };\n}\n\n/**\n * Template that creates the complex type implementation for binary ops.\n * Supports broadcast.\n */\nexport function createComplexBinaryKernelImpl(op: ComplexBinaryOperation):\n ComplexBinaryKernelImpl {\n  return (aShape: number[], bShape: number[], aRealVals: Float32Array,\n aImagVals: Float32Array, bRealVals: Float32Array,\n          bImagVals: Float32Array): [TypedArray, TypedArray, number[]] => {\n    const resultShape = backend_util.assertAndGetBroadcastShape(aShape,
 bShape);\n    const resultSize = util.sizeFromShape(resultShape);\n    const resultRank = resultShape.length;\n const resultStrides = util.computeStrides(resultShape);\n\n    const resultRealVals =
 util.getTypedArrayFromDType('float32', resultSize);\n    const resultImagVals =
 util.getTypedArrayFromDType('float32', resultSize);\n\n    const aBroadcastDims =
 backend_util.getBroadcastDims(aShape, resultShape);\n    const bBroadcastDims =
 backend_util.getBroadcastDims(bShape, resultShape);\n\n    const aVals =
 backend_util.mergeRealAndImagArrays(aRealVals, aImagVals);\n    const bVals =
 backend_util.mergeRealAndImagArrays(bRealVals, bImagVals);\n\n    const aRank = aShape.length;\n    const aStrides = util.computeStrides(aShape);\n\n    const bRank = bShape.length;\n    const bStrides =
 util.computeStrides(bShape);\n\n    if (aBroadcastDims.length + bBroadcastDims.length === 0) {\n      for (let i = 0; i < resultRealVals.length; i++) {\n
    const aIdx = i % aVals.length;\n        const bIdx = i % bVals.length;\n\n        const result =\n op(aVals[aIdx * 2], aVals[aIdx * 2 + 1], bVals[bIdx * 2],\n              bVals[bIdx * 2 + 1]);\n\n        resultRealVals[i] = result.real;\n        resultImagVals[i] = result.imag;\n      }\n    } else {\n      for (let i = 0; i < resultRealVals.length; i++) {\n        const loc = util.indexToLoc(i, resultRank, resultStrides);\n\n        const aLoc = loc.slice(-aRank);\n aBroadcastDims.forEach(d => aLoc[d] = 0);\n        const aIndex = util.locToIndex(aLoc, aRank, aStrides);\n\n const bLoc = loc.slice(-bRank);\n        bBroadcastDims.forEach(d => bLoc[d] = 0);\n        const bIndex =
 util.locToIndex(bLoc, bRank, bStrides);\n\n        const opResult =\n            op(aVals[aIndex * 2], aVals[aIndex * 2 + 1], bVals[bIndex * 2],\n              bVals[bIndex * 2 + 1]);\n\n        resultRealVals[i] = opResult.real;\n resultImagVals[i] = opResult.imag;\n
  }\n    }\n    return [resultRealVals, resultImagVals, resultShape];\n  };\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you
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const addImpl = createSimpleBinaryKernelImpl(((a, b) => a + b));\nexport const addComplexImpl =\n createComplexBinaryKernelImpl(((aReal, aImag, bReal, bImag) => {\n return {real: aReal + bReal, imag: aImag + bImag};\n }));\n\nexport const add = binaryKernelFunc(Add, addImpl, addComplexImpl);\n\nexport const addConfig: KernelConfig = {\n kernelName: Add,\n backendName: 'cpu',\n kernelFunc: add\n};\n\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {buffer, DataType, Rank, TensorBuffer, TypedArray, util} from '@tensorflow/tfjs-core';\n\nexport function bincountImpl(\n xVals: TypedArray, weightsVals: TypedArray, weightsDtype: DataType,\n weightsShape: number[], size: number): TypedArray {\n const weightsSize = util.sizeFromShape(weightsShape);\n const outVals = util.makeZerosTypedArray(size, weightsDtype) as TypedArray;\n\n for (let i = 0; i < xVals.length; i++) {\n const value = xVals[i];\n if (value < 0) {\n throw new Error('Input x must be non-negative!');\n }\n\n if (value >= size) {\n continue;\n }\n\n if (weightsSize > 0) {\n outVals[value] += weightsVals[i];\n } else {\n outVals[value] += 1;\n }\n }\n\n return outVals;\n}\n\nexport function bincountReduceImpl<R extends Rank>(\n xBuf: TensorBuffer<R>,
weightsBuf: TensorBuffer<R>, size: number,\n binaryOutput = false): TensorBuffer<R> {\n const numRows = xBuf.shape[0];\n const numCols = xBuf.shape[1];\n\n const outBuf = buffer([numRows, size], weightsBuf.dtype);\n\n for (let i = 0; i < numRows; i++) {\n for (let j = 0; j < numCols; j++) {\n const value = xBuf.get(i, j);\n if (value < 0) {\n throw new Error('Input x must be non-negative!');\n }\n\n if (value >= size) {\n continue;\n }\n\n if (binaryOutput) {\n outBuf.set(1, i, value);\n } else {\n if (weightsBuf.size > 0) {\n outBuf.set(outBuf.get(i, value) + weightsBuf.get(i, j), i, value);\n } else {\n outBuf.set(outBuf.get(i, value) + 1, i, value);\n }\n }\n }\n }\n\n return outBuf as TensorBuffer<R>;\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may
not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {NumericDataType, util} from '@tensorflow/tfjs-core';\n\nimport {SimpleUnaryImpl, SimpleUnaryOperation} from './unary_types';\n\n/**\n * Template that creates implementation for unary op.\n */\nexport function createSimpleUnaryImpl(op: SimpleUnaryOperation):\n SimpleUnaryImpl {\n return (values, dtype, attrs) => {\n const newValues =\n util.getTypedArrayFromDType(dtype as NumericDataType, values.length);\n

for (let i = 0; i < values.length; ++i) {\n newValues[i] = op(values[i], attrs);\n }\n return newValues;\n };\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {DataType, KernelFunc, TypedArray, UnaryInputs, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendCPU} from '../backend_cpu';\nimport {assertNotComplex} from '../cpu_util';\n\nimport {SimpleUnaryImpl, SimpleUnaryOperation} from './unary_types';\n\n/**\n * Template that creates a `KernelFunc` for unary ops.\n * @param name Kernel name.\n * @param op A `SimpleUnaryOperation` for the kernel.\n * @param dtype Optional. If set, the result has this dtype. Otherwise, the\n * result has the same dtype as the input. This is mainly used in certain\n * kernels that return bool type, such as isFinite, isInf, etc.\n */\nexport function unaryKernelFunc(\n name: string, op: SimpleUnaryOperation, dtype?: DataType): KernelFunc {\n return ({inputs, attrs, backend}) => {\n const {x} = inputs as UnaryInputs;\n assertNotComplex(x, name);\n if (x.dtype === 'string' || dtype === 'string') {\n throw new Error('unaryKernelFunc does not support string input/output');\n }\n\n const cpuBackend = backend as MathBackendCPU;\n const values = cpuBackend.data.get(x.dataId).values as TypedArray;\n const xSize = util.sizeFromShape(x.shape);\n const $dtype = dtype || x.dtype;\n const newValues = util.getArrayFromDType($dtype, xSize);\n for (let i = 0; i < xSize; ++i) {\n newValues[i] = op(values[i], attrs);\n }\n return cpuBackend.makeTensorInfo(x.shape, $dtype, newValues);\n };\n}\n\n/**\n * Template that creates a `KernelFunc` for unary ops from the given\n * `SimpleUnaryImpl`..\n * @param name Kernel name.\n * @param unaryImpl A `SimpleUnaryImpl` that implements the op.\n * @param dtype Optional. If set, the result has this dtype. Otherwise, the\n * result has the same dtype as the input. This is mainly used in certain\n * kernels that return bool type, such as isFinite, isInf, etc.\n */\nexport function unaryKernelFuncFromImpl(\n name: string, unaryImpl: SimpleUnaryImpl, dtype?: DataType): KernelFunc {\n return ({inputs, attrs, backend}) => {\n const {x} = inputs as UnaryInputs;\n assertNotComplex(x, name);\n if (x.dtype === 'string' || dtype === 'string') {\n throw new Error('unaryKernelFunc does not support string input/output');\n }\n\n const cpuBackend = backend as MathBackendCPU;\n const values = cpuBackend.data.get(x.dataId).values as TypedArray;\n const $dtype = dtype || x.dtype;\n const newValues = unaryImpl(values, $dtype, attrs);\n return cpuBackend.makeTensorInfo(x.shape, $dtype, newValues);\n };\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the License);\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an AS IS BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {Ceil, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createSimpleUnaryImpl} from '../utils/unary_impl';\nimport {unaryKernelFuncFromImpl} from '../utils/unary_utils';\n\nexport const ceilImpl = createSimpleUnaryImpl((xi) => Math.ceil(xi));\nexport const ceil = unaryKernelFuncFromImpl(Ceil, ceilImpl);\n\nexport const ceilConfig: KernelConfig = {\n kernelName: Ceil,\n backendName: 'cpu',\n kernelFunc: ceil,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS

IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {backend_util, BackendValues, DataType, TypedArray, util} from '@tensorflow/tfjs-core';\n\nexport function concatImpl(\n inputs: Array<{vals: BackendValues, shape: number[]}>, outShape: number[],\n dtype: DataType, simplyConcat: boolean): TypedArray|string[] {\n const outVals = util.getArrayFromDType(dtype, util.sizeFromShape(outShape));\n\n if (simplyConcat && dtype !== 'string') {\n // Use built-in TypedArray.set() method for speed.\n let offset = 0;\n inputs.forEach(input => {\n const size = util.sizeFromShape(input.shape);\n\n (outVals as TypedArray).set(input.vals as TypedArray, offset);\n offset += size;\n });\n } else {\n let colOffset = 0;\n\n inputs.forEach(input => {\n const decodedData = dtype === 'string' ?\n backend_util.fromUint8ToStringArray(input.vals as Uint8Array[]) :\n input.vals as TypedArray;\n\n let tIdx = 0;\n\n for (let row = 0; row < input.shape[0]; ++row) {\n const resIdx = row * outShape[1] + colOffset;\n for (let col = 0; col < input.shape[1]; ++col) {\n outVals[resIdx + col] = decodedData[tIdx++];\n }\n }\n\n colOffset += input.shape[1];\n });\n }\n\n return outVals;\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the License);\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an AS IS BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {Exp, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createSimpleUnaryImpl} from '../utils/unary_impl';\nimport {unaryKernelFuncFromImpl} from '../utils/unary_utils';\n\nexport const expImpl = createSimpleUnaryImpl((xi) => Math.exp(xi));\nexport const exp = unaryKernelFuncFromImpl(Exp, expImpl);\n\nexport const expConfig: KernelConfig = {\n kernelName: Exp,\n backendName: 'cpu',\n kernelFunc: exp,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the License);\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an AS IS BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {Expm1, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createSimpleUnaryImpl} from '../utils/unary_impl';\nimport {unaryKernelFuncFromImpl} from '../utils/unary_utils';\n\nexport const expm1Impl = createSimpleUnaryImpl((xi) => Math.expm1(xi));\nexport const expm1 = unaryKernelFuncFromImpl(Expm1, expm1Impl);\n\nexport const expm1Config: KernelConfig = {\n kernelName: Expm1,\n backendName: 'cpu',\n kernelFunc: expm1,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the License);\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an AS IS BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {Floor, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createSimpleUnaryImpl} from '../utils/unary_impl';\nimport {unaryKernelFuncFromImpl} from '../utils/unary_utils';\n\nexport const floorImpl = createSimpleUnaryImpl((xi) => Math.floor(xi));\nexport const floor = unaryKernelFuncFromImpl(Floor,

floorImpl);\n\nexport const floorConfig: KernelConfig = {\n kernelName: Floor,\n backendName: 'cpu',\n kernelFunc: floor,\n};\n","/**\n
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*/\n\nimport {buffer, DataType, Rank, TensorBuffer} from '@tensorflow/tfjs-core';\n\nexport function gatherV2Impl<R extends Rank, D extends DataType>(\n   xBuf: TensorBuffer<R, D>, indicesBuf: TensorBuffer<R, D>,\n   flattenOutputShape: number[]): TensorBuffer<R, D> {\n const outBuf = buffer(flattenOutputShape, xBuf.dtype);\n for (let i = 0; i < outBuf.size; ++i) {\n   const newLoc = outBuf.indexToLoc(i);\n\n   const originalLoc: number[] = newLoc.slice();\n   const batchIdx = originalLoc[0];\n const indicesIdx = originalLoc[2];\n   const indicesIndex = indicesBuf.locToIndex([batchIdx, indicesIdx]);\n originalLoc[2] = indicesBuf.values[indicesIndex] as number;\n\n   const originalIndex = xBuf.locToIndex(originalLoc);\n   outBuf.values[i] = xBuf.values[originalIndex];\n }\n\n return outBuf as TensorBuffer<R, D>;\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on
 an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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/\n\nimport {Greater, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {createSimpleBinaryKernelImpl} from '../utils/binary_impl';\nimport {binaryKernelFunc} from '../utils/binary_utils';\n\nexport const greaterImpl =\n createSimpleBinaryKernelImpl((a: number, b: number) => (a > b) ? 1 : 0);\nexport const greater =\n binaryKernelFunc(Greater, greaterImpl, null / complexImpl */, 'bool');\n\nexport const greaterConfig: KernelConfig = {\n kernelName: Greater,\n backendName: 'cpu',\n kernelFunc: greater\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance
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/\n\nimport {KernelConfig, Less} from '@tensorflow/tfjs-core';\n\nimport {createSimpleBinaryKernelImpl} from '../utils/binary_impl';\nimport {binaryKernelFunc} from '../utils/binary_utils';\n\nexport const lessImpl =\n createSimpleBinaryKernelImpl((a: number, b: number) => (a < b) ? 1 : 0);\nexport const less =\n binaryKernelFunc(Less, lessImpl, null / complexImpl */, 'bool');\n\nexport const lessConfig: KernelConfig = {\n kernelName: Less,\n backendName:
 'cpu',\n kernelFunc: less\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,

software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {TypedArray, util} from '@tensorflow/tfjs-core';\n\nexport function linSpaceImpl(\n start: number, stop: number, num: number): TypedArray {\n const step = (stop - start) / (num - 1);\n\n const values = util.makeZerosTypedArray(num,
'float32');\n values[0] = start;\n for (let i = 1; i < values.length; i++) {\n values[i] = values[i - 1] + step;\n }\n\n return values;\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the License);\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an AS IS BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, Log} from '@tensorflow/tfjs-core';\n\nimport {createSimpleUnaryImpl} from '../utils/unary_impl';\nimport
{unaryKernelFuncFromImpl} from '../utils/unary_utils';\n\nexport const logImpl = createSimpleUnaryImpl((xi) => Math.log(xi));\nexport const log = unaryKernelFuncFromImpl(Log, logImpl);\n\nexport const logConfig: KernelConfig = {\n kernelName: Log,\n backendName: 'cpu',\n kernelFunc: log,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {DataType, NumericDataType, TypedArray, util} from '@tensorflow/tfjs-core';\n\nexport function maxImpl(\n aVals: TypedArray, reduceSize: number, outShape: number[],\n dtype: DataType): TypedArray {\n const vals = util.getTypedArrayFromDType(\n dtype as NumericDataType, util.sizeFromShape(outShape));\n\n for (let i = 0; i < vals.length; ++i) {\n const offset = i * reduceSize;\n let max = aVals[offset];\n for (let j = 0; j < reduceSize; ++j) {\n const value = aVals[offset + j];\n if (value > max) {\n max = value;\n }\n }\n vals[i] = max;\n }\n return vals;\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law
or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, Maximum} from '@tensorflow/tfjs-core';\n\nimport {createSimpleBinaryKernelImpl} from '../utils/binary_impl';\nimport {binaryKernelFunc} from '../utils/binary_utils';\n\nexport const maximumImpl = createSimpleBinaryKernelImpl(\n ((aValue, bValue) => Math.max(aValue, bValue)));\nexport const maximum = binaryKernelFunc(Maximum, maximumImpl);\n\nexport const maximumConfig: KernelConfig = {\n kernelName: Maximum,\n backendName: 'cpu',\n kernelFunc: maximum\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n

* you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {KernelConfig, Minimum} from '@tensorflow/tfjs-core';\n\nimport {createSimpleBinaryKernelImpl} from '../utils/binary_impl';\nimport {binaryKernelFunc} from '../utils/binary_utils';\n\nexport const minimumImpl = createSimpleBinaryKernelImpl(\n ((aValue, bValue) => Math.min(aValue, bValue)));\nexport const minimum = binaryKernelFunc(Minimum, minimumImpl);\n\nexport const minimumConfig: KernelConfig = {\n kernelName: Minimum,\n backendName: 'cpu',\n kernelFunc: minimum\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {KernelConfig, Multiply} from '@tensorflow/tfjs-core';\nimport {createSimpleBinaryKernelImpl} from '../utils/binary_impl';\nimport {binaryKernelFunc, createComplexBinaryKernelImpl} from '../utils/binary_utils';\n\nexport const multiplyImpl =\n createSimpleBinaryKernelImpl(((aValue, bValue) => aValue * bValue));\nexport const multiplyComplexImpl =\n createComplexBinaryKernelImpl(((aReal, aImag, bReal, bImag) => {\n return {\n real: aReal * bReal - aImag * bImag,\n imag: aReal * bImag + aImag * bReal\n };\n }));\n\nexport const multiply =\n binaryKernelFunc(Multiply, multiplyImpl, multiplyComplexImpl);\n\nexport const multiplyConfig: KernelConfig = {\n kernelName: Multiply,\n backendName: 'cpu',\n kernelFunc: multiply\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the\n License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {DataType, KernelConfig, KernelFunc, Neg, TensorInfo, TypedArray, UnaryInputs, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendCPU} from '../backend_cpu';\nimport {assertNotComplex} from '../cpu_util';\nimport {multiplyImpl} from './Multiply';\n\nexport function negImpl(xVals: TypedArray, xShape: number[], xDtype: DataType):\n [TypedArray, number[]] {\n const minusOne =\n util.createScalarValue(-1 as {} as 'float32', xDtype) as TypedArray;\n return multiplyImpl([], xShape, minusOne, xVals, xDtype);\n}\n\nexport function neg(args: {inputs: UnaryInputs, backend: MathBackendCPU}):\n TensorInfo {\n const {inputs, backend} = args;\n const {x} =\n inputs;\n\n assertNotComplex(x, 'neg');\n\n const xVals = backend.data.get(x.dataId).values as TypedArray;\n const [res, newShape] = negImpl(xVals, x.shape, x.dtype);\n\n return backend.makeTensorInfo(newShape, x.dtype, res);\n}\n\nexport const negConfig: KernelConfig = {\n kernelName: Neg,\n backendName: 'cpu',\n kernelFunc: neg as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,

software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n
 * ===\n */\n\nimport {KernelConfig, NotEqual} from '@tensorflow/tfjs-core';\n\nimport {createSimpleBinaryKernelImpl} from '../utils/binary_impl';\nimport {binaryKernelFunc} from '../utils/binary_utils';\n\nexport const notEqualImpl =\n   createSimpleBinaryKernelImpl(((a, b) => (a !== b) ? 1 : 0));\nexport const notEqual =\n binaryKernelFunc(NotEqual, notEqualImpl, null /* complexOp */, 'bool');\n\nexport const notEqualConfig: KernelConfig = {\n kernelName: NotEqual,\n backendName: 'cpu',\n kernelFunc: notEqual\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed
 under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ===\n */\n\nimport {DataType, NumericDataType, TypedArray} from '@tensorflow/tfjs-core';\nimport {util} from '@tensorflow/tfjs-core';\n\nexport function transposeImpl(\n   xVals: TypedArray, xShape: number[], dtype: DataType, perm: number[],\n   newShape: number[]): TypedArray {\n const xRank = xShape.length;\n const xSize = util.sizeFromShape(xShape);\n const xStrides = util.computeStrides(xShape);\n const newStrides = util.computeStrides(newShape);\n\n const result = util.getTypedArrayFromDType(\n   dtype as NumericDataType, util.sizeFromShape(newShape));\n\n for (let i = 0; i < xSize; ++i) {\n   const loc = util.indexToLoc(i, xRank, xStrides);\n\n   // Permute
 location.\n   const newLoc: number[] = new Array(loc.length);\n   for (let i = 0; i < newLoc.length; i++) {\n newLoc[i] = loc[perm[i]];\n   }\n\n   const newIndex = util.locToIndex(newLoc, xRank, newStrides);\n result[newIndex] = xVals[i];\n }\n return result;\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 ===\n
 */\n\nimport {KernelConfig, KernelFunc, TensorInfo, Transpose, TransposeAttrs, TransposeInputs, TypedArray} from '@tensorflow/tfjs-core';\n\nimport {MathBackendCPU} from '../backend_cpu';\nimport {assertNotComplex} from '../cpu_util';\n\nimport {transposeImpl} from './Transpose_impl';\n\nexport function transpose(args: {\n inputs: TransposeInputs,\n attrs: TransposeAttrs,\n backend: MathBackendCPU\n}): TensorInfo {\n const {inputs, attrs, backend} = args;\n const {x} = inputs;\n const {perm} = attrs;\n\n assertNotComplex(x, 'transpose');\n\n const xRank = x.shape.length;\n\n const newShape: number[] = new Array(xRank);\n for (let i = 0; i < newShape.length; i++) {\n   newShape[i] = x.shape[perm[i]];\n }\n\n const values = backend.data.get(x.dataId).values as TypedArray;\n const result = transposeImpl(values, x.shape, x.dtype, perm, newShape);\n\n const dataId = backend.write(result, newShape, x.dtype);\n return {dataId, shape: newShape, dtype: x.dtype};\n}\n\nexport
 const transposeConfig: KernelConfig = {\n kernelName: Transpose,\n backendName: 'cpu',\n kernelFunc: transpose as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,

software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {backend_util, DataType, KernelConfig, KernelFunc, Prod, ProdAttrs, ProdInputs, TensorInfo, TypedArray, upcastType, util}
from '@tensorflow/tfjs-core';\n\nimport {MathBackendCPU} from '../backend_cpu';\nimport {assertNotComplex} from '../cpu_util';\nimport {transpose} from './Transpose';\n\nexport function prodImpl(\n xShape: number[], xDtype: DataType, xVals: TypedArray,\n reductionAxes: number[]):\n {outVals: TypedArray, outShape: number[], outDtype: DataType} {\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(xShape, reductionAxes);\n const outDtype = upcastType(xDtype, 'int32');\n const outVals = util.makeZerosTypedArray(\n util.sizeFromShape(outShape), outDtype) as TypedArray;\n const reduceSize = util.sizeFromShape(reduceShape);\n\n for (let i = 0; i < outVals.length; ++i) {\n const offset = i * reduceSize;\n let prod = 1;\n for (let j = 0; j < reduceSize; ++j) {\n prod *= xVals[offset + j];\n }\n outVals[i] = prod;\n }\n\n return {outVals, outShape, outDtype};\n}\n\nexport function prod(\n args: {inputs: ProdInputs,
backend: MathBackendCPU, attrs: ProdAttrs}):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {axis, keepDims} = attrs;\n\n assertNotComplex(x, 'prod');\n\n const xRank = x.shape.length;\n const axes = util.parseAxisParam(axis, x.shape);\n\n const permutation = backend_util.getAxesPermutation(axes, xRank);\n let reductionAxes = axes;\n let permutedX = x;\n const intermediateTensorInfos = [];\n if (permutation != null) {\n permutedX = transpose({inputs: {x}, backend, attrs: {perm: permutation}});\n intermediateTensorInfos.push(permutedX);\n reductionAxes = backend_util.getInnerMostAxes(reductionAxes.length, xRank);\n }\n\n const xVals = backend.data.get(permutedX.dataId).values as TypedArray;\n const {outVals, outShape, outDtype} =\n prodImpl(permutedX.shape, permutedX.dtype, xVals, reductionAxes);\n\n let resultShape = outShape;\n if (keepDims) {\n resultShape = backend_util.expandShapeToKeepDim(outShape, axes);\n }\n\n intermediateTensorInfos.forEach(\n t => backend.disposeIntermediateTensorInfo(t));\n\n return backend.makeTensorInfo(resultShape, outDtype, outVals);\n}\n\nexport const prodConfig: KernelConfig = {\n kernelName: Prod,\n backendName: 'cpu',\n kernelFunc: prod as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {DataTypeMap, util} from '@tensorflow/tfjs-core';\n\nexport function rangeImpl(\n start: number, stop: number, step: number,\n dtype: 'float32'|'int32'): DataTypeMap['float32' | 'int32'] {\n const sameStartStop = start === stop;\n const increasingRangeNegativeStep = start < stop && step < 0;\n const decreasingRangePositiveStep = stop < start && step > 1;\n\n if (sameStartStop || increasingRangeNegativeStep ||\n decreasingRangePositiveStep) {\n return util.makeZerosTypedArray(0, dtype);\n }\n\n const numElements = Math.abs(Math.ceil((stop - start) / step));\n const values = util.makeZerosTypedArray(numElements, dtype);\n\n if (stop < start && step === 1) {\n // Auto adjust the step's sign if it hasn't been set\n // (or was set to 1)\n step = -1;\n }\n\n values[0] = start;\n for (let i = 1; i < values.length; i++) {\n values[i] = values[i - 1] + step;\n }\n return values;\n}\n","/**\n * @license\n * Copyright
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==========\n
*/\n\nimport {KernelConfig, Rsqrt} from '@tensorflow/tfjs-core';\n\nimport {createSimpleUnaryImpl} from '../utils/unary_impl';\nimport {unaryKernelFuncFromImpl} from '../utils/unary_utils';\n\nexport const rsqrtImpl = createSimpleUnaryImpl((xi) => 1 / Math.sqrt(xi));\nexport const rsqrt = unaryKernelFuncFromImpl(Rsqrt, rsqrtImpl);\n\nexport const rsqrtConfig: KernelConfig = {\n kernelName: Rsqrt,\n backendName: 'cpu',\n kernelFunc: rsqrt,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {backend_util, BackendValues, buffer, DataType, KernelConfig, KernelFunc, Slice, slice_util, SliceAttrs, SliceInputs, TensorInfo,
TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendCPU} from '../backend_cpu';\nimport {assertNotComplex} from '../cpu_util';\n\nexport function sliceImpl(\n vals: BackendValues, begin: number[], size: number[], shape: number[],\n dtype: DataType): BackendValues {\n const isContinous = slice_util.isSliceContinous(shape, begin, size);\n const length = util.sizeFromShape(size);\n const xStrides = util.computeStrides(shape);\n\n if (isContinous) {\n const flatOffset = slice_util.computeFlatOffset(begin, xStrides);\n\n if (dtype === 'string') {\n return (vals as Uint8Array[]).slice(flatOffset, flatOffset + length);\n }\n\n return (vals as TypedArray).subarray(flatOffset, flatOffset + length);\n }\n\n const decodedData = dtype === 'string' ?\n backend_util.fromUint8ToStringArray(vals as Uint8Array[]) :\n vals as TypedArray;\n\n const inBuf = buffer(shape, dtype, decodedData);\n const outBuf = buffer(size, dtype);\n for (let i = 0; i < outBuf.size; ++i) {\n const outLoc = outBuf.indexToLoc(i);\n const inLoc = outLoc.map((idx: number, j) => idx + begin[j]);\n outBuf.set(inBuf.get(...inLoc), ...outLoc);\n }\n\n if (dtype === 'string') {\n return backend_util.fromStringArrayToUint8(outBuf.values as string[]);\n }\n return outBuf.values as TypedArray;\n}\n\nexport function slice(\n args: {inputs: SliceInputs, backend: MathBackendCPU, attrs: SliceAttrs}):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {begin, size} = attrs;\n\n assertNotComplex(x, 'slice');\n\n const [$begin, $size] = slice_util.parseSliceParams(x, begin, size);\n slice_util.assertParamsValid(x, $begin, $size);\n\n const vals = backend.data.get(x.dataId).values;\n const outVals = sliceImpl(vals, $begin, $size, x.shape, x.dtype);\n return backend.makeTensorInfo($size, x.dtype, outVals);\n}\n\nexport const sliceConfig: KernelConfig = {\n kernelName: Slice,\n backendName: 'cpu',\n kernelFunc: slice as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {KernelConfig, SquaredDifference} from '@tensorflow/tfjs-core';\n\nimport {createSimpleBinaryKernelImpl} from '../utils/binary_impl';\nimport {binaryKernelFunc} from '../utils/binary_utils';\n\nexport const squaredDifferenceImpl

= createSimpleBinaryKernelImpl(((a, b) => {\n const diff = a - b;\n return diff * diff;\n}));\nexport const squaredDifference =\n   binaryKernelFunc(SquaredDifference, squaredDifferenceImpl);\n\nexport const squaredDifferenceConfig: KernelConfig = {\n kernelName: SquaredDifference,\n backendName: 'cpu',\n kernelFunc: squaredDifference\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {buffer, Rank, TensorBuffer} from '@tensorflow/tfjs-core';\n\nexport function stridedSliceImpl<R extends Rank>(\n   outShape: number[], xBuf: TensorBuffer<R>, strides: number[],\n   begin: number[]): TensorBuffer<R> {\n const outBuf = buffer(outShape, xBuf.dtype);\n\n for (let i = 0; i < outBuf.size; i++) {\n   const loc = outBuf.indexToLoc(i);\n\n   const newLoc: number[] = new Array(loc.length);\n   for (let j = 0; j < newLoc.length; j++) {\n   newLoc[j] = loc[j] * strides[j] + begin[j];\n   }\n   outBuf.set(xBuf.get(...newLoc), ...loc);\n }\n\n return outBuf as TensorBuffer<R>;\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, Sub} from '@tensorflow/tfjs-core';\n\nimport {createSimpleBinaryKernelImpl} from '../utils/binary_impl';\nimport {binaryKernelFunc, createComplexBinaryKernelImpl} from '../utils/binary_utils';\n\nexport const subImpl =\n   createSimpleBinaryKernelImpl(((aValue, bValue) => aValue - bValue));\nexport const subComplexImpl =\n   createComplexBinaryKernelImpl(((aReal, aImag, bReal, bImag) => {\n   return {real: aReal - bReal, imag: aImag - bImag};\n   }));\nexport const sub = binaryKernelFunc(Sub, subImpl, subComplexImpl);\n\nexport const subConfig: KernelConfig = {\n kernelName: Sub,\n backendName: 'cpu',\n kernelFunc: sub\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {buffer, DataType, Rank, TensorBuffer} from '@tensorflow/tfjs-core';\n\n/**\n * An implementation of the tile kernel shared between webgl and cpu for string\n * tensors only.\n */\n\nexport function tileImpl<R extends Rank>(\n   xBuf: TensorBuffer<R, DataType>,\n   reps: number[]): TensorBuffer<R, DataType> {\n const newShape: number[] = new Array(xBuf.rank);\n for (let i = 0; i < newShape.length; i++) {\n   newShape[i] = xBuf.shape[i] * reps[i];\n }\n const result = buffer(newShape, xBuf.dtype);\n for (let i = 0; i < result.values.length; ++i) {\n   const newLoc = result.indexToLoc(i);\n\n   const originalLoc: number[] = new Array(xBuf.rank);\n   for (let j = 0; j < originalLoc.length; j++) {\n   originalLoc[j] = newLoc[j] % xBuf.shape[j];\n   }\n\n   const originalIndex = xBuf.locToIndex(originalLoc);\n\n   result.values[i] = xBuf.values[originalIndex];\n }\n return result as TensorBuffer<R, DataType>;\n}\n","/**\n * @license\n *

Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\n/** An implementation of the TopK kernel shared between webgl and cpu. */\n\nimport {buffer, NumericDataType, Rank, ShapeMap, Tensor, TensorBuffer, TypedArray, util} from '@tensorflow/tfjs-core';\n\nexport function topKImpl<T extends Tensor, R extends Rank>(\n x: TypedArray, xShape: number[], xDtype: NumericDataType, k: number,\n sorted: boolean):\n [TensorBuffer<R, NumericDataType>, TensorBuffer<R, 'int32'>] {\n // Reshape into a 2d tensor [batch, lastDim] and compute topk along lastDim.\n const lastDim = xShape[xShape.length - 1];\n const [batch, size] = [x.length / lastDim, lastDim];\n const allTopKVals = util.getTypedArrayFromDType(xDtype, batch * k);\n const allTopKIndices = util.getTypedArrayFromDType('int32', batch * k);\n\n for (let b = 0; b < batch; b++) {\n const offset = b * size;\n const vals = x.subarray(offset, offset + size);\n const valAndInd: Array<{value: number, index: number}> = [];\n for (let i = 0; i < vals.length; i++) {\n valAndInd.push({value: vals[i], index: i});\n }\n valAndInd.sort((a, b) => b.value - a.value);\n\n const outOffset = b * k;\n const topKVals = allTopKVals.subarray(outOffset, outOffset + k);\n const topKIndices = allTopKIndices.subarray(outOffset, outOffset + k);\n for (let i = 0; i < k; i++) {\n topKVals[i] = valAndInd[i].value;\n topKIndices[i] = valAndInd[i].index;\n }\n }\n // Reshape back to the original input shape, except that the last\n // dimension is k.\n const outputShape = xShape.slice();\n outputShape[outputShape.length - 1] = k;\n\n return [\n buffer(outputShape as ShapeMap[R], xDtype, allTopKVals),\n buffer(outputShape as ShapeMap[R], 'int32', allTopKIndices)\n];\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {BackendValues, DataType, TensorBuffer, TypedArray, util} from '@tensorflow/tfjs-core';\n\nexport function uniqueImpl(\n values: BackendValues, axis: number, shape: number[], dtype: DataType): {\n outputValues: BackendValues,\n outputShape: number[],\n indices: BackendValues\n} {\n // Normalize and validate axis.\n const $axis = util.parseAxisParam(axis, shape)[0];\n\n // Calculate the new shape that is suitable for extracting data along the\n // given axis.\n //\n // The rank is 3.\n // The size of the 1st dimension is the size of all the axes < the given axis.\n // The size of the 2nd dimension is the same as the size of the given axis.\n // The size of the 3rd dimension is the size of all the axes > the given axis.\n //\n // For example, for a 4D tensor with shape=[2, 3, 5, 4] and axis=2, the\n // newShape would be: [2*3, 5, 4].\n //\n // Note that this is not the final output shape. This will be the shape for an\n // intermediate TensorBuffer (see inputBuffer below) to allow us to extract\n // values along the given axis. To demonstrate how it works, consider the\n // following example:\n //\n // Input: a 3D tensor, with shape [1, 2, 3]\n // [\n // [\n // [1,2,3],\n // [4,5,6]\n //]\n //]\n // Axis: 2 (the last axis).\n // Along axis 2, we expect to extract 3 tensors: [1,4], [2,5], [3,6].\n //\n // For this example, newShape would be: [2, 3, 1], where 2 is calculated from\n // 1*2. The re-shaped data would look like:\n //\n // [\n // [\n // [1], [2], [3]\n //],\n // [\n // [4], [5], [6]\n //]\n //]\n //\n // Then, we can construct a 3-level nested loop by the following dimension\n // order to extract the values along the axis (dimension1):\n // i: dimension1 // 0,1,2 (newShape[1])\n // m: dimension0 // 0,1 (newShape[0])\n // n: dimension2 // 0 (newShape[2])\n //\n // m, i, n\n // ---------\n // Iteration 0: data at [0, 0, 0] => \"1\"\n // Iteration 1:

data at [1, 0, 0] => \"4\"\n // We got [1,4].\n // Iteration 2: data at [0, 1, 0] => \"2\"\n // Iteration 3: data at [1, 1, 0] => \"5\"\n // We got [2,5].\n // Iteration 4: data at [0, 2, 0] => \"3\"\n // Iteration 5: data at [1, 2, 0] => \"6\"\n // We got [3,6].\n const newShape = [1, shape[0], 1];\n for (let i = 0; i < $axis; i++) {\n   newShape[0] *= shape[i];\n }\n newShape[1] = shape[$axis];\n for (let i = $axis + 1; i < shape.length; i++) {\n   newShape[2] *= shape[i];\n }\n\n // A map from unique elements (their string representations) to their values\n // in \"indices\" (below).\n const uniqueElements: {[key: string]: number} = {};\n // The indices of each unique element in the original tensor along the given\n // axis. It is 1D and has the same size as the given axis.\n const indices = new Int32Array(shape[$axis]);\n // Create a buffer so we can easily extract value at a given location.\n const inputBuffer = new TensorBuffer(newShape, dtype, values as TypedArray);\n // The indices along the given axis that have unique elements. This is a\n // de-duped version of \"indices\" above.\n const uniqueIndices: number[] = [];\n const is1DTensor = newShape[0] === 1 && newShape[2] === 1;\n for (let i = 0; i < shape[$axis]; i++) {\n   // Extract values along the axis.\n   let element: string;\n   if (is1DTensor) {\n   // Fast path for 1D tensor input.\n   element = values[i].toString();\n   } else {\n   const axisValues = [];\n   for (let m = 0; m < newShape[0]; m++) {\n   for (let n = 0; n < newShape[2]; n++) {\n   axisValues.push(inputBuffer.get(m, i, n));\n   }\n   }\n   element = axisValues.join(',');\n   }\n\n   // Dedup and update various indices.\n   if (uniqueElements[element] !== undefined) {\n   indices[i] = uniqueElements[element];\n   } else {\n   const uniqueIndex = Object.keys(uniqueElements).length;\n   uniqueElements[element] = uniqueIndex;\n   indices[i] = uniqueIndex;\n   uniqueIndices.push(i);\n   }\n }\n\n // Now we know where each of the unique elements are located along the axis\n // (uniqueIndices). Extract them from input buffer and store them in the\n // output buffer.\n const outputTmpShape = newShape.slice();\n outputTmpShape[1] = Object.keys(uniqueElements).length;\n const outputBuffer = new TensorBuffer(outputTmpShape, dtype);\n uniqueIndices.forEach((uniqueElementIndex, i) => {\n   for (let m = 0; m < newShape[0]; m++) {\n   for (let n = 0; n < newShape[2]; n++) {\n   outputBuffer.set(inputBuffer.get(m, uniqueElementIndex, n), m, i, n);\n   }\n   }\n });\n\n // The output shape can be calculated from the input shape with the size of\n // the given axis replaced by the number of unique elements along that axis.\n const outputShape = shape.slice();\n outputShape[$axis] = outputTmpShape[1];\n\n return {\n   outputValues: outputBuffer.values as BackendValues,\n   outputShape,\n   indices,\n };\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\n// Shared functionality among backends.\nexport {simpleAbsImpl} from './kernels/Abs';\nexport {addImpl} from './kernels/Add';\nexport {bincountImpl, bincountReduceImpl} from './kernels/Bincount_impl';\nexport {ceilImpl} from './kernels/Ceil';\nexport {concatImpl} from './kernels/Concat_impl';\nexport {expImpl} from './kernels/Exp';\nexport {expm1Impl} from './kernels/Expm1';\nexport {floorImpl} from './kernels/Floor';\nexport {gatherV2Impl} from './kernels/GatherV2_impl';\nexport {greaterImpl} from './kernels/Greater';\nexport {lessImpl} from './kernels/Less';\nexport {linSpaceImpl} from './kernels/LinSpace_impl';\nexport {logImpl} from './kernels/Log';\nexport {maxImpl} from './kernels/Max_impl';\nexport {maximumImpl} from './kernels/Maximum';\nexport {minimumImpl} from './kernels/Minimum';\nexport {multiplyImpl} from './kernels/Multiply';\nexport {negImpl} from './kernels/Neg';\nexport {notEqualImpl} from './kernels/NotEqual';\nexport {prodImpl} from './kernels/Prod';\nexport {rangeImpl} from './kernels/Range_impl';\nexport {rsqrtImpl} from './kernels/Rsqrt';\nexport {sliceImpl} from './kernels/Slice';\nexport {squaredDifferenceImpl} from './kernels/SquaredDifference';\nexport {stridedSliceImpl} from './kernels/StridedSlice_impl';\nexport {subImpl} from './kernels/Sub';\nexport

{tileImpl} from './kernels/Tile_impl';\nexport {topKImpl} from './kernels/TopK_impl';\nexport {transposeImpl} from './kernels/Transpose_impl';\nexport {uniqueImpl} from './kernels/Unique_impl';\nexport {ComplexBinaryKernelImpl, SimpleBinaryKernelImpl} from './utils/binary_types';\n","\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\n// Import shared functionality from tfjs-backend-cpu without triggering\n// side effects.\n// tslint:disable-next-line: no-imports-from-dist\nimport * as shared from '@tensorflow/tfjs-backend-cpu/dist/shared';\n// tslint:disable-next-line: no-imports-from-dist\nimport {SimpleBinaryKernelImpl} from '@tensorflow/tfjs-backend-cpu/dist/shared';\n// tslint:disable-next-line: no-imports-from-dist\nimport {SimpleUnaryImpl} from '@tensorflow/tfjs-backend-cpu/dist/utils/unary_types';\n\nexport type SimpleBinaryKernelImplCPU = SimpleBinaryKernelImpl;\nexport type SimpleUnaryKernelImplCPU = SimpleUnaryImpl;\nconst {\n addImpl: addImplCPU,\n bincountImpl: bincountImplCPU,\n bincountReduceImpl: bincountReduceImplCPU,\n ceilImpl: ceilImplCPU,\n concatImpl: concatImplCPU,\n expImpl: expImplCPU,\n expm1Impl: expm1ImplCPU,\n floorImpl: floorImplCPU,\n gatherV2Impl: gatherV2ImplCPU,\n greaterImpl: greaterImplCPU,\n lessImpl: lessImplCPU,\n linSpaceImpl: linSpaceImplCPU,\n logImpl: logImplCPU,\n maxImpl: maxImplCPU,\n maximumImpl: maximumImplCPU,\n minimumImpl: minimumImplCPU,\n multiplyImpl: multiplyImplCPU,\n negImpl: negImplCPU,\n prodImpl: prodImplCPU,\n rangeImpl: rangeImplCPU,\n rsqrtImpl: rsqrtImplCPU,\n simpleAbsImpl: simpleAbsImplCPU,\n sliceImpl: sliceImplCPU,\n stridedSliceImpl: stridedSliceImplCPU,\n subImpl: subImplCPU,\n tileImpl: tileImplCPU,\n topKImpl: topKImplCPU,\n transposeImpl: transposeImplCPU,\n uniqueImpl: uniqueImplCPU,\n} = shared;\n\nexport {\n addImplCPU,\n bincountImplCPU,\n bincountReduceImplCPU,\n ceilImplCPU,\n concatImplCPU,\n expImplCPU,\n expm1ImplCPU,\n floorImplCPU,\n gatherV2ImplCPU,\n greaterImplCPU,\n lessImplCPU,\n linSpaceImplCPU,\n logImplCPU,\n maxImplCPU,\n maximumImplCPU,\n minimumImplCPU,\n multiplyImplCPU,\n negImplCPU,\n prodImplCPU,\n simpleAbsImplCPU,\n sliceImplCPU,\n stridedSliceImplCPU,\n subImplCPU,\n rangeImplCPU,\n rsqrtImplCPU,\n tileImplCPU,\n topKImplCPU,\n transposeImplCPU,\n uniqueImplCPU,\n};\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nexport function getVecChannels(name: string, rank: number): string[] {\n return ['x', 'y', 'z', 'w', 'u', 'v'].slice(0, rank).map(d => `${name}.${d}`);\n}\n\nexport function getChannels(name: string, rank: number): string[] {\n if (rank === 1) {\n return [name];\n }\n return getVecChannels(name, rank);\n}\n\nexport function getSourceCoords(rank: number, dims: string[]): string {\n if (rank === 1) {\n return 'rc';\n }\n\n let coords = '';\n for (let i = 0; i < rank; i++) {\n coords += dims[i];\n if (i < rank - 1) {\n coords += ',';\n }\n }\n return coords;\n}","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or

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==========================================================================\n
*/\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getChannels} from './packing_util';\nimport
{getCoordsDataType} from './shader_compiler';\n\nexport class PackProgram implements GPGPUProgram {\n
variableNames = ['A'];\n  outputShape: number[];\n  userCode: string;\n  packedInputs = false;\n  packedOutput =
true;\n\n  constructor(\n      outputShape:\n          number[]) {  //
TODO(https://github.com/tensorflow/tfjs/issues/893):\n                  // Only input / output 3D tensors.\n
this.outputShape = outputShape;\n    const rank = outputShape.length;\n\n    if (rank === 0) {\n      this.userCode =
`\n        void main() {\n          setOutput(vec4(getA(), 0., 0., 0.));\n        }\n      `;\n    } else {\n      const channels =
getChannels('rc', rank);\n      const dtype = getCoordsDataType(rank);\n      const outOfBoundsCondition =\n
getOutOfBoundsCondition(rank,
 outputShape, channels);\n      const setup = getSetup(\n          rank, outputShape[outputShape.length - 1],\n
outputShape[outputShape.length - 2], channels);\n      const output = getOutput(outputShape, channels);\n\n
this.userCode = `\n        void main() {\n          ${dtype} rc = getOutputCoords();\n\n
if(${outOfBoundsCondition}) {\n            setOutput(vec4(0));\n          } else {\n            ${setup}\n\n
setOutput(vec4(${output}));\n          }\n        }\n      `;\n    }\n  }\n}\n\nfunction getSourceCoordsArr(rank: number,
dims: string[]): string[] {\n  const coords = [];\n\n  for (let row = 0; row <= 1; row++) {\n    for (let col = 0; col <= 1;
col++) {\n      let coord = `${row === 0 ? 'r' : 'rp1'}, ${col === 0 ? 'c' : 'cp1'}`;\n\n      for (let d = 2; d < rank; d++)
{\n        coord = `${dims[dims.length - 1 - d]},` + coord;\n      }\n\n      coords.push(coord);\n    }\n  }\n  return
coords;\n}\n\nfunction getOutOfBoundsCondition(\n
    rank: number, shape: number[], dims: string[]): string {\n  if (rank === 1) {\n    return `rc > ${shape[0]}`;\n  }\n\n
let cond = '';\n  for (let i = rank - 2; i < rank; i++) {\n    cond += `${dims[i]} >= ${shape[i]}`;\n    if (i < rank - 1) {\n
  cond += '||';\n    }\n  }\n\n  return cond;\n}\n\nfunction getSetup(\n    rank: number, cols: number, rows: number,
dims: string[]): string {\n  if (rank === 1) {\n    return '';\n  }\n\n  const innerDims = dims.slice(-2);\n\n  return `\n
int r = ${innerDims[0]};\n    int c = ${innerDims[1]};\n    int rp1 = r + 1;\n    int cp1 = c + 1;\n\n    bool cEdge = cp1
>= ${cols};\n    bool rEdge = rp1 >= ${rows};\n  `;\n}\n\nfunction getOutput(shape: number[], dims: string[]):
string {\n  const rank = shape.length;\n  const sourceCoords = getSourceCoordsArr(rank, dims);\n  if (rank === 1)
{\n    return `getA(rc),\n            rc + 1 >= ${shape[0]} ? 0. : getA(rc + 1),\n            0, 0`;\n  }\n\n  return
`getA(${sourceCoords[0]}),\n
      cEdge ? 0. : getA(${sourceCoords[1]}),\n          rEdge ? 0. : getA(${sourceCoords[2]}),\n          rEdge || cEdge ?
0. : getA(${sourceCoords[3]})`;\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n *
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport * as shader_util from
'./shader_compiler_util';\n\nexport class
 ReshapePackedProgram implements GPGPUProgram {\n  variableNames = ['A'];\n  packedInputs = true;\n
packedOutput = true;\n  outputShape: number[];\n  userCode: string;\n\n  constructor(outputShape: [number,
number, number], inputShape: [\n    number, number, number\n  ]) {\n    this.outputShape = outputShape;\n\n    let
mainLoop = ``;\n    for (let i = 0; i < 4; i++) {\n      let thisRC = `thisRC = rc;`;\n      if (i % 2 === 1) {\n        thisRC
+= `thisRC.z += 1;`;\n      }\n      if (i > 1) {\n        thisRC += `thisRC.y += 1;`;\n      }\n\n      mainLoop += `\n
${thisRC}\n        ${i > 0 ? `if(thisRC.y < rows && thisRC.z < cols){` : ''}\n          int flatIndex =
getFlatIndex(thisRC);\n\n          ivec3 inputRC = inputCoordsFromReshapedOutCoords(flatIndex);\n          vec2
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inputRCInnerDims = vec2(float(inputRC.y),float(inputRC.z));\n\n result[${i}] =\n getChannel(getA(inputRC.x, inputRC.y, inputRC.z), inputRCInnerDims);\n ${i > 0 ? '}' : ''}\n `;\n }\n\n this.userCode = `\n ${getReshapedInputCoords(inputShape)}\n ${shader_util.getFlatIndexFrom3D(outputShape)}\n\n void main() {\n ivec3 rc = getOutputCoords();\n\n vec4 result = vec4(0.);\n\n ivec3 thisRC;\n int rows = ${outputShape[1]};\n int cols = ${outputShape[2]};\n\n ${mainLoop}\n\n setOutput(result);\n }\n `;\n }\n}\n\nfunction getReshapedInputCoords(shape: [number, number, number]): string {\n const coordsFromIndexSnippet =\n shader_util.getLogicalCoordinatesFromFlatIndex(['r', 'c', 'd'], shape);\n\n return `\n ivec3 inputCoordsFromReshapedOutCoords(int index) {\n ${coordsFromIndexSnippet}\n return ivec3(r, c, d);\n }\n `;\n}\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {env} from '@tensorflow/tfjs-core';\n\nimport {GPGPUContext} from './gpgpu_context';\nimport {getInternalFormatForFloat16MatrixTexture, getInternalFormatForFloat16PackedMatrixTexture, getInternalFormatForFloat32MatrixTexture, getInternalFormatForPackedMatrixTexture, getInternalFormatForUnsignedBytesMatrixTexture} from './gpgpu_util';\nimport {getPackedMatrixTextureShapeWidthHeight, getUnpackedMatrixTextureShapeWidthHeight, PhysicalTextureType, TextureConfig, TextureUsage} from './tex_util';\n\nexport class
TextureManager {\n private numUsedTextures = 0;\n private numFreeTextures = 0;\n private _numBytesAllocated = 0;\n private _numBytesFree = 0; // How many bytes that have been allocated\n // are available for reuse.\n private freeTextures: {[shape: string]: WebGLTexture[]} = {};\n private logEnabled = false;\n private usedTextures: {[shape: string]: WebGLTexture[]} = {};\n\n constructor(private gpgpu: GPGPUContext) {}\n\n acquireTexture(\n shapeRC: [number, number], usage: TextureUsage,\n isPacked: boolean): WebGLTexture {\n const physicalTexType = getPhysicalFromLogicalTextureType(usage, isPacked);\n\n const shapeKey = getKeyFromTextureShape(shapeRC, physicalTexType, isPacked);\n if (!(shapeKey in this.freeTextures)) {\n this.freeTextures[shapeKey] = [];\n }\n if (!(shapeKey in this.usedTextures)) {\n this.usedTextures[shapeKey] = [];\n }\n\n const texBytes = computeBytes(\n shapeRC, physicalTexType,
this.gpgpu.gl, this.gpgpu.textureConfig,\n isPacked);\n\n if (this.freeTextures[shapeKey].length > 0) {\n this.numFreeTextures--;\n this.numUsedTextures++;\n this._numBytesFree -= texBytes;\n this.log();\n const newTexture = this.freeTextures[shapeKey].shift();\n this.usedTextures[shapeKey].push(newTexture);\n return newTexture;\n }\n\n let newTexture: WebGLTexture;\n if (physicalTexType === PhysicalTextureType.PACKED_2X2_FLOAT32) {\n newTexture = this.gpgpu.createPackedMatrixTexture(shapeRC[0], shapeRC[1]);\n } else if (physicalTexType === PhysicalTextureType.PACKED_2X2_FLOAT16) {\n newTexture =\n this.gpgpu.createFloat16PackedMatrixTexture(shapeRC[0], shapeRC[1]);\n } else if (physicalTexType === PhysicalTextureType.UNPACKED_FLOAT32) {\n newTexture =\n this.gpgpu.createFloat32MatrixTexture(shapeRC[0], shapeRC[1]);\n } else if (physicalTexType === PhysicalTextureType.UNPACKED_FLOAT16) {\n newTexture =\n this.gpgpu.createFloat16MatrixTexture(shapeRC[0], shapeRC[1]);\n } else if (\n physicalTexType === PhysicalTextureType.PACKED_4X1_UNSIGNED_BYTE) {\n newTexture =\n this.gpgpu.createUnsignedBytesMatrixTexture(shapeRC[0], shapeRC[1]);\n }\n this.usedTextures[shapeKey].push(newTexture);\n\n this.numUsedTextures++;\n this._numBytesAllocated +=

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texBytes;\n    this.log();\n\n    return newTexture;\n  }\n\n  releaseTexture(\n      texture: WebGLTexture, shape: [number, number],\n      logicalTexType: TextureUsage, isPacked: boolean): void {\n    if (this.freeTextures == null) {\n      // Already disposed.\n      return;\n    }\n    const physicalTexType =\n getPhysicalFromLogicalTextureType(logicalTexType, isPacked);\n    const shapeKey =
getKeyFromTextureShape(shape, physicalTexType, isPacked);\n    if (!(shapeKey in this.freeTextures)) {\n
this.freeTextures[shapeKey] = [];\n    }\n\n    const texBytes = computeBytes(\n
      shape, physicalTexType, this.gpgpu.gl, this.gpgpu.textureConfig,\n        isPacked);\n    const
deleteTexThreshold = env().get('WEBGL_DELETE_TEXTURE_THRESHOLD');\n    if (deleteTexThreshold !== -
1 &&\n        this._numBytesAllocated > deleteTexThreshold) {\n      this.gpgpu.deleteMatrixTexture(texture);\n
this._numBytesAllocated -= texBytes;\n    } else {\n      this.freeTextures[shapeKey].push(texture);\n
this.numFreeTextures++;\n      this._numBytesFree += texBytes;\n    }\n\n    this.numUsedTextures--;\n\n    const
texList = this.usedTextures[shapeKey];\n    const texIndex = texList.indexOf(texture);\n    if (texIndex < 0) {\n
throw new Error(\n          'Cannot release a texture that was never provided by this ' +\n          'texture manager');\n
}\n    texList.splice(texIndex, 1);\n    this.log();\n  }\n\n  private log() {\n    if (!this.logEnabled) {\n      return;\n
}\n    const total = this.numFreeTextures + this.numUsedTextures;\n    console.log(\n
      'Free/Used', `${this.numFreeTextures} / ${this.numUsedTextures}`,\n        `(${total})`);\n    const freeRatio =
this._numBytesFree / this._numBytesAllocated;\n    console.log(`Bytes allocated: ${this._numBytesAllocated}`);\n
console.log(`Bytes unused: ${this._numBytesFree} (${\n        Math.round(100 * freeRatio)}%)`);\n  }\n\n  get
numBytesAllocated(): number {\n    return this._numBytesAllocated;\n  }\n\n  get numBytesFree(): number {\n
return this._numBytesFree;\n  }\n\n  getNumUsedTextures(): number {\n    return this.numUsedTextures;\n  }\n\n
getNumFreeTextures(): number {\n    return this.numFreeTextures;\n  }\n\n  dispose() {\n    if (this.freeTextures ==
null) {\n      // Already disposed.\n      return;\n    }\n    for (const texShape in this.freeTextures) {\n
this.freeTextures[texShape].forEach(tex => {\n        this.gpgpu.deleteMatrixTexture(tex);\n      });\n    }\n    for
(const texShape in this.usedTextures) {\n      this.usedTextures[texShape].forEach(tex
 => {\n        this.gpgpu.deleteMatrixTexture(tex);\n      });\n    }\n    this.freeTextures = null;\n    this.usedTextures =
null;\n    this.numUsedTextures = 0;\n    this.numFreeTextures = 0;\n    this._numBytesAllocated = 0;\n
this._numBytesFree = 0;\n  }\n}\n\nfunction numBytesForInternalFormat(\n    gl: WebGLRenderingContext,
internalFormat: number): number {\n  // tslint:disable-next-line:no-any\n  const glany = gl as any;\n  if
(internalFormat === glany.R32F) {\n    return 4;\n  } else if (internalFormat === glany.R16F) {\n    return 2;\n  }
else if (internalFormat === glany.RGBA32F) {\n    return 16;\n  } else if (internalFormat === gl.RGBA) {\n
return 16;\n  } else if (internalFormat === glany.RGBA16F) {\n    return 8;\n  }\n  throw new Error(`Unknown
internal format ${internalFormat}`);\n}\n\nexport function computeBytes(\n    shape: [number, number],
physicalTexType: PhysicalTextureType,\n    gl: WebGLRenderingContext, textureConfig: TextureConfig,\n
isPacked:
 boolean): number {\n  // It is not possible to infer packed status from the texture type because\n  // depending on the
textureConfig, different  texture types may resolve to the\n  // same internal format (e.g. in WebGL1, the internal
format for\n  // UNPACKED_FLOAT16 textures is gl.RGBA). Therefore we pass in `isPacked`\n  // explicitly.\n
const internalFormat =\n      internalFormatForPhysicalTexType(physicalTexType, textureConfig);\n\n  let
numElements: number;\n  if (isPacked) {\n    const [packedWidth, packedHeight] =\n
getPackedMatrixTextureShapeWidthHeight(shape[0], shape[1]);\n    numElements = packedWidth *
packedHeight;\n\n  } else {\n    const [width, height] =\n
getUnpackedMatrixTextureShapeWidthHeight(shape[0], shape[1]);\n    numElements = width * height;\n  }\n\n
const bytesPerElement = numBytesForInternalFormat(gl, internalFormat);\n  return numElements *
bytesPerElement;\n}\n\nfunction internalFormatForPhysicalTexType(\n    physicalTexType:
PhysicalTextureType,\n
   textureConfig: TextureConfig): number {\n  switch (physicalTexType) {\n    case
PhysicalTextureType.PACKED_2X2_FLOAT32:\n      return
getInternalFormatForPackedMatrixTexture(textureConfig);\n    case
```

PhysicalTextureType.PACKED_2X2_FLOAT16:\n return getInternalFormatForFloat16PackedMatrixTexture(textureConfig);\n case PhysicalTextureType.UNPACKED_FLOAT32:\n return getInternalFormatForFloat32MatrixTexture(textureConfig);\n case PhysicalTextureType.UNPACKED_FLOAT16:\n return getInternalFormatForFloat16MatrixTexture(textureConfig);\n case PhysicalTextureType.PACKED_4X1_UNSIGNED_BYTE:\n return getInternalFormatForUnsignedBytesMatrixTexture(textureConfig);\n default:\n throw new Error(`Unknown physical texture type ${physicalTexType}`);\n }\n}\n\nfunction getPhysicalTextureForRendering(isPacked: boolean):\n PhysicalTextureType {\n if (env().getBool('WEBGL_RENDER_FLOAT32_ENABLED')) {\n if (isPacked) {\n return PhysicalTextureType.PACKED_2X2_FLOAT32;\n }\n return PhysicalTextureType.UNPACKED_FLOAT32;\n }\n\n if (isPacked) {\n return PhysicalTextureType.PACKED_2X2_FLOAT16;\n }\n return PhysicalTextureType.UNPACKED_FLOAT16;\n}\n\nfunction getPhysicalFromLogicalTextureType(\n logicalTexType: TextureUsage, isPacked: boolean): PhysicalTextureType {\n if (logicalTexType === TextureUsage.UPLOAD) {\n return PhysicalTextureType.PACKED_2X2_FLOAT32;\n } else if (logicalTexType === TextureUsage.RENDER || logicalTexType == null) {\n return getPhysicalTextureForRendering(isPacked);\n } else if (\n logicalTexType === TextureUsage.DOWNLOAD ||\n logicalTexType === TextureUsage.PIXELS) {\n return PhysicalTextureType.PACKED_4X1_UNSIGNED_BYTE;\n }\n throw new Error(`Unknown logical texture type ${logicalTexType}`);\n}\n\nfunction getKeyFromTextureShape(\n shapeRowsCol: [number, number], physicalTexType: PhysicalTextureType,\n isPacked: boolean): string {\n return `${shapeRowsCol[0]}_${shapeRowsCol[1]}_${physicalTexType}_${isPacked}`;\n}\n\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class UnaryOpProgram implements GPGPUProgram {\n variableNames = ['A'];\n userCode: string;\n outputShape: number[];\n\n constructor(aShape: number[], opSnippet: string) {\n this.outputShape = aShape;\n this.userCode = `\n float unaryOperation(float x) {\n ${opSnippet}\n }\n\n void main() {\n float x = getAAtOutCoords();\n float y = unaryOperation(x);\n\n setOutput(y);\n }\n `;\n }\n}\n\nexport const CHECK_NAN_SNIPPET = `if (isnan(x)) return x;`;\n\nexport const LINEAR = `return x;`;\n\nexport const ABS = `return abs(x);`;\n\nexport function STEP(alpha = 0.0) {\n return CHECK_NAN_SNIPPET + `\n return x > 0.0 ? 1.0 : float(${alpha});\n `;\n}\n\nexport const ELU = `return (x >= 0.0) ? x : (exp(x) - 1.0);`;\n\nexport const RELU = CHECK_NAN_SNIPPET + `\n return (x < 0.0) ? 0.0 : x;\n`;\n\nexport const RELU6 = CHECK_NAN_SNIPPET + `\n return (x < 0.0) ? 0.0 : min(6.0, x);\n`;\n\nexport const CLONE = 'return x;';\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n

*/\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport const LINEAR = `return x;`;\n\nexport const ELU = `\n  vec4 result;\n\n  result.r = (x.r >= 0.0) ? x.r : (exp(x.r) - 1.0);\n  result.g = (x.g >= 0.0) ? x.g : (exp(x.g) - 1.0);\n  result.b = (x.b >= 0.0) ? x.b : (exp(x.b) - 1.0);\n  result.a = (x.a >= 0.0) ? x.a : (exp(x.a) - 1.0);\n\n  return result;\n`;\n\nexport const RELU = `\n  vec4 result = x * vec4(greaterThanEqual(x, vec4(0.0)));\n  bvec4 isNaN = isnan(x);\n\n  result.r = isNaN.r ? x.r : result.r;\n  result.g = isNaN.g ? x.g : result.g;\n  result.b = isNaN.b ? x.b : result.b;\n  result.a = isNaN.a ? x.a : result.a;\n\n  return result;\n`;\n\nexport const RELU6 = `\n  vec4 result = min(x, vec4(6.)) * vec4(greaterThanEqual(x, vec4(0.0)));\n  bvec4 isNaN = isnan(x);\n\n  result.r = isNaN.r ? x.r : result.r;\n  result.g = isNaN.g ? x.g : result.g;\n  result.b = isNaN.b ? x.b : result.b;\n  result.a = isNaN.a ? x.a : result.a;\n\n  return result;\n`;\n\nexport class UnaryOpPackedProgram implements GPGPUProgram {\n variableNames = ['A'];\n userCode: string;\n outputShape: number[];\n packedInputs = true;\n packedOutput = true;\n\n constructor(aShape: number[], opSnippet: string) {\n   this.outputShape = aShape;\n   this.userCode = `\n   vec4 unaryOperation(vec4 x) {\n ${opSnippet}\n   }\n\n   void main() {\n   vec4 x = getAAtOutCoords();\n   vec4 y = unaryOperation(x);\n\n
  setOutput(y);\n   }\n   `;\n }\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getChannels, getSourceCoords} from './packing_util';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class UnpackProgram implements GPGPUProgram {\n variableNames
  = ['A'];\n packedInputs = true;\n packedOutput = false;\n outputShape: number[];\n userCode: string;\n\n constructor(outputShape: number[]) {\n   this.outputShape = outputShape;\n   const rank = outputShape.length;\n\n
  const channels = getChannels('rc', rank);\n   const dtype = getCoordsDataType(rank);\n   const sourceCoords = getSourceCoords(rank, channels);\n   const innerDims = channels.slice(-2);\n   const coords = rank <= 1 ? 'rc' : `vec2(${innerDims.join(',')})`;\n\n   this.userCode = `\n   void main() {\n ${dtype} rc = getOutputCoords();\n
      vec4 packedInput = getA(${sourceCoords});\n\n   setOutput(getChannel(packedInput, ${coords}));\n   }\n
  `;\n }\n}\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n
  *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\n// Import webgl flags.\nimport './flags_webgl';\n\nimport * as tf from '@tensorflow/tfjs-core';\nimport {backend_util, BackendValues, buffer, DataId, DataStorage, DataType, DataValues, engine, env, kernel_impls, KernelBackend, MemoryInfo, NumericDataType, Rank, RecursiveArray, scalar, ShapeMap, Tensor, Tensor2D, TensorBuffer, TensorInfo, tidy, TimingInfo, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {getWebGLContext} from './canvas_util';\nimport {DecodeMatrixProgram} from './decode_matrix_gpu';\nimport {DecodeMatrixPackedProgram} from './decode_matrix_packed_gpu';\nimport
  {EncodeFloatProgram} from './encode_float_gpu';\nimport {EncodeFloatPackedProgram} from './encode_float_packed_gpu';\nimport {EncodeMatrixProgram} from './encode_matrix_gpu';\nimport {EncodeMatrixPackedProgram} from './encode_matrix_packed_gpu';\nimport {GPGPUContext} from './gpgpu_context';\nimport * as gpgpu_math from './gpgpu_math';\nimport {GPGPUBinary, GPGPUProgram,

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TensorData} from './gpgpu_math';\nimport {simpleAbsImplCPU} from './kernel_utils/shared';\nimport
{PackProgram} from './pack_gpu';\nimport {ReshapePackedProgram} from './reshape_packed_gpu';\nimport * as
tex_util from './tex_util';\nimport {TextureData, TextureUsage} from './tex_util';\nimport {TextureManager} from
'./texture_manager';\nimport * as unary_op from './unaryop_gpu';\nimport {UnaryOpProgram} from
'./unaryop_gpu';\nimport {UnaryOpPackedProgram} from './unaryop_packed_gpu';\nimport {UnpackProgram} from
'./unpack_gpu';\nimport * as webgl_util from './webgl_util';\n\nconst whereImpl
 = kernel_impls.whereImpl;\n\nexport const EPSILON_FLOAT32 = 1e-7;\nexport const EPSILON_FLOAT16 =
1e-4;\n\ntype KernelInfo = {\n  name: string; query: Promise<number>;\n};\n\nexport type TimerNode =
RecursiveArray<KernelInfo>|KernelInfo;\nexport interface CPUTimerQuery {\n  startMs: number;\n  endMs?:
number;\n}\n\nexport interface WebGLMemoryInfo extends MemoryInfo {\n  numBytesInGPU: number;\n  //
Tracks the total number of bytes allocated on the GPU, accounting for the\n  // physical texture type.\n
numBytesInGPUAllocated: number;\n  // Tracks byte size of textures that were created and then made available
for\n  // reuse (disposed).\n  numBytesInGPUFree: number;\n  unreliable: boolean;\n}\n\nexport interface
WebGLTimingInfo extends TimingInfo {\n  uploadWaitMs: number;\n  downloadWaitMs: number;\n}\n\nconst
binaryCaches: {[webGLVersion: string]: {[key: string]: GPGPUBinary}} = {};\n\nexport function
getBinaryCache(webGLVersion: number) {\n  if (webGLVersion in binaryCaches)
 {\n    return binaryCaches[webGLVersion];\n  }\n  binaryCaches[webGLVersion] = {};\n  return
binaryCaches[webGLVersion];\n}\n\n// Empirically determined constant used to determine size threshold for
handing\n// off execution to the CPU.\nconst CPU_HANDOFF_SIZE_THRESHOLD = 128;\n\n// Empirically
determined constant used to decide the number of MB on GPU\n// before we warn about high memory use. The MB
are this constant * screen area\n// * dpi / 1024 / 1024.\nconst BEFORE_PAGING_CONSTANT = 600;\nfunction
numMBBeforeWarning(): number {\n  if (env().global.screen == null) {\n    return 1024;  // 1 GB.\n  }\n  return
(env().global.screen.height * env().global.screen.width *\n          window.devicePixelRatio) *\n
BEFORE_PAGING_CONSTANT / 1024 / 1024;\n}\n\nexport class MathBackendWebGL extends KernelBackend
{\n  texData: DataStorage<TextureData>;\n  gpgpu: GPGPUContext;\n\n  private static nextDataId = 0;\n  private
nextDataId(): number {\n    return MathBackendWebGL.nextDataId++;\n  }\n
  // Maps data ids that have a pending read operation, to list of subscribers.\n  private pendingRead = new
WeakMap<DataId, Array<(arr: TypedArray) => void>>();\n  // List of data ids that are scheduled for disposal, but
are waiting on a\n  // pending read operation.\n  private pendingDisposal = new WeakSet<DataId>();\n\n  // Used to
count the number of 'shallow' sliced tensors that point to the\n  // same data id.\n  dataRefCount = new
WeakMap<DataId, number>();\n  private numBytesInGPU = 0;\n\n  private canvas:
HTMLCanvasElement|OffscreenCanvas;\n\n  private programTimersStack: TimerNode[];\n  private activeTimers:
TimerNode[];\n  // Accumulated time spent (including blocking) in uploading data to webgl.\n  private
uploadWaitMs = 0;\n  // Accumulated time spent (including blocking in downloading data from webgl.\n  private
downloadWaitMs = 0;\n  private cpuBackend: KernelBackend;\n\n  // Number of bits of precision of this backend.\n
private floatPrecisionValue: 32|16;\n\n  private
 textureManager: TextureManager;\n  private binaryCache: {[key: string]: GPGPUBinary};\n  private
gpgpuCreatedLocally: boolean;\n  private numMBBeforeWarning: number;\n  private warnedAboutMemory =
false;\n  private warnedAboutCPUBackend = false;\n\n  constructor(gpgpu?: GPGPUContext) {\n    super();\n    if
(!env().getBool('HAS_WEBGL')) {\n      throw new Error('WebGL is not supported on this device');\n    }\n\n    if
(gpgpu == null) {\n      const gl = getWebGLContext(env().getNumber('WEBGL_VERSION'));\n
this.binaryCache = getBinaryCache(env().getNumber('WEBGL_VERSION'));\n      this.gpgpu = new
GPGPUContext(gl);\n      this.canvas = gl.canvas;\n      this.gpgpuCreatedLocally = true;\n    } else {\n      this.gpgpu
= gpgpu;\n      this.binaryCache = {};\n      this.gpgpuCreatedLocally = false;\n      this.canvas = gpgpu.gl.canvas;\n
}\n    this.textureManager = new TextureManager(this.gpgpu);\n    this.numMBBeforeWarning =
numMBBeforeWarning();\n\n    this.texData = new DataStorage(this,
 engine());\n  }\n\n  numDataIds() {\n    return this.texData.numDataIds() +\n        (this.cpuBackend ?
this.cpuBackend.numDataIds() : 0) -\n        this.pendingDeletes;\n  }\n\n  write(values: BackendValues, shape:
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number[], dtype: DataType): DataId {\n    if (env().getBool('WEBGL_CHECK_NUMERICAL_PROBLEMS') ||\n
  env().getBool('DEBUG')) {\n      this.checkNumericalProblems(values);\n    }\n    if (dtype === 'complex64' &&
values != null) {\n      throw new Error(\n          `Cannot write to a complex64 dtype. ` +\n          `Please use
tf.complex(real, imag).`);\n    }\n    const dataId = {id: this.nextDataId()};\n    this.texData.set(\n        dataId,\n
{shape, dtype, values, usage: TextureUsage.UPLOAD, refCount: 1});\n    return dataId;\n  }\n\n  /** Return
refCount of a `TensorData`. */\n  refCount(dataId: DataId): number {\n    if (this.texData.has(dataId)) {\n      const
tensorData = this.texData.get(dataId);\n      return tensorData.refCount;\n    }\n
    return 0;\n  }\n\n  /** Increase refCount of a `TextureData`. */\n  incRef(dataId: DataId): void {\n    const texData
= this.texData.get(dataId);\n    texData.refCount++;\n  }\n\n  /** Decrease refCount of a `TextureData`. */\n
decRef(dataId: DataId): void {\n    if (this.texData.has(dataId)) {\n      const texData = this.texData.get(dataId);\n
texData.refCount--;\n    }\n  }\n\n  move(\n      dataId: DataId, values: BackendValues, shape: number[], dtype:
DataType,\n      refCount: number): void {\n    if (env().getBool('DEBUG')) {\n
this.checkNumericalProblems(values);\n    }\n    if (dtype === 'complex64') {\n      throw new Error(\n          `Cannot
write to a complex64 dtype. ` +\n          `Please use tf.complex(real, imag).`);\n    }\n    this.texData.set(\n
dataId, {shape, dtype, values, usage: TextureUsage.UPLOAD, refCount});\n  }\n\n
disposeIntermediateTensorInfo(tensorInfo: TensorInfo): void {\n    this.disposeData(tensorInfo.dataId);\n  }\n\n
readSync(dataId:
 DataId): BackendValues {\n    const texData = this.texData.get(dataId);\n    const {values, dtype,
complexTensorInfos, slice, shape, isPacked} = texData;\n\n    // The presence of `slice` indicates this tensor is a
shallow slice of a\n    // different tensor, and is using that original tensor's texture. Run\n    // `clone` in order to copy
that texture and read from it.\n    if (slice != null) {\n      let program;\n      if (isPacked) {\n        program = new
UnaryOpPackedProgram(shape, unary_op.CLONE);\n      } else {\n        program = new UnaryOpProgram(shape,
unary_op.CLONE);\n      }\n      const res =\n          this.runWebGLProgram(program, [{dataId, shape, dtype}],
dtype);\n      const data = this.readSync(res.dataId);\n      this.disposeIntermediateTensorInfo(res);\n      return data;\n
  }\n    if (values != null) {\n      return this.convertAndCacheOnCPU(dataId);\n    }\n    if (dtype === 'string') {\n
return values;\n    }\n    const shouldTimeProgram = this.activeTimers
 != null;\n    let start: number;\n    if (shouldTimeProgram) {\n      start = util.now();\n    }\n\n    let result:
Float32Array;\n    if (dtype === 'complex64') {\n      const realValues =\n
this.readSync(complexTensorInfos.real.dataId) as Float32Array;\n      const imagValues =\n
this.readSync(complexTensorInfos.imag.dataId) as Float32Array;\n      result =
backend_util.mergeRealAndImagArrays(realValues, imagValues);\n    } else {\n      result =
this.getValuesFromTexture(dataId);\n    }\n\n    if (shouldTimeProgram) {\n      this.downloadWaitMs += util.now()
- start;\n    }\n    return this.convertAndCacheOnCPU(dataId, result);\n  }\n\n  async read(dataId: DataId):
Promise<BackendValues> {\n    if (this.pendingRead.has(dataId)) {\n      const subscribers =
this.pendingRead.get(dataId);\n      return new Promise<TypedArray>(resolve => subscribers.push(resolve));\n    }\n
  const texData = this.texData.get(dataId);\n    const {values, shape, slice, dtype,
 complexTensorInfos, isPacked} = texData;\n\n    // The presence of `slice` indicates this tensor is a shallow slice of
a\n    // different tensor, and is using that original tensor's texture. Run\n    // `clone` in order to copy that texture and
read from it.\n    if (slice != null) {\n      let program;\n      if (isPacked) {\n        program = new
UnaryOpPackedProgram(shape, unary_op.CLONE);\n      } else {\n        program = new UnaryOpProgram(shape,
unary_op.CLONE);\n      }\n      const res =\n          this.runWebGLProgram(program, [{dataId, shape, dtype}],
dtype);\n      const data = this.read(res.dataId);\n      this.disposeIntermediateTensorInfo(res);\n      return data;\n
}\n\n    if (values != null) {\n      return this.convertAndCacheOnCPU(dataId);\n    }\n\n    if
(!env().getBool('WEBGL_DOWNLOAD_FLOAT_ENABLED') &&\n
env().getNumber('WEBGL_VERSION') === 2) {\n      throw new Error(\n          `tensor.data() with
WEBGL_DOWNLOAD_FLOAT_ENABLED=false and ` +\n
      `WEBGL_VERSION=2 not yet supported.`);\n    }\n\n    let buffer = null;\n    let tmpDownloadTarget:
TensorInfo;\n\n    if (dtype !== 'complex64' && env().get('WEBGL_BUFFER_SUPPORTED')) {\n      // Possibly
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copy the texture into a buffer before inserting a fence.\n      tmpDownloadTarget = this.decode(dataId);\n      const
tmpData = this.texData.get(tmpDownloadTarget.dataId);\n\n      buffer = this.gpgpu.createBufferFromTexture(\n
  tmpData.texture, ...tex_util.getDenseTexShape(shape));\n    }\n\n    this.pendingRead.set(dataId, []);\n\n    if (dtype
!== 'complex64') {\n      // Create a fence and wait for it to resolve.\n      await
this.gpgpu.createAndWaitForFence();\n    }\n\n    // Download the values from the GPU.\n    let vals:
Float32Array;\n    if (dtype === 'complex64') {\n      const ps = await Promise.all([\n
this.read(complexTensorInfos.real.dataId),\n        this.read(complexTensorInfos.imag.dataId)\n      ]);\n\n      const
realValues = ps[0];\n      const
 imagValues = ps[1];\n      vals = backend_util.mergeRealAndImagArrays(\n          realValues as Float32Array,
imagValues as Float32Array);\n    } else if (buffer == null) {\n      vals = this.getValuesFromTexture(dataId);\n    }
else {\n      const size = util.sizeFromShape(shape);\n      vals =
this.gpgpu.downloadFloat32MatrixFromBuffer(buffer, size);\n    }\n    if (tmpDownloadTarget != null) {\n
this.disposeIntermediateTensorInfo(tmpDownloadTarget);\n    }\n    const dTypeVals =
this.convertAndCacheOnCPU(dataId, vals);\n\n    const subscribers = this.pendingRead.get(dataId);\n
this.pendingRead.delete(dataId);\n\n    // Notify all pending reads.\n    subscribers.forEach(resolve =>
resolve(dTypeVals));\n    if (this.pendingDisposal.has(dataId)) {\n      this.pendingDisposal.delete(dataId);\n      if
(this.disposeData(dataId)) {\n        engine().removeDataId(dataId, this);\n      }\n      this.pendingDeletes--;\n    }\n
return dTypeVals;\n  }\n\n  bufferSync<R extends Rank>(t:
 TensorInfo): TensorBuffer<R> {\n    const data = this.readSync(t.dataId);\n    let decodedData = data as
DataValues;\n    if (t.dtype === 'string') {\n      try {\n        // Decode the bytes into string.\n        decodedData = (data
as Uint8Array[]).map(d => util.decodeString(d));\n      } catch {\n        throw new Error('Failed to decode encoded
string bytes into utf-8');\n      }\n    }\n    return buffer(t.shape as ShapeMap[R], t.dtype, decodedData) as\n
TensorBuffer<R>;\n  }\n\n  private checkNumericalProblems(values: BackendValues): void {\n    if (values == null)
{\n      return;\n    }\n    for (let i = 0; i < values.length; i++) {\n      const num = values[i] as number;\n      if
(!webgl_util.canBeRepresented(num)) {\n        if (env().getBool('WEBGL_RENDER_FLOAT32_CAPABLE')) {\n
      throw Error(\n            `The value ${num} cannot be represented with your ` +\n            `current settings.
Consider enabling float32 rendering: ` +\n            `'tf.env().set('WEBGL_RENDER_FLOAT32_ENABLED',
 true);'`);\n        }\n        throw Error(`The value ${num} cannot be represented on this device.`);\n      }\n    }\n  }\n\n
private getValuesFromTexture(dataId: DataId): Float32Array {\n    const {shape, dtype, isPacked} =
this.texData.get(dataId);\n    const size = util.sizeFromShape(shape);\n    if
(env().getBool('WEBGL_DOWNLOAD_FLOAT_ENABLED')) {\n      const tmpTarget = this.decode(dataId);\n
const tmpData = this.texData.get(tmpTarget.dataId);\n      const vals = this.gpgpu\n
.downloadMatrixFromPackedTexture(\n                tmpData.texture, ...tex_util.getDenseTexShape(shape))\n
            .subarray(0, size);\n\n      this.disposeIntermediateTensorInfo(tmpTarget);\n\n      return vals;\n    }\n\n
const shouldUsePackedProgram =\n        env().getBool('WEBGL_PACK') && isPacked === true;\n    const
outputShape =\n        shouldUsePackedProgram ? webgl_util.getShapeAs3D(shape) : shape;\n
    const program = shouldUsePackedProgram ?\n        new EncodeFloatPackedProgram(outputShape as [number,
number, number]) :\n        new EncodeFloatProgram(outputShape);\n    const output = this.runWebGLProgram(\n
 program, [{shape: outputShape, dtype, dataId}], 'float32');\n    const tmpData = this.texData.get(output.dataId);\n
const vals =\n        this.gpgpu\n            .downloadByteEncodedFloatMatrixFromOutputTexture(\n
tmpData.texture, tmpData.texShape[0], tmpData.texShape[1])\n            .subarray(0, size);\n
this.disposeIntermediateTensorInfo(output);\n\n    return vals;\n  }\n\n  timerAvailable(): boolean {\n    return
env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_RELIABLE') > 0;\n  }\n\n  async time(f:
() => void): Promise<WebGLTimingInfo> {\n    const oldActiveTimers = this.activeTimers;\n    const
newActiveTimers: TimerNode[] = [];\n\n    let outerMostTime = false;\n    if (this.programTimersStack == null) {\n
  this.programTimersStack
 = newActiveTimers;\n      outerMostTime = true;\n    } else {\n      this.activeTimers.push(newActiveTimers);\n
}\n    this.activeTimers = newActiveTimers;\n\n    f();\n\n    // needing to split these up because util.flatten only
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accepts certain types\n    const flattenedActiveTimerQueries =\n        util.flatten(this.activeTimers.map((d:
KernelInfo) => d.query))\n            .filter(d => d != null);\n    const flattenedActiveTimerNames =\n
util.flatten(this.activeTimers.map((d: KernelInfo) => d.name))\n            .filter(d => d != null);\n\n
this.activeTimers = oldActiveTimers;\n\n    if (outerMostTime) {\n      this.programTimersStack = null;\n    }\n\n
const res: WebGLTimingInfo = {\n      uploadWaitMs: this.uploadWaitMs,\n      downloadWaitMs:
this.downloadWaitMs,\n      kernelMs: null,\n      wallMs: null  // will be filled by the engine\n    };\n\n    if
(env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_RELIABLE') > 0) {\n      const kernelMs
= await Promise.all(flattenedActiveTimerQueries);\n\n
    res['kernelMs'] = util.sum(kernelMs);\n      res['getExtraProfileInfo'] = () =>\n        kernelMs.map((d, i) =>
({name: flattenedActiveTimerNames[i], ms: d}))\n            .map(d => `${d.name}: ${d.ms}`)\n            .join(', ');\n
  } else {\n      res['kernelMs'] = {\n        error: 'WebGL query timers are not supported in this environment.'\n      };\n
  }\n\n    this.uploadWaitMs = 0;\n    this.downloadWaitMs = 0;\n    return res;\n  }\n  memory():
WebGLMemoryInfo {\n    return {\n      unreliable: false,\n      numBytesInGPU: this.numBytesInGPU,\n
numBytesInGPUAllocated: this.textureManager.numBytesAllocated,\n      numBytesInGPUFree:
this.textureManager.numBytesFree\n    } as WebGLMemoryInfo;\n  }\n\n  private startTimer():
WebGLQuery|CPUTimerQuery {\n    if
(env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_RELIABLE') > 0) {\n      return
this.gpgpu.beginQuery();\n    }\n    return {startMs: util.now(), endMs: null};\n
  }\n\n  private endTimer(query: WebGLQuery|CPUTimerQuery): WebGLQuery|CPUTimerQuery {\n    if
(env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_RELIABLE') > 0) {\n
this.gpgpu.endQuery();\n      return query;\n    }\n    (query as CPUTimerQuery).endMs = util.now();\n    return
query;\n  }\n\n  private async getQueryTime(query: WebGLQuery|CPUTimerQuery): Promise<number> {\n    if
(env().getNumber('WEBGL_DISJOINT_QUERY_TIMER_EXTENSION_RELIABLE') > 0) {\n      return
this.gpgpu.waitForQueryAndGetTime(query as WebGLQuery);\n    }\n    const timerQuery = query as
CPUTimerQuery;\n    return timerQuery.endMs - timerQuery.startMs;\n  }\n\n  private pendingDeletes = 0;\n\n
/**\n   * Decrease the RefCount on the dataId and dispose the memory if the dataId\n   * has 0 refCount. If there are
pending read on the data, the disposal would\n   * added to the pending delete queue. Return true if the dataId is
removed\n   * from backend or the backend does not contain the dataId, false if
 the\n   * dataId is not removed. Memory may or may not be released even when dataId\n   * is removed, which also
depends on dataRefCount, see `releaseGPU`.\n   * @param dataId\n   * @oaram force Optional, remove the data
regardless of refCount\n   */\n  disposeData(dataId: DataId, force = false): boolean {\n    if
(this.pendingDisposal.has(dataId)) {\n      return false;\n    }\n\n    // No-op if already disposed.\n    if
(!this.texData.has(dataId)) {\n      return true;\n    }\n\n    // if force flag is set, change refCount to 0, this would
ensure disposal\n    // when added to the pendingDisposal queue. Memory may or may not be\n    // released, which
also depends on dataRefCount, see `releaseGPU`.\n    if (force) {\n      this.texData.get(dataId).refCount = 0;\n    }
else {\n      this.texData.get(dataId).refCount--;\n    }\n\n    if (!force && this.texData.get(dataId).refCount > 0) {\n
 return false;\n    }\n\n    if (this.pendingRead.has(dataId)) {\n      this.pendingDisposal.add(dataId);\n
    this.pendingDeletes++;\n      return false;\n    }\n\n    this.releaseGPUData(dataId);\n    const
{complexTensorInfos} = this.texData.get(dataId);\n    if (complexTensorInfos != null) {\n
this.disposeData(complexTensorInfos.real.dataId, force);\n      this.disposeData(complexTensorInfos.imag.dataId,
force);\n    }\n\n    this.texData.delete(dataId);\n\n    return true;\n  }\n\n  private releaseGPUData(dataId: DataId):
void {\n    const {texture, dtype, texShape, usage, isPacked, slice} =\n        this.texData.get(dataId);\n    const key =
slice && slice.origDataId || dataId;\n    const refCount = this.dataRefCount.get(key);\n\n    if (refCount > 1) {\n
this.dataRefCount.set(key, refCount - 1);\n    } else {\n      this.dataRefCount.delete(key);\n      if (texture != null) {\n
    this.numBytesInGPU -= this.computeBytes(texShape, dtype);\n        this.textureManager.releaseTexture(texture,
texShape, usage, isPacked);\n      }\n    }\n\n    const texData
 = this.texData.get(dataId);\n    texData.texture = null;\n    texData.texShape = null;\n    texData.isPacked = false;\n
texData.slice = null;\n  }\n\n  getTexture(dataId: DataId): WebGLTexture {\n    this.uploadToGPU(dataId);\n
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return this.texData.get(dataId).texture;\n  }\n\n  /**\n   * Returns internal information for the specific data bucket. Used in unit\n   * tests.\n   */\n  getDataInfo(dataId: DataId): TextureData {\n    return this.texData.get(dataId);\n  }\n\n  private getCPUBackend(): KernelBackend|null {\n    if (!env().getBool('WEBGL_CPU_FORWARD')) {\n      return null;\n    }\n\n    if (this.cpuBackend == null) {\n      this.cpuBackend = engine().findBackend('cpu');\n    }\n\n    return this.cpuBackend;\n  }\n\n  /*\n  Tests whether all the inputs to an op are small and on the CPU. This heuristic\n  determines when it would be faster to execute a kernel on the CPU. WebGL\n  kernels opt into running this check and forwarding when appropriate.\n  TODO(https://github.com/tensorflow/tfjs/issues/872): Develop a more\n  sustainable strategy for optimizing backend execution of ops.\n   */\n  shouldExecuteOnCPU(\n      inputs: TensorInfo[],\n      sizeThreshold = CPU_HANDOFF_SIZE_THRESHOLD): boolean {\n    const cpuBackend = this.getCPUBackend();\n    if (!env().getBool('IS_TEST') && !this.warnedAboutCPUBackend &&\n        cpuBackend == null) {\n      console.warn(\n          'Your application contains ops that are small enough to be ' +\n          'executed on the CPU backend, however the CPU backend cannot ' +\n          'be found. Consider importing the CPU backend ' +\n          '(@tensorflow/tfjs-backend-cpu) for better performance.');\n\n      this.warnedAboutCPUBackend = true;\n    }\n\n    return cpuBackend != null &&\n        inputs.every(\n            input => this.texData.get(input.dataId).texture == null &&\n                util.sizeFromShape(input.shape) < sizeThreshold);\n  }\n\n  getGPGPUContext(): GPGPUContext {\n    return this.gpgpu;\n  }\n\n  where(condition: Tensor): Tensor2D {\n    backend_util.warn(\n        'tf.where() in webgl locks the UI thread. ' +\n        'Call tf.whereAsync() instead');\n    const condVals = condition.dataSync();\n    return whereImpl(condition.shape, condVals);\n  }\n\n  private packedUnaryOp(x: TensorInfo, op: string, dtype: DataType) {\n    const program = new UnaryOpPackedProgram(x.shape, op);\n    const outInfo = this.compileAndRun(program, [x], dtype);\n    return engine().makeTensorFromDataId(\n        outInfo.dataId, outInfo.shape, outInfo.dtype);\n  }\n\n  // TODO(msoulanille) remove this once the backend has been modularized\n  // a copy is needed here to break a circular dependency.\n  // Also remove the op from unary_op.\n  abs<T extends Tensor>(x: T): T {\n    // TODO: handle cases when x is complex.\n    if (this.shouldExecuteOnCPU([x]) &&\n        x.dtype !== 'complex64') {\n      const outValues =\n          simpleAbsImplCPU(this.texData.get(x.dataId).values as TypedArray);\n
      return this.makeOutput(x.shape, x.dtype, outValues);\n    }\n\n    if (env().getBool('WEBGL_PACK_UNARY_OPERATIONS')) {\n      return this.packedUnaryOp(x, unary_op.ABS, x.dtype) as T;\n    }\n\n    const program = new UnaryOpProgram(x.shape, unary_op.ABS);\n    const outInfo = this.compileAndRun(program, [x]);\n    return engine().makeTensorFromDataId(\n        outInfo.dataId, outInfo.shape, outInfo.dtype) as T;\n  }\n\n  makeTensorInfo(\n      shape: number[], dtype: DataType,\n      values?: BackendValues|string[]): TensorInfo {\n    let dataId;\n    if (dtype === 'string' && values != null && values.length > 0 &&\n        util.isString(values[0])) {\n      const encodedValues =\n          (values as {} as string[]).map(d => util.encodeString(d));\n\n      dataId = this.write(encodedValues, shape, dtype);\n    } else {\n      dataId = this.write(values as TypedArray, shape, dtype);\n    }\n\n    this.texData.get(dataId).usage = null;\n    return {dataId, shape, dtype};\n  }\n\n
  private makeOutput<T extends Tensor>(\n      shape: number[], dtype: DataType, values?: BackendValues): T {\n    const {dataId} = this.makeTensorInfo(shape, dtype, values);\n    return engine().makeTensorFromDataId(dataId, shape, dtype, this) as T;\n  }\n\n  private unpackTensor(input: TensorInfo): TensorInfo {\n    const program = new UnpackProgram(input.shape);\n    return this.runWebGLProgram(program, [input], input.dtype);\n  }\n\n  private packTensor(input: TensorInfo): TensorInfo {\n    const program = new PackProgram(input.shape);\n    const preventEagerUnpackingOutput = true;\n    return this.runWebGLProgram(\n        program, [input], input.dtype, null /* customSetup */,\n        preventEagerUnpackingOutput);\n  }\n\n  private packedReshape(input: TensorInfo, afterShape: number[]): TensorInfo {\n    const input3DShape = [\n      webgl_util.getBatchDim(input.shape),\n      ...webgl_util.getRowsCols(input.shape)\n    ] as [number, number, number];\n    const input3D: TensorInfo = {\n      dtype: input.dtype,\n      shape: input3DShape,\n      dataId: input.dataId\n    };\n    const afterShapeAs3D = [\n      webgl_util.getBatchDim(afterShape), ...webgl_util.getRowsCols(afterShape)\n    ] as [number, number, number];\n\n    const program = new ReshapePackedProgram(afterShapeAs3D, input3DShape);\n    const
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preventEagerUnpackingOfOutput = true;\n    const output = this.runWebGLProgram(\n        program, [input3D], input.dtype, null /* customSetup */,\n        preventEagerUnpackingOfOutput);\n    return {dataId: output.dataId, shape: afterShape, dtype: output.dtype};\n  }\n\n  private decode(dataId: DataId): TensorInfo {\n    const texData = this.texData.get(dataId);\n    const {isPacked, shape, dtype} = texData;\n    const shapeAs3D =\n webgl_util.getShapeAs3D(shape) as [number, number, number];\n    let program;\n    if (isPacked) {\n      program = new DecodeMatrixPackedProgram(shapeAs3D);\n    } else {\n      program = new DecodeMatrixProgram(shapeAs3D);\n
    }\n    const preventEagerUnpackingOfOutput = true;\n    const out = this.runWebGLProgram(\n        program, [{shape: shapeAs3D, dtype, dataId}], dtype,\n        null /* customSetup */, preventEagerUnpackingOfOutput);\n return {dtype, shape, dataId: out.dataId};\n  }\n\n  runWebGLProgram(\n      program: GPGPUProgram, inputs: TensorInfo[], outputDtype: DataType,\n      customSetup?: (gpgpu: GPGPUContext, webGLProgram: WebGLProgram) => void,\n      preventEagerUnpackingOfOutput = false): TensorInfo {\n    const output = this.makeTensorInfo(program.outputShape, outputDtype);\n    const outData = this.texData.get(output.dataId);\n    if (program.packedOutput) {\n      outData.isPacked = true;\n    }\n    if (program.outPackingScheme === tex_util.PackingScheme.DENSE) {\n      const texelShape = tex_util.getDenseTexShape(program.outputShape);\n      // For a densely packed output, we explicitly set texShape\n      // so it doesn't get assigned later according to our typical packing\n
      // scheme wherein a single texel can only contain values from adjacent\n      // rows/cols.\n      outData.texShape = texelShape.map(d => d * 2) as [number, number];\n    }\n    if (program.outTexUsage != null) {\n outData.usage = program.outTexUsage;\n    }\n    if (util.sizeFromShape(output.shape) === 0) {\n      // Short-circuit the computation since the result is empty (has 0 in its\n      // shape).\n      outData.values =\n util.getTypedArrayFromDType(output.dtype as 'float32', 0);\n      return output;\n    }\n\n    const dataToDispose: TensorInfo[] = [];\n    const inputsData: TensorData[] = inputs.map(input => {\n      if (input.dtype === 'complex64') {\n        throw new Error(\n            `GPGPUProgram does not support complex64 input. For complex64 ` +\n `dtypes, please separate the program into real and imaginary ` +\n            `parts.`);\n      }\n\n      let texData = this.texData.get(input.dataId);\n\n      if (texData.texture ==
 null) {\n        if (!program.packedInputs &&\n            util.sizeFromShape(input.shape) <=\n env().getNumber('WEBGL_SIZE_UPLOAD_UNIFORM')) {\n          // Upload small tensors that live on the CPU as uniforms, not as\n          // textures. Do this only when the environment supports 32bit floats\n          // due to problems when comparing 16bit floats with 32bit floats.\n          // TODO(https://github.com/tensorflow/tfjs/issues/821): Make it\n          // possible for packed shaders to sample from uniforms.\n          return {\n            shape: input.shape,\n            texData: null,\n            isUniform: true,\n            uniformValues: texData.values as TypedArray\n          };\n        }\n\n        // This ensures that if a packed program's inputs have not yet been\n        // uploaded to the GPU, they get uploaded as packed right off the bat.\n        if (program.packedInputs) {\n          texData.isPacked = true;\n          texData.shape = input.shape;\n
        }\n      } else if (!!texData.isPacked !== !!program.packedInputs) {\n        input = texData.isPacked ? this.unpackTensor(input) :\n                                   this.packTensor(input);\n        dataToDispose.push(input);\n        texData = this.texData.get(input.dataId);\n      } else if (\n          texData.isPacked &&\n          !webgl_util.isReshapeFree(texData.shape, input.shape)) {\n        // This is a special case where a texture exists for a tensor\n        // but the shapes are incompatible (due to packing constraints) because\n        // the tensor did not have a chance to go through the packed reshape\n        // shader. This only happens when we reshape the *same* tensor to form\n        // *distinct* inputs to an op, e.g. dotting a vector with itself. This\n        // case will disappear once packed uploading is the default.\n\n        const savedInput = input;\n        const targetShape = input.shape;\n\n        input.shape = texData.shape;\n        input =
 this.packedReshape(input as Tensor, targetShape);\n        dataToDispose.push(input);\n        texData = this.texData.get(input.dataId);\n\n        savedInput.shape = targetShape;\n      }\n\n      this.uploadToGPU(input.dataId);\n      return {shape: input.shape, texData, isUniform: false};\n    });\n\n    this.uploadToGPU(output.dataId);\n    const outputData:\n        TensorData = {shape: output.shape, texData:
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outData, isUniform: false};\n    const key = gpgpu_math.makeShaderKey(program, inputsData, outputData);\n
const binary = this.getAndSaveBinary(key, () => {\n      return gpgpu_math.compileProgram(\n          this.gpgpu,
program, inputsData, outputData);\n    });\n    const shouldTimeProgram = this.activeTimers != null;\n    let query:
WebGLQuery|CPUTimerQuery;\n    if (shouldTimeProgram) {\n      query = this.startTimer();\n    }\n\n
gpgpu_math.runProgram(\n        this.gpgpu, binary, inputsData, outputData, customSetup);\n\n
dataToDispose.forEach(info => this.disposeIntermediateTensorInfo(info));\n\n
   if (shouldTimeProgram) {\n      query = this.endTimer(query);\n      this.activeTimers.push(\n          {name:
program.constructor.name, query: this.getQueryTime(query)});\n    }\n\n    if
(!env().getBool('WEBGL_LAZILY_UNPACK') && outData.isPacked &&\n        preventEagerUnpackingOfOutput
=== false) {\n      const unpacked = this.unpackTensor(output);\n      this.disposeIntermediateTensorInfo(output);\n
 return unpacked;\n    }\n    return output;\n  }\n\n  compileAndRun(\n      program: GPGPUProgram, inputs:
TensorInfo[], outputDtype?: DataType,\n      customSetup?: (gpgpu: GPGPUContext, webGLProgram:
WebGLProgram) => void,\n      preventEagerUnpackingOfOutput = false): TensorInfo {\n    outputDtype =
outputDtype || inputs[0].dtype;\n    const outInfo = this.runWebGLProgram(\n        program, inputs, outputDtype,
customSetup,\n        preventEagerUnpackingOfOutput);\n    return outInfo;\n  }\n\n  private getAndSaveBinary(key:
string, getBinary:
 () => GPGPUBinary):\n      GPGPUBinary {\n    if (!(key in this.binaryCache)) {\n      this.binaryCache[key] =
getBinary();\n    }\n    return this.binaryCache[key];\n  }\n\n  getTextureManager(): TextureManager {\n    return
this.textureManager;\n  }\n\n  private disposed = false;\n\n  dispose() {\n    if (this.disposed) {\n      return;\n    }\n
// Avoid disposing the compiled webgl programs during unit testing because\n    // it slows down test execution.\n
if (!env().getBool('IS_TEST')) {\n      const allKeys = Object.keys(this.binaryCache);\n      allKeys.forEach(key =>
{\n        this.gpgpu.deleteProgram(this.binaryCache[key].webGLProgram);\n        delete this.binaryCache[key];\n
});\n    }\n    this.textureManager.dispose();\n    if (this.canvas != null &&\n        (typeof (HTMLCanvasElement)
!== 'undefined' &&\n        this.canvas instanceof HTMLCanvasElement)) {\n      this.canvas.remove();\n    } else
{\n      this.canvas = null;\n    }\n    if (this.gpgpuCreatedLocally)
 {\n      this.gpgpu.program = null;\n      this.gpgpu.dispose();\n    }\n    this.disposed = true;\n  }\n\n
floatPrecision(): 16|32 {\n    if (this.floatPrecisionValue == null) {\n      this.floatPrecisionValue = tidy(() => {\n
if (!env().get('WEBGL_RENDER_FLOAT32_ENABLED')) {\n          // Momentarily switching DEBUG flag to
false so we don't throw an\n          // error trying to upload a small value.\n          const debugFlag =
env().getBool('DEBUG');\n          env().set('DEBUG', false);\n          const underflowCheckValue =
this.abs(scalar(1e-8)).dataSync()[0];\n          env().set('DEBUG', debugFlag);\n\n          if (underflowCheckValue >
0) {\n            return 32;\n          }\n        }\n        return 16;\n      });\n    }\n    return this.floatPrecisionValue;\n  }\n\n
/** Returns the smallest representable number.  */\n  epsilon(): number {\n    return this.floatPrecision() === 32 ?
EPSILON_FLOAT32 : EPSILON_FLOAT16;\n  }\n\n  uploadToGPU(dataId: DataId):
 void {\n    const texData = this.texData.get(dataId);\n    const {shape, dtype, values, texture, usage, isPacked} =
texData;\n\n    if (texture != null) {\n      // Array is already on GPU. No-op.\n      return;\n    }\n    const
shouldTimeProgram = this.activeTimers != null;\n    let start: number;\n    if (shouldTimeProgram) {\n      start =
util.now();\n    }\n\n    let texShape = texData.texShape;\n    if (texShape == null) {\n      texShape =
webgl_util.getTextureShapeFromLogicalShape(shape, isPacked);\n      texData.texShape = texShape;\n    }\n\n    if
(values != null) {\n      const shapeAs3D = webgl_util.getShapeAs3D(shape);\n\n      let program;\n      let width =
texShape[1], height = texShape[0];\n      const isByteArray = values instanceof Uint8Array;\n\n      if (isPacked) {\n
   [width, height] = tex_util.getPackedMatrixTextureShapeWidthHeight(\n          texShape[0], texShape[1]);\n
program = new EncodeMatrixPackedProgram(\n          shapeAs3D, [height,
 width], isByteArray);\n      } else {\n        program =\n            new EncodeMatrixProgram(shapeAs3D, [height,
width], isByteArray);\n      }\n\n      const tempDenseInputHandle = this.makeTensorInfo([height, width], dtype);\n
 if (isByteArray) {\n        this.texData.get(tempDenseInputHandle.dataId).usage =\n            TextureUsage.PIXELS;\n
   } else {\n        this.texData.get(tempDenseInputHandle.dataId).usage =\n            TextureUsage.UPLOAD;\n
}\n      this.gpgpu.uploadDenseMatrixToTexture(\n          this.getTexture(tempDenseInputHandle.dataId), width,
```

height,\n values as TypedArray);\n\n // We want the output to remain packed regardless of the value of\n // WEBGL_PACK.\n const preventEagerUnpacking = true;\n const encodedOutputTarget = this.runWebGLProgram(\n program, [tempDenseInputHandle], dtype, null, preventEagerUnpacking);\n\n // Have the original texture assume the identity of the encoded output.\n const outputTexData = this.texData.get(encodedOutputTarget.dataId);\n texData.texture = outputTexData.texture;\n texData.texShape = outputTexData.texShape;\n texData.isPacked = outputTexData.isPacked;\n texData.usage = outputTexData.usage;\n\n this.disposeIntermediateTensorInfo(tempDenseInputHandle);\n this.texData.delete(encodedOutputTarget.dataId);\n\n // Once uploaded, don't store the values on cpu.\n texData.values = null;\n if (shouldTimeProgram) {\n this.uploadWaitMs += util.now() - start;\n }\n } else {\n const newTexture = this.acquireTexture(texShape, usage, dtype, isPacked);\n texData.texture = newTexture;\n }\n }\n\n private convertAndCacheOnCPU(dataId: DataId, float32Values?: Float32Array):\n TypedArray {\n const texData = this.texData.get(dataId);\n const {dtype} = texData;\n\n this.releaseGPUData(dataId);\n\n if (float32Values != null) {\n texData.values = float32ToTypedArray(float32Values, dtype as 'float32');\n }\n return texData.values as TypedArray;\n }\n\n private acquireTexture(\n texShape: [number, number], texType: TextureUsage, dtype: DataType,\n isPacked: boolean): WebGLTexture {\n this.numBytesInGPU += this.computeBytes(texShape, dtype);\n if (!this.warnedAboutMemory &&\n this.numBytesInGPU > this.numMBBeforeWarning * 1024 * 1024) {\n const mb = (this.numBytesInGPU / 1024 / 1024).toFixed(2);\n this.warnedAboutMemory = true;\n console.warn(\n `High memory usage in GPU: ${mb} MB, ` +\n `most likely due to a memory leak`);\n }\n return this.textureManager.acquireTexture(texShape, texType, isPacked);\n }\n\n private computeBytes(shape: [number, number], dtype: DataType) {\n return shape[0] * shape[1] * util.bytesPerElement(dtype);\n }\n}\n\nfunction float32ToTypedArray<D extends NumericDataType>(\n a: Float32Array, dtype: D): tf.DataTypeMap[D] {\n if (dtype === 'float32' || dtype === 'complex64') {\n return a as tf.DataTypeMap[D];\n } else if (dtype === 'int32' || dtype === 'bool') {\n const result = (dtype === 'int32') ? new Int32Array(a.length) :\n new Uint8Array(a.length);\n for (let i = 0; i < result.length; ++i) {\n result[i] = Math.round(a[i]);\n }\n return result as tf.DataTypeMap[D];\n } else {\n throw new Error(`Unknown dtype ${dtype}`);\n }\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {env} from '@tensorflow/tfjs-core';\n\nimport * as gpgpu_util from './gpgpu_util';\nimport * as webgl_util from './webgl_util';\n\nexport {MathBackendWebGL, WebGLMemoryInfo, WebGLTimingInfo} from './backend_webgl';\nexport {setWebGLContext} from './canvas_util';\nexport {GPGPUContext} from './gpgpu_context';\nexport {GPGPUProgram} from './gpgpu_math';\n// WebGL specific utils.\nexport {gpgpu_util, webgl_util};\n\n/**\n * Enforce use of half precision textures if available on the platform.\n *\n * @doc {heading: 'Environment', namespace: 'webgl'}\n */\nexport function forceHalfFloat(): void {\n env().set('WEBGL_FORCE_F16_TEXTURES', true);\n}\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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==========================================================================\n
*/\n\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nexport const CHECK_NAN_SNIPPET = `\n  if (isnan(a)) return a;\n  if (isnan(b)) return
b;\n`;\n\nexport const SQUARED_DIFFERENCE = 'return (a - b) * (a - b);';\nexport class BinaryOpProgram
implements GPGPUProgram {\n  variableNames = ['A', 'B'];\n  outputShape: number[];\n  userCode: string;\n\n
constructor(op: string, aShape: number[],
 bShape: number[]) {\n    this.outputShape = backend_util.assertAndGetBroadcastShape(aShape, bShape);\n
this.userCode = `\n      float binaryOperation(float a, float b) {\n        ${op}\n      }\n\n      void main() {\n        float a
= getAAtOutCoords();\n        float b = getBAtOutCoords();\n        setOutput(binaryOperation(a, b));\n      }\n    `;\n
}\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache
License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You
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by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\"
BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the
 License.\n *
==========================================================================\n
*/\n\nimport {backend_util, util} from '@tensorflow/tfjs-core';\n\nimport {GPGPUProgram} from
'./gpgpu_math';\nimport {getChannels} from './packing_util';\nimport {getCoordsDataType} from
'./shader_compiler';\n\nexport const CHECK_NAN_SNIPPET = `\n  result.r = isNaN.r > 0. ? NAN : result.r;\n
result.g = isNaN.g > 0. ? NAN : result.g;\n  result.b = isNaN.b > 0. ? NAN : result.b;\n  result.a = isNaN.a > 0. ?
NAN : result.a;\n`;\n\nexport const ELU_DER = `\n  vec4 bGTEZero = vec4(greaterThanEqual(b, vec4(0.)));\n
return (bGTEZero * a) + ((vec4(1.0) - bGTEZero) * (a * (b + vec4(1.0))));\n`;\n\nexport const NOT_EQUAL = `\n
return vec4(notEqual(a, b));\n`;\n\nexport class BinaryOpPackedProgram implements GPGPUProgram {\n
variableNames = ['A', 'B'];\n  outputShape: number[];\n  userCode: string;\n  supportsBroadcasting = true;\n
packedInputs = true;\n  packedOutput = true;\n\n  constructor(\n
    op: string, aShape: number[], bShape: number[],\n    checkOutOfBounds = false) {\n    this.outputShape =
backend_util.assertAndGetBroadcastShape(aShape, bShape);\n    const rank = this.outputShape.length;\n    let
checkOutOfBoundsString = '';\n    if (checkOutOfBounds) {\n      if (rank === 0 ||
util.sizeFromShape(this.outputShape) === 1) {\n        checkOutOfBoundsString = `\n          result.y = 0.;\n
result.z = 0.;\n          result.w = 0.;\n        `;\n      } else {\n        const dtype = getCoordsDataType(rank);\n
checkOutOfBoundsString = `\n          ${dtype} coords = getOutputCoords();\n        `;\n        if (rank === 1) {\n
checkOutOfBoundsString += `\n            result.y = (coords + 1) >= ${this.outputShape[0]} ? 0. : result.y;\n
result.z = 0.;\n            result.w = 0.;\n          `;\n        } else {\n          const channels = getChannels('coords', rank);\n
    checkOutOfBoundsString += `\n            bool nextRowOutOfBounds
 =\n              (${channels[rank - 2]} + 1) >= ${this.outputShape[rank - 2]};\n            bool nextColOutOfBounds =\n
          (${channels[rank - 1]} + 1) >= ${this.outputShape[rank - 1]};\n            result.y = nextColOutOfBounds ? 0. :
result.y;\n            result.z = nextRowOutOfBounds ? 0. : result.z;\n            result.w = nextColOutOfBounds ||
nextRowOutOfBounds ? 0. : result.w;\n          `;\n        }\n      }\n    }\n\n    this.userCode = `\n      vec4
binaryOperation(vec4 a, vec4 b) {\n        ${op}\n      }\n\n      void main() {\n        vec4 a = getAAtOutCoords();\n
  vec4 b = getBAtOutCoords();\n\n        vec4 result = binaryOperation(a, b);\n        ${checkOutOfBoundsString}\n\n
    setOutput(result);\n      }\n    `;\n  }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights
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BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
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==========================================================================\n
*/\n\nimport {env, KernelConfig, KernelFunc, LeakyRelu, LeakyReluAttrs, LeakyReluInputs, TensorInfo, util}
from '@tensorflow/tfjs-core';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport
{BinaryOpProgram} from '../binaryop_gpu';\nimport {BinaryOpPackedProgram} from
'../binaryop_packed_gpu';\n\nexport const LEAKYRELU = `return (a < 0.) ? b * a : a;`;\nexport const
LEAKYRELU_PACKED = `\n  vec4 aLessThanZero = vec4(lessThan(a, vec4(0.)));\n  return (aLessThanZero * (b
* a)) + ((vec4(1.0) - aLessThanZero)
 * a);\n`;\n\nexport function leakyRelu(args: {\n  inputs: LeakyReluInputs,\n  backend: MathBackendWebGL,\n
attrs: LeakyReluAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const
{alpha} = attrs;\n\n  const $alpha = backend.makeTensorInfo(\n      [], 'float32',\n      util.createScalarValue(alpha as
{} as 'float32', 'float32'));\n\n  const program = env().getBool('WEBGL_PACK_BINARY_OPERATIONS') ?\n
new BinaryOpPackedProgram(LEAKYRELU_PACKED, x.shape, $alpha.shape) :\n      new
BinaryOpProgram(LEAKYRELU, x.shape, $alpha.shape);\n  const result = backend.runWebGLProgram(program,
[x, $alpha], x.dtype);\n\n  backend.disposeIntermediateTensorInfo($alpha);\n\n  return result;\n}\n\nexport const
leakyReluConfig: KernelConfig = {\n  kernelName: LeakyRelu,\n  backendName: 'webgl',\n  kernelFunc: leakyRelu
as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
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BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {env, KernelConfig, KernelFunc, Prelu, PreluInputs, TensorInfo} from '@tensorflow/tfjs-
core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {BinaryOpProgram} from
'../binaryop_gpu';\nimport {BinaryOpPackedProgram} from '../binaryop_packed_gpu';\n\nexport const PRELU =
`return (a < 0.) ? b * a : a;`;\nexport const PRELU_PACKED = `\n  vec4 aLessThanZero = vec4(lessThan(a,
 vec4(0.)));\n  return (aLessThanZero * (b * a)) + ((vec4(1.0) - aLessThanZero) * a);\n`;\n\nexport function
prelu(args: {inputs: PreluInputs, backend: MathBackendWebGL}):\n    TensorInfo {\n  const {inputs, backend} =
args;\n  const {x, alpha} = inputs;\n\n  const program = env().getBool('WEBGL_PACK_BINARY_OPERATIONS')
?\n      new BinaryOpPackedProgram(PRELU_PACKED, x.shape, alpha.shape) :\n      new
BinaryOpProgram(PRELU, x.shape, alpha.shape);\n  return backend.runWebGLProgram(program, [x, alpha],
x.dtype);\n}\n\nexport const preluConfig: KernelConfig = {\n  kernelName: Prelu,\n  backendName: 'webgl',\n
kernelFunc: prelu as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights
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BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {backend_util, BinaryInputs, DataType, env, KernelFunc, TypedArray, UnaryInputs, upcastType}
from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport
{BinaryOpProgram} from '../binaryop_gpu';\nimport {BinaryOpPackedProgram} from
'../binaryop_packed_gpu';\nimport {complex} from '../kernels/Complex';\nimport {LEAKYRELU,
LEAKYRELU_PACKED} from '../kernels/LeakyRelu';\nimport {PRELU, PRELU_PACKED} from
'../kernels/Prelu';\nimport * as unary_op from '../unaryop_gpu';\nimport {UnaryOpProgram} from
'../unaryop_gpu';\nimport * as unary_packed_op from '../unaryop_packed_gpu';\nimport
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{UnaryOpPackedProgram} from '../unaryop_packed_gpu';\n\nimport {SimpleBinaryKernelImplCPU, SimpleUnaryKernelImplCPU} from './shared';\n\nexport const CHECK_NAN_SNIPPET_UNARY = `if (isnan(x)) return x;`;\n\nexport const CHECK_NAN_SNIPPET_BINARY = `\n  if (isnan(a)) return a;\n  if (isnan(b)) return b;\n`;\n\nexport const CHECK_NAN_SNIPPET_BINARY_PACKED = `\n  result.r = isNaN.r > 0. ? NAN : result.r;\n  result.g = isNaN.g > 0. ? NAN : result.g;\n  result.b = isNaN.b > 0. ? NAN : result.b;\n  result.a = isNaN.a > 0. ? NAN : result.a;\n`;\n\ntype UnaryKernelFuncConfig = {\n opSnippet: string,\n packedOpSnippet?: string,\n cpuKernelImpl?: SimpleUnaryKernelImplCPU,\n dtype?: DataType\n};\n\n/**\n * Template that creates a `KernelFunc` for unary ops.\n * @param opSnippet Op snippet to create `UnaryOpProgram`.\n * @param packedOpSnippet Op snippet to create `UnaryOpPackedProgram`.\n * @param dtype Optional. If set, the result has this dtype. Otherwise, the\n *
result has the same dtype as the first input. This is mainly used in\n *
comparison kernels, such as Equal, Less, Greater, etc.\n */\nexport function unaryKernelFunc(\n
{opSnippet, packedOpSnippet, cpuKernelImpl, dtype}: UnaryKernelFuncConfig):\n
KernelFunc {\n return ({inputs, backend}) => {\n
const {x} = inputs as UnaryInputs;\n
const webglBackend = backend as MathBackendWebGL;\n\n
const $dtype = dtype || x.dtype;\n if (webglBackend.shouldExecuteOnCPU([x]) && cpuKernelImpl != null) {\n
const xData = webglBackend.texData.get(x.dataId);\n
const outValues = cpuKernelImpl(xData.values as TypedArray, $dtype);\n
return webglBackend.makeTensorInfo(x.shape, $dtype, outValues);\n
}\n\n
const shouldUsePackedProgram =\n
env().getBool('WEBGL_PACK_UNARY_OPERATIONS') && packedOpSnippet != null;\n
let program: UnaryOpProgram|UnaryOpPackedProgram;\n
if (shouldUsePackedProgram) {\n
program = new UnaryOpPackedProgram(x.shape, packedOpSnippet);\n
} else {\n
program = new UnaryOpProgram(x.shape, opSnippet);\n
}\n\n
return webglBackend.runWebGLProgram(program, [x], $dtype);\n
};\n}\n\ntype BinaryKernelFuncConfig = {\n opSnippet: string,\n packedOpSnippet?: string,\n checkOutOfBounds?: boolean,\n supportsComplex?: boolean,\n cpuKernelImpl?: SimpleBinaryKernelImplCPU,\n dtype?: DataType\n};\n\n/**\n * Template that creates a `KernelFunc` for binary ops.\n * @param opSnippet Op snippet to create `BinaryOpProgram`.\n * @param packedOpSnippet Op snippet to create `BinaryOpPackedProgram`.\n * @param checkOutOfBoundsForPackedProgram Whether to set checkOutOfBounds=true\n *
when creating BinaryOpPackedProgram.\n * @param dtype Optional. If set, the result has this dtype. Otherwise, the\n *
result has the same dtype as the first input. This is mainly used in\n *
comparison kernels, such as Equal, Less, Greater, etc.\n */\nexport function binaryKernelFunc({\n opSnippet,\n packedOpSnippet,\n checkOutOfBounds = false,\n supportsComplex = false,\n cpuKernelImpl,\n dtype\n}: BinaryKernelFuncConfig): KernelFunc {\n return ({inputs, backend}) => {\n
const {a, b} = inputs as BinaryInputs;\n
const webglBackend = backend as MathBackendWebGL;\n\n
if (supportsComplex && a.dtype === 'complex64') {\n
const aData = webglBackend.texData.get(a.dataId);\n
const bData = webglBackend.texData.get(b.dataId);\n\n
const [real, imag] = [\n
[aData.complexTensorInfos.real, bData.complexTensorInfos.real],\n
[aData.complexTensorInfos.imag, bData.complexTensorInfos.imag]\n
].map(complexParts => {\n
const [aPart, bPart] = complexParts;\n\n
const aHandle = {\n
dataId: aPart.dataId,\n
dtype: aPart.dtype,\n
shape: a.shape\n
};\n
const bHandle = {\n
dataId: bPart.dataId,\n
dtype: bPart.dtype,\n
shape: b.shape\n
};\n\n
const program = new BinaryOpProgram(opSnippet, a.shape, b.shape);\n
return webglBackend.runWebGLProgram(\n
program, [aHandle, bHandle], upcastType(aPart.dtype, bPart.dtype));\n
});\n\n
const complexOutput =\n
complex({inputs: {real, imag}, backend: webglBackend});\n\n
webglBackend.disposeIntermediateTensorInfo(real);\n
webglBackend.disposeIntermediateTensorInfo(imag);\n\n
// TODO(annxingyuan): Implement CPU forwarding for complex inputs.\n\n
return complexOutput;\n
}\n\n
const $dtype = dtype || upcastType(a.dtype, b.dtype);\n
if (webglBackend.shouldExecuteOnCPU([a, b]) && cpuKernelImpl != null) {\n
const aData = webglBackend.texData.get(a.dataId);\n
const bData = webglBackend.texData.get(b.dataId);\n
const [outValues, outShape] = cpuKernelImpl(\n
a.shape, b.shape, aData.values as TypedArray,\n
bData.values as TypedArray, $dtype);\n\n
const out = webglBackend.makeTensorInfo(outShape, $dtype);\n
const outData

= webglBackend.texData.get(out.dataId);\n
outData.values = outValues;\n return out;\n }\n\n const shouldUsePackedProgram =\n env().getBool('WEBGL_PACK_BINARY_OPERATIONS') &&\n packedOpSnippet != null;\n let program: BinaryOpProgram|BinaryOpPackedProgram;\n if (shouldUsePackedProgram) {\n program = new BinaryOpPackedProgram(\n packedOpSnippet, a.shape, b.shape, checkOutOfBounds);\n } else {\n program = new BinaryOpProgram(opSnippet, a.shape, b.shape);\n }\n\n return webglBackend.runWebGLProgram(program, [a, b], $dtype);\n };\n}\n\nexport function mapActivationToShaderProgram(\n activation: backend_util.Activation, packed = false): string {\n if (activation === 'linear') {\n if (packed) {\n return unary_packed_op.LINEAR;\n }\n return unary_op.LINEAR;\n } else if (activation === 'relu') {\n if (packed) {\n return unary_packed_op.RELU;\n }\n return unary_op.RELU;\n } else if (activation === 'elu') {\n if (packed) {\n return unary_packed_op.ELU;\n }\n return unary_op.ELU;\n } else if (activation === 'relu6') {\n if (packed) {\n return unary_packed_op.RELU6;\n }\n return unary_op.RELU6;\n } else if (activation === 'prelu') {\n if (packed) {\n return PRELU_PACKED;\n }\n return PRELU;\n } else if (activation === 'leakyrelu') {\n if (packed) {\n return LEAKYRELU_PACKED;\n }\n return LEAKYRELU;\n }\n throw new Error(`Activation ${\n activation} has not been implemented for the WebGL backend.`);\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n*/\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class MatMulPackedProgram implements GPGPUProgram {\n variableNames = ['matrixA', 'matrixB'];\n packedInputs = true;\n packedOutput = true;\n outputShape: number[];\n userCode: string;\n\n constructor(\n aShape: [number, number, number], bShape: [number, number, number],\n outputShape: [number, number, number], transposeA = false,\n transposeB = false, addBias = false, activation: string = null,\n hasPreluActivation = false, hasLeakyreluActivation = false) {\n this.outputShape = outputShape;\n\n const sharedDim = transposeA ? aShape[1] : aShape[2];\n const sharedDimensionPacked = Math.ceil(sharedDim / 2);\n\n const aSample = transposeA ? 'i * 2, rc.y' : 'rc.y, i * 2';\n const bSample = transposeB ? 'rc.z, i * 2' : 'i * 2, rc.z';\n const aSwizzle = transposeA ? ['a.xxyy', 'a.zzww'] : ['a.xxzz', 'a.yyww'];\n const bSwizzle = transposeB ? ['b.xzxz', 'b.ywyw'] : ['b.xyxy', 'b.zwzw'];\n\n let activationSnippet = '', applyActivationSnippet = '';\n if (activation) {\n if (hasPreluActivation) {\n activationSnippet = `vec4 activation(vec4 a) {\n vec4 b = getPreluActivationWeightsAtOutCoords();\n ${activation}\n }`;\n } else if (hasLeakyreluActivation) {\n activationSnippet = `vec4 activation(vec4 a) {\n vec4 b = getLeakyreluAlphaAtOutCoords();\n ${activation}\n }`;\n } else {\n activationSnippet = `vec4 activation(vec4 x) {\n ${activation}\n }`;\n }\n\n applyActivationSnippet = `result = activation(result);`;\n }\n\n const addBiasSnippet = addBias ? 'result += getBiasAtOutCoords();'\n : '';\n if (addBias) {\n this.variableNames.push('bias');\n }\n\n if (hasPreluActivation) {\n this.variableNames.push('preluActivationWeights');\n }\n\n if (hasLeakyreluActivation) {\n this.variableNames.push('leakyreluAlpha');\n }\n\n let batchASnippet = 'rc.x';\n let batchBSnippet = 'rc.x';\n if (aShape[0] < bShape[0]) {\n batchASnippet = `int(min(float(rc.x), ${aShape[0] - 1}.))`;\n } else if (bShape[0] < aShape[0]) {\n batchBSnippet = `int(min(float(rc.x), ${bShape[0] - 1}.))`;\n }\n\n this.userCode = `\n ${activationSnippet}\n\n const float sharedDimension = ${sharedDimensionPacked}.0;\n\n vec4 dot2x2ARowBCol(ivec3 rc) {\n vec4 result = vec4(0);\n for (int i = 0; i < ${sharedDimensionPacked}; i++) {\n int batchA = ${batchASnippet};\n int batchB = ${batchBSnippet};\n vec4 a = getMatrixA(batchA, ${aSample});\n vec4 b = getMatrixB(batchB, ${bSample});\n\n

// These swizzled products need to be separately added.\n // See: https://github.com/tensorflow/tfjs/issues/1735\n result += (${aSwizzle[0]} * ${bSwizzle[0]});\n result += (${aSwizzle[1]} * ${bSwizzle[1]});\n }\n return result;\n }\n\n void main() {\n ivec3 rc = getOutputCoords();\n vec4 result = dot2x2ARowBCol(rc);\n\n ${addBiasSnippet}\n\n ${applyActivationSnippet}\n\n setOutput(result);\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS

OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from './gpgpu_math';\n\n// (Ar + Ai)(Br + Bi) =\n// ArBr + ArBi + AiBr + AiBi = ArBr - AB + ArBi + AiBr\n// Yr = ArBr - AB\n// Yi = ArBi + AiBr\nexport const COMPLEX_MULTIPLY = {\n REAL: 'return areal * breal - aimag * bimag;',\n IMAG: 'return areal * bimag + aimag * breal;'\n};\n\nexport class BinaryOpComplexProgram implements GPGPUProgram {\n variableNames = ['AReal', 'AImag', 'BReal', 'BImag'];\n userCode: string;\n outputShape: number[];\n\n constructor(op: string, aShape: number[], bShape: number[]) {\n this.outputShape = backend_util.assertAndGetBroadcastShape(aShape, bShape);\n\n this.userCode = `\n float binaryOpComplex(\n float areal, float

aimag, float breal, float bimag) {\n ${op}\n }\n\n void main() {\n float areal = getARealAtOutCoords();\n float aimag = getAImagAtOutCoords();\n float breal = getBRealAtOutCoords();\n float bimag = getBImagAtOutCoords();\n setOutput(binaryOpComplex(areal, aimag, breal, bimag));\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {ReshapePackedProgram} from '../reshape_packed_gpu';\nimport {getBatchDim, getRowsCols} from '../webgl_util';\n\nexport function packedReshape(\n input: TensorInfo, afterShape: number[],\n backend: MathBackendWebGL): TensorInfo {\n const input3DShape =\n [getBatchDim(input.shape),\n ...getRowsCols(input.shape)] as [number, number, number];\n const input3D: TensorInfo = {\n dtype: input.dtype,\n shape: input3DShape,\n dataId: input.dataId\n };\n const afterShapeAs3D =\n [getBatchDim(afterShape),\n ...getRowsCols(afterShape)] as [number, number, number];\n\n const program = new ReshapePackedProgram(afterShapeAs3D, input3DShape);\n const preventEagerUnpackingOfOutput = true;\n const output = backend.runWebGLProgram(\n program, [input3D], input.dtype,

null /* customSetup */,\n preventEagerUnpackingOfOutput);\n return {dataId: output.dataId, shape: afterShape, dtype: output.dtype};\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or

implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n===\n*/\n\nimport {KernelConfig, KernelFunc, Reshape, ReshapeAttrs, ReshapeInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {packedReshape} from '../kernel_utils/reshape';\nimport {isReshapeFree} from '../webgl_util';\n\nexport function reshape(args: {\n inputs: ReshapeInputs,\n backend: MathBackendWebGL,\n attrs: ReshapeAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {shape} = attrs;\n const webglBackend = backend;\n\n const xSize = util.sizeFromShape(x.shape);\n const $shape = util.inferFromImplicitShape(shape, xSize);\n const $xSize = util.sizeFromShape($shape);\n\n util.assert(\n xSize === $xSize,\n () => `The new shape (${$shape}) has ${$xSize} elements and the old ` +\n `shape (${x.shape}) has ${xSize} elements. The new shape and old ` +\n `shape must have the same number of elements.`);\n\n const xTexData = webglBackend.texData.get(x.dataId);\n if (xTexData.isPacked && !isReshapeFree(x.shape, $shape) &&\n !(xTexData.texture !== null && isReshapeFree(xTexData.shape, $shape))) {\n return packedReshape(x, $shape, webglBackend);\n }\n\n webglBackend.incRef(x.dataId);\n\n return {dataId: x.dataId, shape: $shape, dtype: x.dtype};\n}\n\nexport const reshapeConfig: KernelConfig = {\n kernelName: Reshape,\n backendName: 'webgl',\n kernelFunc: reshape as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n===\n */\n\nimport {backend_util, util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class MeanProgram implements GPGPUProgram {\n variableNames = ['x'];\n outputShape: number[];\n userCode: string;\n\n constructor(reduceInfo: backend_util.ReduceInfo, divisor?: number) {\n const {windowSize, batchSize, inSize, outSize} = reduceInfo;\n this.outputShape = [batchSize, outSize];\n\n const windowSizeNearestVec4 = Math.floor(windowSize / 4) * 4;\n const windowSizeVec4Remainder = windowSize % 4;\n\n let updateSnippet = `sumValue += dot(values, ones);`;\n if (divisor != null) {\n const denominator = 1 / divisor;\n updateSnippet = `sumValue += dot(values * ${\n util.isInt(denominator) ? denominator.toPrecision(2) :\n denominator}, ones);`;\n }\n\n let checkOutOfBounds = '';\n if (inSize % windowSize > 0) {\n checkOutOfBounds = `\n if (inIdx < 0 || inIdx >= ${inSize}) {\n return 0.0;\n }\n `;\n }\n\n this.userCode = `\n const vec4 ones = vec4(1.0, 1.0, 1.0, 1.0);\n\n float getValue(int batch, int inIdx) {\n ${checkOutOfBounds}\n return getX(batch, inIdx);\n }\n\n void main() {\n ivec2 coords = getOutputCoords();\n int batch = coords[0];\n int outIdx = coords[1];\n int inOffset = outIdx * ${windowSize};\n\n float sumValue = 0.0;\n\n for (int i = 0; i < ${windowSizeNearestVec4}; i += 4) {\n int inIdx = inOffset + i;\n vec4 values = vec4(\n getValue(batch, inIdx),\n getValue(batch, inIdx + 1),\n getValue(batch, inIdx + 2),\n getValue(batch, inIdx + 3)\n);\n\n ${updateSnippet}\n }\n\n int inIdx = inOffset + ${windowSizeNearestVec4};\n if (${windowSizeVec4Remainder === 1}) {\n vec4 values = vec4(getValue(batch, inIdx), 0.0, 0.0, 0.0);\n\n ${updateSnippet}\n } else if (${windowSizeVec4Remainder === 2}) {\n vec4 values = vec4(\n getValue(batch, inIdx),\n getValue(batch, inIdx + 1), 0.0, 0.0);\n\n ${updateSnippet}\n } else if (${windowSizeVec4Remainder === 3}) {\n vec4 values = vec4(\n getValue(batch, inIdx),\n getValue(batch, inIdx + 1),\n getValue(batch, inIdx + 2), 0.0);\n\n ${updateSnippet}\n }\n setOutput(sumValue);\n }\n `;\n

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 is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nexport class ReduceProgram implements GPGPUProgram {\n  variableNames = ['x'];\n
outputShape: number[];\n  userCode: string;\n\n  constructor(\n      reduceInfo: backend_util.ReduceInfo,\n
reduceType: 'all'|'any'|'max'|'min'|'sum'|'prod') {\n    const {windowSize, batchSize, inSize, outSize} = reduceInfo;\n
this.outputShape = [batchSize, outSize];\n\n    let initializationValue = '0.0';\n    let compareOp = ``;\n\n    if
(reduceType === 'prod') {\n      initializationValue = '1.0';\n    } else if (reduceType === 'min') {\n      // WebGL on
Firefox Linux can't compile
 1/0 so we do 1/eps.\n      initializationValue = '1.0 / 1e-20';\n      compareOp = `min`;\n    } else if (reduceType ===
'max') {\n      // WebGL on Firefox Linux can't compile 1/0 so we do 1/eps.\n      initializationValue = '-1.0 / 1e-
20';\n      compareOp = `max`;\n    }\n\n    let returnValue = `${reduceType}(${reduceType}(${reduceType}(` +\n
  'minMaxValue[0], minMaxValue[1]), minMaxValue[2]), minMaxValue[3])';\n\n    if (reduceType === 'sum') {\n
  returnValue = `sumValue`;\n    } else if (reduceType === 'prod') {\n      returnValue = `prodValue`;\n    } else if
(reduceType === 'all') {\n      returnValue = `allValue`;\n    } else if (reduceType === 'any') {\n      returnValue =
`anyValue`;\n    }\n\n    const windowSizeNearestVec4 = Math.floor(windowSize / 4) * 4;\n    const
windowSizeVec4Remainder = windowSize % 4;\n\n    let updateSnippet = `\n      if (${reduceType === 'sum'}) {\n
    sumValue += dot(values, ones);\n      } else if (${reduceType === 'prod'}) {\n
      vec2 tmp = vec2(values[0], values[1]) * vec2(values[2], values[3]);\n        prodValue *= tmp[0] * tmp[1];\n      }
else {\n        minMaxValue = ${compareOp}(values, minMaxValue);\n      }\n    `;\n\n    let vecType = `vec4`;\n\n
if (reduceType === 'all') {\n      initializationValue = '1.0';\n      updateSnippet = `\n        bool reducedAllValue =
all(values);\n        float floatedReducedAllValue = float(reducedAllValue);\n        allValue = float(allValue >= 1.0
&& floatedReducedAllValue >= 1.0);\n      `;\n      vecType = `bvec4`;\n    } else if (reduceType === 'any') {\n
initializationValue = '0.0';\n      updateSnippet = `\n        bool reducedAnyValue = any(values);\n        float
floatedReducedAnyValue = float(reducedAnyValue);\n        anyValue = float(anyValue >= 1.0 ||
floatedReducedAnyValue >= 1.0);\n      `;\n      vecType = `bvec4`;\n    }\n\n    let checkOutOfBounds = '';\n    if
(inSize % windowSize > 0) {\n      checkOutOfBounds = `\n        if (inIdx < 0
 || inIdx >= ${inSize}) {\n          return initializationValue;\n        }\n      `;\n    }\n    this.userCode = `\n      const
float initializationValue = ${initializationValue};\n      const vec4 ones = vec4(1.0, 1.0, 1.0, 1.0);\n\n      float
getValue(int batch, int inIdx) {\n        ${checkOutOfBounds}\n        return getX(batch, inIdx);\n      }\n\n      void
main() {\n        ivec2 coords = getOutputCoords();\n        int batch = coords[0];\n        int outIdx = coords[1];\n
int inOffset = outIdx * ${windowSize};\n\n        vec4 minMaxValue = vec4(${initializationValue});\n        float
prodValue = 1.0;\n        float sumValue = 0.0;\n        float allValue = 1.0;\n        float anyValue = 0.0;\n\n        for
(int i = 0; i < ${windowSizeNearestVec4}; i += 4) {\n          int inIdx = inOffset + i;\n          ${vecType} values =
${vecType}(\n            getValue(batch, inIdx),\n            getValue(batch, inIdx + 1),\n            getValue(batch, inIdx +
2),\n            getValue(batch,
 inIdx + 3)\n          );\n\n          ${updateSnippet}\n        }\n\n        int inIdx = inOffset +
${windowSizeNearestVec4};\n        if (${windowSizeVec4Remainder === 1}) {\n          ${vecType} values =
${vecType}(\n            getValue(batch, inIdx),\n            initializationValue,\n            initializationValue,\n
initializationValue\n          );\n\n          ${updateSnippet}\n        } else if (${windowSizeVec4Remainder === 2}) {\n
      ${vecType} values = ${vecType}(\n            getValue(batch, inIdx),\n            getValue(batch, inIdx + 1),\n
initializationValue,\n            initializationValue\n          );\n\n          ${updateSnippet}\n        } else if
```

(${windowSizeVec4Remainder === 3}) {\n ${vecType} values = ${vecType}(\n getValue(batch, inIdx),\n getValue(batch, inIdx + 1),\n getValue(batch, inIdx + 2),\n initializationValue\n);\n\n ${updateSnippet}\n }\n setOutput(${returnValue});\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {backend_util, DataType, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {MeanProgram} from '../mean_gpu';\nimport {ReduceProgram} from '../reduce_gpu';\n\ntype ReduceTypes = 'all'|'any'|'max'|'min'|'sum'|'prod'|'mean';\n\n// Returns an array of configuration objects that describe each stage of the\n// reduction.\nfunction getReductionStages(inShape: number[]):\n Array<{inSize: number, windowSize: number, outSize: number}> {\n const stages = [];\n\n while (stages.length === 0 || stages[stages.length - 1].outSize !== 1) {\n const outSize: number =\n stages.length ? stages[stages.length - 1].outSize : inShape[1];\n const windowSize = backend_util.computeOptimalWindowSize(outSize);\n stages.push({\n inSize: outSize,\n windowSize,\n outSize: Math.ceil(outSize / windowSize)\n });\n }\n\n return stages;\n}\n\nexport function reduce(\n x: TensorInfo, dtype: DataType, reductionType: ReduceTypes,\n backend: MathBackendWebGL): TensorInfo {\n const reductionStages = getReductionStages(x.shape);\n\n let result = x;\n for (let i = 0; i < reductionStages.length; i++) {\n const {inSize, windowSize, outSize} = reductionStages[i];\n\n let program: ReduceProgram|MeanProgram;\n let previousResult: TensorInfo;\n if (reductionType === 'mean') {\n program = i === 0 ?\n new MeanProgram(\n {windowSize, inSize, batchSize: x.shape[0], outSize}, inSize) :\n new MeanProgram({windowSize, inSize, batchSize: x.shape[0], outSize});\n } else {\n program = new ReduceProgram(\n {windowSize, inSize, batchSize: x.shape[0], outSize}, reductionType);\n }\n\n previousResult = result;\n result = backend.runWebGLProgram(program, [result], dtype);\n\n if (previousResult.dataId !== x.dataId) {\n backend.disposeIntermediateTensorInfo(previousResult);\n }\n }\n\n return result;\n}\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class TransposeProgram implements GPGPUProgram {\n variableNames = ['A'];\n outputShape: number[];\n userCode: string;\n rank: number;\n\n constructor(aShape: number[], newDim: number[]) {\n const outputShape: number[] = new Array(aShape.length);\n for (let i = 0; i < outputShape.length; i++) {\n outputShape[i] = aShape[newDim[i]];\n }\n this.outputShape = outputShape;\n this.rank = outputShape.length;\n const dtype = getCoordsDataType(this.rank);\n const switched = getSwitchedCoords(newDim);\n\n this.userCode = `\n void main() {\n ${dtype} resRC = getOutputCoords();\n setOutput(getA(${switched}));\n }\n `;\n }\n}\n\nfunction getSwitchedCoords(newDim: number[]): string {\n const rank = newDim.length;\n if (rank > 6) {\n throw Error(`Transpose for rank ${rank} is not yet supported`);\n }\n const originalOrder =\n ['resRC.x', 'resRC.y',

'resRC.z', 'resRC.w', 'resRC.u', 'resRC.v'];\n const switchedCoords = new Array(rank);\n for (let i = 0; i < newDim.length; i++) {\n   switchedCoords[newDim[i]] = originalOrder[i];\n }\n return switchedCoords.join();\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
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==========\n */\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getVecChannels} from './packing_util';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class TransposePackedProgram implements GPGPUProgram {\n variableNames = ['A'];\n outputShape: number[];\n userCode: string;\n rank: number;\n packedInputs = true;\n packedOutput = true;\n\n constructor(aShape: number[], newDim: number[]) {\n   const outputShape: number[] = new Array(aShape.length);\n   for (let i = 0; i < outputShape.length; i++) {\n   outputShape[i]
= aShape[newDim[i]];\n   }\n   this.outputShape = outputShape;\n   this.rank = outputShape.length;\n   if (this.rank > 6) {\n   throw Error(\n   `Packed transpose for rank ${this.rank} is not yet supported.`);\n   }\n   const dtype = getCoordsDataType(this.rank);\n\n   const outputOrder = getVecChannels('rc', this.rank);\n   const switchedOrder = new Array(this.rank);\n   for (let i = 0; i < newDim.length; i++) {\n   switchedOrder[newDim[i]] = outputOrder[i];\n   }\n   const innerDims = `vec2(${switchedOrder.slice(-2).join()})`;\n   const nextColumn =\n   `++${outputOrder[this.rank - 1]} < ${outputShape[this.rank - 1]}`;\n   const getc = `getChannel(getA(${switchedOrder.join()}), ${innerDims})`;\n\n   this.userCode = `\n   void main() {\n ${dtype} rc = getOutputCoords();\n   vec4 result = vec4(0.);\n   result[0] = ${getc};\n   if(${nextColumn}) {\n   result[1] = ${getc};\n   }\n   --${outputOrder[this.rank - 1]};\n   if(++${outputOrder[this.rank - 2]} < ${outputShape[this.rank - 2]}) {\n   result[2] = ${getc};\n   if(${nextColumn}) {\n   result[3] = ${getc};\n   }\n   }\n   setOutput(result);\n   }\n   `;\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
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==========\n */\n\nimport {backend_util, sumOutType, TensorInfo,
util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {reduce} from '../kernel_utils/reduce';\nimport {reshape} from './Reshape';\n\nimport {transposeImpl} from './Transpose_impl';\n\nexport function sumImpl(\n   x: TensorInfo, axis: number|number[], keepDims: boolean,\n   backend: MathBackendWebGL): TensorInfo {\n const reductionIndices = axis;\n\n const xRank = x.shape.length;\n\n const origAxes = util.parseAxisParam(reductionIndices, x.shape);\n let axes = origAxes;\n const permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n const sumInputIsTransposed = permutedAxes != null;\n\n let sumInput = x;\n if (sumInputIsTransposed) {\n   sumInput = transposeImpl(x, permutedAxes, backend);\n\n   axes = backend_util.getInnerMostAxes(axes.length, xRank);\n }\n\n backend_util.assertAxesAreInnerMostDims('sum', axes, xRank);\n const [sumOutShape, reduceShape] =\n   backend_util.computeOutAndReduceShapes(sumInput.shape, axes);\n\n
  let outShape = sumOutShape;\n if (keepDims) {\n   // rather than reshape at the end, set the target shape here.\n   outShape = backend_util.expandShapeToKeepDim(sumOutShape, origAxes);\n }\n\n const inSize = util.sizeFromShape(reduceShape);\n const xSize = util.sizeFromShape(x.shape);\n const batchSize = xSize /

inSize;\n const reshapedInput = reshape(\n   {inputs: {x: sumInput}, attrs: {shape: [batchSize, inSize]}, backend});\n\n const outType = sumOutType(x.dtype);\n\n const reduced = reduce(reshapedInput, outType, 'sum', backend);\n const out =\n   reshape({inputs: {x: reduced}, attrs: {shape: outShape}, backend});\n\n backend.disposeIntermediateTensorInfo(reshapedInput);\n backend.disposeIntermediateTensorInfo(reduced);\n if (sumInputIsTransposed) {\n   backend.disposeIntermediateTensorInfo(sumInput);\n }\n\n return out;\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the
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==========\n */\n\nimport {KernelConfig, KernelFunc, Sum, SumAttrs, SumInputs} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\n\nimport {sumImpl} from './Sum_impl';\n\nexport function sum(\n   args: {inputs: SumInputs, attrs: SumAttrs, backend: MathBackendWebGL}) {\n const {inputs, backend, attrs} = args;\n\n const {x} = inputs;\n const {axis, keepDims} = attrs;\n\n return sumImpl(x,
 axis, keepDims, backend);\n}\n\nexport const sumConfig: KernelConfig = {\n kernelName: Sum,\n backendName: 'webgl',\n kernelFunc: sum as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {backend_util, TensorInfo, upcastType, util} from '@tensorflow/tfjs-core';\n\nimport
 {MathBackendWebGL}
 from '../backend_webgl';\nimport {mapActivationToShaderProgram} from
'../kernel_utils/kernel_funcs_utils';\nimport {MatMulPackedProgram} from '../mulmat_packed_gpu';\n\nimport {multiply} from './Multiply';\nimport {reshape} from './Reshape';\nimport {sum} from './Sum';\nimport {transpose} from './Transpose';\n\n// Empirically determined minimal shared dimension in matmul before we forward\n// to a.mul(b).sum() in order to take advantage of GPU parallelism. See\n// https://github.com/tensorflow/tfjs-core/pull/1379 for benchmarks.\nexport const MATMUL_SHARED_DIM_THRESHOLD = 1000;\n\ntype BatchMatMulConfig = {\n a: TensorInfo,\n b: TensorInfo,\n transposeA: boolean,\n transposeB: boolean,\n backend: MathBackendWebGL,\n bias?: TensorInfo,\n preluActivationWeights?: TensorInfo,\n leakyreluAlpha?: number,\n activation?: backend_util.Activation\n};\n\nexport function batchMatMulImpl({\n a,\n b,\n transposeA,\n transposeB,\n backend,\n bias = null,\n preluActivationWeights
 = null,\n leakyreluAlpha = 0,\n activation = null\n}: BatchMatMulConfig): TensorInfo {\n const aRank = a.shape.length;\n const bRank = b.shape.length;\n\n const innerShapeA = transposeA ? a.shape[aRank - 2] : a.shape[aRank - 1];\n const innerShapeB = transposeB ? b.shape[bRank - 1] : b.shape[bRank - 2];\n\n const outerShapeA = transposeA ? a.shape[aRank - 1] : a.shape[aRank - 2];\n const outerShapeB = transposeB ? b.shape[bRank - 2] : b.shape[bRank - 1];\n\n const outerDimsA = a.shape.slice(0, -2);\n const outerDimsB = b.shape.slice(0, -2);\n\n const batchDimA = util.sizeFromShape(outerDimsA);\n const batchDimB = util.sizeFromShape(outerDimsB);\n\n const batchDimsCompatible =\n   batchDimA === batchDimB || batchDimA === 1 || batchDimB === 1;\n\n util.assert(\n   aRank >= 2 && bRank >= 2 && batchDimsCompatible,\n   () => `Error in matMul: the input batch dimensions must either be the ` +\n   `same or at least one input batch dimension must be 1. Got

```
input ` +\n        `batch dimensions of (${outerDimsA}) and (${outerDimsB}).`);\n\n  const outShapeOuterDims
=\n      batchDimA > batchDimB ? a.shape.slice(0, -2) : b.shape.slice(0, -2);\n  const outShape =
outShapeOuterDims.concat([outerShapeA, outerShapeB]);\n\n  util.assert(\n      innerShapeA === innerShapeB,\n
() => `Error in matMul: inner shapes (${innerShapeA}) and (` +\n        `${innerShapeB}) of Tensors with shapes
${a.shape} and ` +\n        `${b.shape} and transposeA=${transposeA}` +\n        ` and transposeB=${transposeB}
must match.`);\n\n  const a3dShape: [number, number, number] = transposeA ?\n      [batchDimA, innerShapeA,
outerShapeA] :\n      [batchDimA, outerShapeA, innerShapeA];\n  const b3dShape: [number, number, number] =
transposeB ?\n      [batchDimB, outerShapeB, innerShapeB] :\n      [batchDimB, innerShapeB, outerShapeB];\n\n  //
The rest of the implementation is designed to operate on rank-3 tensors\n  const a3d = reshape({inputs: {x: a},
backend,
 attrs: {shape: a3dShape}});\n  const b3d = reshape({inputs: {x: b}, backend, attrs: {shape: b3dShape}});\n\n  const
intermediates: TensorInfo[] = [a3d, b3d];\n\n  const batchDim = Math.max(batchDimA, batchDimB);\n  const
sharedDim = transposeA ? a3d.shape[1] : a3d.shape[2];\n\n  const hasBias = bias != null;\n  const
hasPreluActivationWeights = preluActivationWeights != null;\n  const hasLeakyreluAlpha = activation ===
'leakyrelu';\n  const fusedActivation = activation != null ?\n      mapActivationToShaderProgram(activation, true) :\n
    null;\n  const containsFusedOps = hasBias || hasPreluActivationWeights ||\n      hasLeakyreluAlpha ||
fusedActivation != null;\n  let out: TensorInfo;\n\n  // Since the matrices are vectors, it is faster to call mul().sum()\n
// because sum() is O(sqrt(N)) due to divide-and-conquer.\n  if ((outerShapeA === 1 || outerShapeB === 1) &&\n
sharedDim > MATMUL_SHARED_DIM_THRESHOLD && containsFusedOps === false) {\n    let aVec = a3d;\n
 let bVec
 = b3d;\n    if (transposeA) {\n      aVec = transpose({inputs: {x: a3d}, backend, attrs: {perm: [0, 2, 1]}});\n
intermediates.push(aVec);\n    }\n    if (transposeB) {\n      bVec = transpose({inputs: {x: b3d}, backend, attrs:
{perm: [0, 2, 1]}});\n      intermediates.push(bVec);\n    }\n\n    const shouldReshapeA = outerShapeB !== 1;\n
const shouldReshapeB = outerShapeB === 1;\n\n    let aVec3d = aVec;\n    if (shouldReshapeA) {\n      aVec3d =
reshape({\n        inputs: {x: aVec},\n        backend,\n        attrs: {shape: [batchDim, sharedDim, 1]}\n      });\n\n
intermediates.push(aVec3d);\n    }\n\n    const axis = outerShapeB === 1 ? 2 : 1;\n\n    let bVec3d = bVec;\n    if
(shouldReshapeB) {\n      bVec3d = reshape({\n        inputs: {x: bVec},\n        backend,\n        attrs: {shape:
[batchDim, 1, sharedDim]}\n      });\n\n      intermediates.push(bVec3d);\n    }\n\n    const product =
multiply({inputs: {a: aVec3d, b: bVec3d}, backend});\n    out = sum({inputs: {x:
 product}, backend, attrs: {axis, keepDims: true}});\n    intermediates.push(product);\n  } else {\n    const dtype =
upcastType(a.dtype, b.dtype);\n\n    const program = new MatMulPackedProgram(\n        a3dShape, b3dShape,
[batchDim, outerShapeA, outerShapeB], transposeA,\n        transposeB, hasBias, fusedActivation,
hasPreluActivationWeights,\n        hasLeakyreluAlpha);\n\n    const inputs: TensorInfo[] = [a3d, b3d];\n    if (bias !=
null) {\n      inputs.push(bias);\n    }\n    if (hasPreluActivationWeights) {\n
inputs.push(preluActivationWeights);\n    }\n    if (hasLeakyreluAlpha) {\n      const $leakyreluAlpha =
backend.makeTensorInfo(\n          [], 'float32',\n          util.createScalarValue(leakyreluAlpha as {} as 'float32',
'float32'));\n      inputs.push($leakyreluAlpha);\n      intermediates.push($leakyreluAlpha);\n    }\n\n    out =
backend.runWebGLProgram(program, inputs, dtype);\n  }\n\n  const outReshaped =\n      reshape({inputs: {x: out},
backend, attrs: {shape:
 outShape}});\n  intermediates.push(out);\n  for (const i of intermediates) {\n
backend.disposeIntermediateTensorInfo(i);\n  }\n  return outReshaped;\n}\n","/**\n * @license\n * Copyright 2020
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==========================================================================\n
```

*/\n\nimport {_FusedMatMul, _FusedMatMulAttrs, _FusedMatMulInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {batchMatMulImpl} from './BatchMatMul_impl';\n\nexport function _fusedMatMul(args: {\n inputs: _FusedMatMulInputs,\n attrs: _FusedMatMulAttrs,\n backend: MathBackendWebGL\n}) {\n const {inputs, backend, attrs} = args;\n const {a, b, bias, preluActivationWeights} = inputs;\n const {transposeA, transposeB, activation, leakyreluAlpha} = attrs;\n\n return batchMatMulImpl({\n   a,\n   b,\n   transposeA,\n   transposeB,\n   backend,\n   bias,\n   preluActivationWeights,\n   leakyreluAlpha,\n   activation\n });\n}\n\nexport const _fusedMatMulConfig: KernelConfig = {\n kernelName: _FusedMatMul,\n backendName: 'webgl',\n kernelFunc: _fusedMatMul as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {Acos, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\nimport {CHECK_NAN_SNIPPET} from '../unaryop_gpu';\n\nconst ACOS = CHECK_NAN_SNIPPET + `\n  if (abs(x) > 1.) {\n    return NAN;\n  }\n  return acos(x);\n`;\n\nexport const acos = unaryKernelFunc({opSnippet: ACOS});\n\nexport const acosConfig: KernelConfig = {\n kernelName: Acos,\n backendName: 'webgl',\n kernelFunc: acos,\n};\n","\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {Acosh, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\nimport {CHECK_NAN_SNIPPET} from '../unaryop_gpu';\n\nconst ACOSH = CHECK_NAN_SNIPPET + `\n  if (x < 1.0) return NAN;\nreturn log(x + sqrt(x * x - 1.0));`;\n\nexport const acosh = unaryKernelFunc({opSnippet: ACOSH});\n\nexport const acoshConfig: KernelConfig = {\n kernelName: Acosh,\n backendName: 'webgl',\n kernelFunc: acosh,\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class AddNProgram implements GPGPUProgram {\n variableNames: string[];\n outputShape: number[] = [];\n userCode: string;\n\n constructor(outputShape: number[], shapes: number[][]) {\n   this.outputShape = outputShape;\n   this.variableNames = shapes.map((_, i) => `T${i}`);\n\n   const snippets: string[] = [];\n   // Get target elements from every input tensor.\n   this.variableNames.forEach(variable => {\n   snippets.push(`float v${variable} = get${variable}AtOutCoords();`);\n   });\n\n   // Calculate the sum of all

elements.\n const operation = this.variableNames\n .map(variable => {\n return `v${variable}`;\n })\n .join(' + ');\n\n this.userCode = `\n void main() {\n ${snippets.join('\\n ')}\n\n float result = ${operation};\n setOutput(result);\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n
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==========\n */\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class AddNPackedProgram implements GPGPUProgram {\n variableNames: string[];\n outputShape: number[] = [];\n userCode: string;\n packedInputs = true;\n packedOutput = true;\n\n constructor(outputShape: number[], shapes: number[][]) {\n this.outputShape = outputShape;\n this.variableNames = shapes.map((_, i) => `T${i}`);\n\n const snippets: string[] = [];\n // Get target elements from every input tensor.\n this.variableNames.forEach(variable => {\n snippets.push(`vec4 v${variable} = get${variable}AtOutCoords();`);\n });\n\n // Calculate the sum of all elements.\n const operation = this.variableNames\n .map(variable => {\n return `v${variable}`;\n })\n .join(' + ');\n\n this.userCode = `\n void main() {\n ${snippets.join('\\n ')}\n\n vec4 result = ${operation};\n setOutput(result);\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {AddN, AddNInputs, env, KernelConfig, KernelFunc, TensorInfo, upcastType} from '@tensorflow/tfjs-core';\n\nimport {AddNProgram} from '../addn_gpu';\nimport {AddNPackedProgram} from '../addn_packed_gpu';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {identity} from './Identity';\n\nexport function addN(args: {inputs: AddNInputs, backend: MathBackendWebGL}):\n TensorInfo {\n const {inputs, backend} = args;\n\n const tensors = inputs;\n if (tensors.length === 1) {\n return identity({inputs: {x: tensors[0]}, backend});\n }\n\n // Limit the number of uploaded textures for optimization.\n if (tensors.length > env().get('WEBGL_MAX_TEXTURES_IN_SHADER'))
{\n const midIndex = Math.floor(tensors.length / 2);\n const leftSide = addN({inputs: tensors.slice(0, midIndex), backend});\n const rightSide = addN({inputs: tensors.slice(midIndex), backend});\n return addN({inputs: [leftSide, rightSide], backend});\n }\n\n const dtype =\n tensors.map(t => t.dtype).reduce((d1, d2) => upcastType(d1, d2));\n const shapes = tensors.map(t => t.shape);\n // We can make sure shapes are identical in op level.\n const usePackedOp = env().getBool('WEBGL_PACK');\n const program = usePackedOp ?\n new AddNPackedProgram(tensors[0].shape, shapes) :\n new AddNProgram(tensors[0].shape, shapes);\n return backend.runWebGLProgram(program, tensors, dtype);\n}\n\nexport const addNConfig: KernelConfig = {\n kernelName: AddN,\n backendName: 'webgl',\n kernelFunc: addN as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License,
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License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {All, AllAttrs, AllInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {reduce} from '../kernel_utils/reduce';\n\nimport {reshape} from './Reshape';\nimport {transpose} from './Transpose';\n\nexport function all(\n args: {inputs: AllInputs, backend: MathBackendWebGL, attrs: AllAttrs}):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {axis, keepDims} = attrs;\n\n const xRank = x.shape.length;\n\n const origAxes = util.parseAxisParam(axis, x.shape);\n let axes = origAxes;\n const permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n let permutedX = x;\n if (permutedAxes != null) {\n permutedX = transpose({inputs: {x}, backend, attrs: {perm: permutedAxes}});\n axes = backend_util.getInnerMostAxes(axes.length, xRank);\n }\n\n backend_util.assertAxesAreInnerMostDims('all', axes, xRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(permutedX.shape, axes);\n const inSize = util.sizeFromShape(reduceShape);\n\n const a2D =\n reshape({inputs: {x: permutedX}, backend, attrs: {shape: [-1, inSize]}});\n const reduced = reduce(a2D, a2D.dtype, 'all', backend);\n\n let res;\n if (keepDims) {\n const newShape = backend_util.expandShapeToKeepDim(outShape, origAxes);\n res = reshape({inputs: {x: reduced}, backend, attrs: {shape: newShape}});\n } else {\n res = reshape({inputs: {x: reduced}, backend, attrs: {shape: outShape}});\n }\n\n backend.disposeIntermediateTensorInfo(a2D);\n backend.disposeIntermediateTensorInfo(reduced);\n\n if (permutedAxes != null) {\n backend.disposeIntermediateTensorInfo(permutedX);\n }\n\n return res;\n}\n\nexport const allConfig: KernelConfig = {\n kernelName: All,\n backendName: 'webgl',\n kernelFunc: all as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {Any, AnyAttrs, AnyInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {reduce} from '../kernel_utils/reduce';\nimport {reshape} from './Reshape';\nimport {transpose} from './Transpose';\n\nexport function any(\n args: {inputs: AnyInputs, backend: MathBackendWebGL, attrs: AnyAttrs}):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {axis, keepDims} = attrs;\n\n const xRank = x.shape.length;\n\n const origAxes = util.parseAxisParam(axis, x.shape);\n let axes = origAxes;\n const permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n let permutedX = x;\n if (permutedAxes != null) {\n permutedX = transpose({inputs: {x}, backend, attrs: {perm: permutedAxes}});\n axes = backend_util.getInnerMostAxes(axes.length, xRank);\n }\n\n backend_util.assertAxesAreInnerMostDims('any', axes, xRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(permutedX.shape, axes);\n const inSize = util.sizeFromShape(reduceShape);\n\n const a2D =\n reshape({inputs: {x: permutedX}, backend, attrs: {shape: [-1, inSize]}});\n const reduced = reduce(a2D, a2D.dtype, 'any', backend);\n\n let res;\n if (keepDims) {\n const newShape = backend_util.expandShapeToKeepDim(outShape, origAxes);\n res = reshape({inputs: {x: reduced}, backend, attrs: {shape: newShape}});\n } else {\n res = reshape({inputs: {x: reduced}, backend, attrs: {shape: outShape}});\n }\n\n backend.disposeIntermediateTensorInfo(a2D);\n backend.disposeIntermediateTensorInfo(reduced);\n\n if (permutedAxes != null) {\n backend.disposeIntermediateTensorInfo(permutedX);\n

```
}\n\n  return res;\n}\n\nexport const anyConfig: KernelConfig = {\n  kernelName: Any,\n  backendName: 'webgl',\n  kernelFunc: any as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nexport
 class ArgMinMaxProgram implements GPGPUProgram {\n  variableNames = ['A'];\n  outputShape: number[];\n
userCode: string;\n\n  constructor(\n      reduceInfo: backend_util.ReduceInfo, op: 'max'|'min',\n      firstPass:
boolean) {\n    const {windowSize, batchSize, outSize} = reduceInfo;\n    if (!firstPass) {\n
this.variableNames.push('bestIndicesA');\n    }\n    this.outputShape = [batchSize, outSize];\n    const compOp = (op
=== 'max') ? '>' : '<';\n    const indexSnippet = firstPass ?\n        'inOffset + i;' :\n        'round(getBestIndicesA(batch,
inOffset + i));';\n\n    this.userCode = `\n      void main() {\n        ivec2 coords = getOutputCoords();\n        int batch
= coords[0];\n        int outIdx = coords[1];\n        int inOffset = outIdx * ${windowSize};\n\n        int bestIndex =
inOffset;\n        float bestValue = getA(batch, bestIndex);\n\n        for (int i = 0; i < ${windowSize}; i++) {\n
int inIdx = ${indexSnippet};\n
 float candidate = getA(batch, inIdx);\n          if (candidate ${compOp} bestValue) {\n            bestValue =
candidate;\n            bestIndex = inIdx;\n          }\n        }\n        setOutput(float(bestIndex));\n      }\n    `;\n
}\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache
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==========================================================================\n
*/\n\nimport {util} from '@tensorflow/tfjs-core';\n\nimport
 {GPGPUProgram} from './gpgpu_math';\nimport {getChannels} from './packing_util';\nimport
{getCoordsDataType} from './shader_compiler';\n\nexport class ArgMinMaxPackedProgram implements
GPGPUProgram {\n  variableNames = ['A'];\n  outputShape: number[];\n  userCode: string;\n  packedInputs =
true;\n  packedOutput = true;\n\n  constructor(\n      shape: number[], windowSize: number, op: 'max'|'min',\n
firstPass: boolean) {\n    util.assert(\n        shape.length > 2,\n        () => `Packed arg${\n
op.charAt(0).toUpperCase() +\n            op.slice(1)} supports only inputs with rank above 2.`);\n    const inSize =
shape[shape.length - 1];\n    const outSize = Math.ceil(inSize / windowSize);\n    this.outputShape = shape.slice(0, -
1);\n    if (outSize > 1) {\n      this.outputShape.push(outSize);\n    }\n    if (!firstPass) {\n
this.variableNames.push('bestIndicesA');\n    }\n    const outShape = this.outputShape;\n    const rank =
outShape.length;\n
    const dtype = getCoordsDataType(rank);\n    const coords = getChannels('coords', rank);\n\n    let
sourceLocSetup;\n    let sourceRank;\n    if (outSize === 1) {\n      sourceRank = rank + 1;\n      const
sourceLocDType = getCoordsDataType(sourceRank);\n      sourceLocSetup = `\n        ${sourceLocDType}
sourceLocR = ${sourceLocDType}(${coords.join()}, 0);\n        ++${coords[rank - 1]};\n        ${sourceLocDType}
sourceLocG = ${sourceLocDType}(${coords.join()}, 0);\n        ++${coords[rank - 2]};\n        ${sourceLocDType}
sourceLocA = ${sourceLocDType}(${coords.join()}, 0);\n        --${coords[rank - 1]};\n        ${sourceLocDType}
sourceLocB = ${sourceLocDType}(${coords.join()}, 0);\n        --${coords[rank - 2]};`;\n    } else {\n
sourceRank = rank;\n      sourceLocSetup = `\n        ${dtype} sourceLocR = coords;\n        ++${coords[rank - 1]};\n
```

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    ${dtype} sourceLocG = coords;\n        ++${coords[rank - 2]};\n        ${dtype} sourceLocA = coords;\n        --${coords[rank
 - 1]};\n        ${dtype} sourceLocB = coords;\n        --${coords[rank - 2]};`;\n    }\n    const channels = ['x', 'y', 'z',
'w', 'u', 'v'].slice(0, sourceRank);\n    const inChannel = '.' + channels[sourceRank - 1];  // e.g. \".b\" for rank 3.\n
const intChannels = channels.map(x => 'int ' + x);\n    const srcRCoords =\n        getChannels('sourceLocR',
sourceRank - 1).concat('inIdx.r');\n    const srcGCoords =\n        getChannels('sourceLocG', sourceRank -
1).concat('inIdx.g');\n    const srcBCoords =\n        getChannels('sourceLocB', sourceRank - 1).concat('inIdx.b');\n
const srcACoords =\n        getChannels('sourceLocA', sourceRank - 1).concat('inIdx.a');\n\n    const compOp = (op
=== 'max') ? 'greaterThan' : 'lessThan';\n    const fetchCandidateIdx = firstPass ? '' : `\n          inIdx =
round(vec4(getBestIndicesAChannel(${srcRCoords.join()}),\n
getBestIndicesAChannel(${srcGCoords.join()}),\n
getBestIndicesAChannel(${srcBCoords.join()}),\n
                    getBestIndicesAChannel(${srcACoords.join()})));`;\n\n    const fetchValue = `vec4(\n
getAChannel(${srcRCoords.join()}),\n            hasNextCol ? getAChannel(${srcGCoords.join()}) : 0.,\n
hasNextRow ? getAChannel(${srcBCoords.join()}) : 0.,\n            hasNextRow && hasNextCol ?
getAChannel(${srcACoords.join()}) : 0.)`;\n\n    const getBestIndicesAChannelSnippet = firstPass ? '' : `\n      float
getBestIndicesAChannel(${intChannels.join()}) {\n        return getChannel(getBestIndicesA(${channels.join()}),\n
                    vec2(${channels.slice(-2).join()}));\n      }`;\n\n    this.userCode = `\n      float
getAChannel(${intChannels.join()}) {\n        return getChannel(getA(${channels.join()}),\n
vec2(${channels.slice(-2).join()}));\n      }\n      ${getBestIndicesAChannelSnippet}\n      void main() {\n
${dtype} coords = getOutputCoords();\n
      bool hasNextCol = ${coords[rank - 1]} < ${outShape[rank - 1] - 1};\n        bool hasNextRow = ${coords[rank -
2]} < ${outShape[rank - 2] - 1};\n        ${sourceLocSetup}\n        ivec4 srcIdx = ivec4(sourceLocR${inChannel},
sourceLocG${inChannel},\n            sourceLocB${inChannel}, sourceLocA${inChannel}) * ${windowSize};\n
ivec4 inIdx = srcIdx;\n        vec4 bestIndex = vec4(inIdx);\n        vec4 bestValue = ${fetchValue};\n\n        for (int i
= 0; i < ${windowSize}; i++) {\n          inIdx = srcIdx;\n          ${fetchCandidateIdx}\n          vec4 candidate =
${fetchValue};\n          bvec4 nan = isnan(candidate);\n          bvec4 replace = bvec4(\n
vec4(${compOp}(candidate, bestValue)) * (vec4(1.0) - vec4(nan)));\n\n          bestValue = vec4(replace.x  ?
candidate.x : bestValue.x,\n                           replace.y  ? candidate.y : bestValue.y,\n                           replace.z  ?
candidate.z : bestValue.z,\n                           replace.w  ? candidate.w
 : bestValue.w);\n          bestIndex = mix(bestIndex, vec4(inIdx), vec4(replace));\n          srcIdx++;\n        }\n
setOutput(bestIndex);\n      }\n    `;\n  }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {backend_util, env, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {ArgMinMaxProgram}
 from '../argminmax_gpu';\nimport {ArgMinMaxPackedProgram} from '../argminmax_packed_gpu';\nimport
{MathBackendWebGL} from '../backend_webgl';\nimport {reshape} from '../kernels/Reshape';\n\nfunction
argReduce(\n    backend: MathBackendWebGL, x: TensorInfo, reduceType: 'max'|'min',\n    bestIndicesA:
TensorInfo = null): TensorInfo {\n  let batchSize = x.shape[0];\n  let inSize = x.shape[1];\n  if (bestIndicesA != null)
{\n    batchSize = bestIndicesA.shape[0];\n    inSize = bestIndicesA.shape[1];\n  }\n  const windowSize =
backend_util.computeOptimalWindowSize(inSize);\n  const reduceInfo =\n      {windowSize, inSize, batchSize,
outSize: Math.ceil(inSize / windowSize)};\n  const program =\n      new ArgMinMaxProgram(reduceInfo,
reduceType, bestIndicesA == null);\n  const inputs = [x];\n  if (bestIndicesA != null) {\n
```

inputs.push(bestIndicesA);\n }\n const output = backend.runWebGLProgram(program, inputs, 'int32');\n // No need to run another GPGPU program.\n if (output.shape[1] === 1) {\n   return output;\n }\n const result = argReduce(backend, x, reduceType, output);\n backend.disposeIntermediateTensorInfo(output);\n return result;\n}\n\nfunction argReducePacked(\n   backend: MathBackendWebGL, x: TensorInfo, reduceType: 'max'|'min',\n   bestIndicesA: TensorInfo = null): TensorInfo {\n const inShape = bestIndicesA != null ? bestIndicesA.shape : x.shape;\n const inSize = inShape[inShape.length - 1];\n const windowSize = backend_util.computeOptimalWindowSize(inSize);\n const program = new ArgMinMaxPackedProgram(\n   inShape, windowSize, reduceType, bestIndicesA == null);\n const inputs = bestIndicesA == null ? [x] : [x, bestIndicesA];\n const output = backend.runWebGLProgram(program, inputs, 'int32');\n if (output.shape.length === x.shape.length) {\n   const result = argReducePacked(backend, x, reduceType, output);\n   backend.disposeIntermediateTensorInfo(output);\n   return result;\n }\n return output;\n}\n\nexport function argMinMaxReduce(\n   backend: MathBackendWebGL, x: TensorInfo, axis: number,\n   reduceType: 'min'|'max'): TensorInfo {\n const axes = [axis];\n backend_util.assertAxesAreInnerMostDims(\n   'arg' + reduceType.charAt(0).toUpperCase() + reduceType.slice(1), axes,\n   x.shape.length);\n if (!env().getBool('WEBGL_PACK_REDUCE') || x.shape.length <= 2) {\n   const intermediateTensorInfos = [];\n const [outShape, reduceShape] =\n   backend_util.computeOutAndReduceShapes(x.shape, axes);\n   const inSize = util.sizeFromShape(reduceShape);\n   const a2D = reshape({inputs: {x}, backend, attrs: {shape: [-1, inSize]}});\n intermediateTensorInfos.push(a2D);\n\n   const reduced = argReduce(backend, a2D, reduceType);\n intermediateTensorInfos.push(reduced);\n   const reshaped =\n   reshape({inputs: {x: reduced}, backend, attrs: {shape: outShape}});\n\n   intermediateTensorInfos.forEach(\n   t => backend.disposeIntermediateTensorInfo(t));\n   return reshaped;\n }\n return argReducePacked(backend, x, reduceType);\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ArgMax, ArgMaxAttrs, ArgMaxInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {argMinMaxReduce} from '../kernel_utils/arg_min_max';\n\nimport {transpose} from './Transpose';\n\nexport function argMax(\n   args:\n {inputs: ArgMaxInputs, backend: MathBackendWebGL, attrs: ArgMaxAttrs}):\n   TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {axis} = attrs;\n\n let axes = util.parseAxisParam(axis, x.shape);\n const permutedAxes = backend_util.getAxesPermutation(axes, x.shape.length);\n let $x = x;\n const intermediateTensorInfos = [];\n if (permutedAxes != null) {\n $x = transpose({inputs: {x}, backend, attrs: {perm: permutedAxes}});\n   intermediateTensorInfos.push($x);\n   axes = backend_util.getInnerMostAxes(axes.length, $x.shape.length);\n }\n\n backend_util.assertAxesAreInnerMostDims('argMax', [axes[0]], $x.shape.length);\n const out = argMinMaxReduce(backend, $x, axes[0], 'max');\n\n intermediateTensorInfos.forEach(\n   t => backend.disposeIntermediateTensorInfo(t));\n return out;\n}\n\nexport const argMaxConfig: KernelConfig = {\n kernelName: ArgMax,\n backendName: 'webgl',\n kernelFunc: argMax as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for

the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {ArgMin, ArgMinAttrs, ArgMinInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {argMinMaxReduce} from '../kernel_utils/arg_min_max';\nimport {transpose} from './Transpose';\n\nexport function argMin(\n args:\n {inputs: ArgMinInputs, backend: MathBackendWebGL, attrs: ArgMinAttrs}):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {axis} = attrs;\n\n let axes = util.parseAxisParam(axis, x.shape);\n const permutedAxes = backend_util.getAxesPermutation(axes, x.shape.length);\n let $x = x;\n const intermediateTensorInfos = [];\n if (permutedAxes != null) {\n $x = transpose({inputs: {x}, backend, attrs: {perm: permutedAxes}});\n intermediateTensorInfos.push($x);\n axes = backend_util.getInnerMostAxes(axes.length, $x.shape.length);\n }\n\n backend_util.assertAxesAreInnerMostDims('argMin', [axes[0]], $x.shape.length);\n\n const out = argMinMaxReduce(backend, $x, axes[0], 'min');\n\n intermediateTensorInfos.forEach(\n t => backend.disposeIntermediateTensorInfo(t));\n return out;\n}\n\nexport const argMinConfig: KernelConfig = {\n kernelName: ArgMin,\n backendName: 'webgl',\n kernelFunc: argMin as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {Asin, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\nimport {CHECK_NAN_SNIPPET} from '../unaryop_gpu';\n\nconst ASIN = CHECK_NAN_SNIPPET + `\n if (abs(x) > 1.) {\n return NAN;\n }\n return asin(x);\n`;\n\nexport const asin = unaryKernelFunc({opSnippet: ASIN});\n\nexport const asinConfig: KernelConfig = {\n kernelName: Asin,\n backendName: 'webgl',\n kernelFunc: asin,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {Asinh, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\nimport {CHECK_NAN_SNIPPET} from '../unaryop_gpu';\n\nconst ASINH = CHECK_NAN_SNIPPET + `return log(x + sqrt(x * x + 1.0));`;\n\nexport const asinh = unaryKernelFunc({opSnippet: ASINH});\n\nexport const asinhConfig: KernelConfig = {\n kernelName: Asinh,\n backendName: 'webgl',\n kernelFunc: asinh,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS
 OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
==========\n*/\n\nimport {Atan, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\nimport {CHECK_NAN_SNIPPET} from '../unaryop_gpu';\n\nconst ATAN = CHECK_NAN_SNIPPET + `\n  return atan(x);\n`;\n\nexport const atan = unaryKernelFunc({opSnippet: ATAN});\n\nexport const atanConfig: KernelConfig = {\n  kernelName: Atan,\n  backendName: 'webgl',\n  kernelFunc: atan,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
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==========\n*/\n\nimport {Atan2} from '@tensorflow/tfjs-core';\nimport {KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {binaryKernelFunc, CHECK_NAN_SNIPPET_BINARY, CHECK_NAN_SNIPPET_BINARY_PACKED} from '../kernel_utils/kernel_funcs_utils';\n\nconst ATAN2 = CHECK_NAN_SNIPPET_BINARY + `\n  return atan(a, b);\n`;\n\nconst ATAN2_PACKED = `\n  vec4 result = atan(a, b);\n  vec4 isNaN = min(vec4(isnan(a)) + vec4(isnan(b)), vec4(1.0));\n  ` +\n CHECK_NAN_SNIPPET_BINARY_PACKED + `\n  return result;\n`;\n\nexport const atan2 =\n binaryKernelFunc({opSnippet: ATAN2, packedOpSnippet: ATAN2_PACKED});\n\nexport const atan2Config: KernelConfig = {\n  kernelName: Atan2,\n  backendName: 'webgl',\n  kernelFunc: atan2,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n*/\n\nimport {Atanh, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\nimport {CHECK_NAN_SNIPPET} from '../unaryop_gpu';\n\nconst ATANH = CHECK_NAN_SNIPPET + `\n  if ((x < -1.0) || (x > 1.0)) return NAN;\nreturn (log(1.0 + x) - log(1.0 - x)) / 2.0;`;\n\nexport const atanh = unaryKernelFunc({opSnippet: ATANH});\n\nexport const atanhConfig: KernelConfig = {\n  kernelName: Atanh,\n  backendName: 'webgl',\n  kernelFunc: atanh,\n};\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class Pool2DProgram implements GPGPUProgram {\n  variableNames = ['x'];\n outputShape: number[];\n  userCode: string;\n\n  constructor(\n      convInfo: backend_util.Conv2DInfo, poolType: 'max'|'avg',\n      computePositions: boolean, flattenPositions = false,\n      includeBatchInIndex = false) {\n    if (poolType === 'avg' && computePositions) {\n      throw new Error('Cannot compute positions for average pool.');\n    }\n\n    const filterWidth = convInfo.filterWidth;\n    const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n    const dilationHeight = convInfo.dilationHeight;\n    const dilationWidth = convInfo.dilationWidth;\n    const effectiveFilterHeight = convInfo.effectiveFilterHeight;\n    const
```

```
effectiveFilterWidth = convInfo.effectiveFilterWidth;\n\n    const padTop = convInfo.padInfo.top;\n
    const padLeft = convInfo.padInfo.left;\n    this.outputShape = convInfo.outShape;\n\n    const isAvgPool =
poolType === 'avg';\n    const batchFlattenPositionStr = `((batch  * ${convInfo.inHeight} + xR) * ${\n
convInfo.inWidth} + xC) * ${convInfo.inChannels} + d`;\n    const flattenPositionStr =\n        `(xR *
${convInfo.inWidth} + xC) * ${convInfo.inChannels} + d`;\n\n    let initializationValue = '0.0';\n    if (!isAvgPool)
{\n      // WebGL on Firefox Linux can't compile 1/0 so we do 1/eps.\n      initializationValue = '-1.0 / 1e-20';\n
}\n\n    if (computePositions) {\n      const compareOp = '>=';\n\n      this.userCode = `\n        const ivec2 strides =
ivec2(${strideHeight}, ${strideWidth});\n        const ivec2 pads = ivec2(${padTop}, ${padLeft});\n\n        void
main() {\n          ivec4 coords = getOutputCoords();\n          int batch = coords[0];\n          int d = coords[3];\n\n
ivec2 xRCCorner = coords.yz * strides - pads;\n          int xRCorner
 = xRCCorner.x;\n          int xCCorner = xRCCorner.y;\n\n          // max/min x(?, ?, d) to get y(yR, yC, d).\n          // ?
= to be determined\n          float minMaxValue = 0.0;\n          float minMaxValueFound = 0.0;\n          int
minMaxPosition = 0;\n          float avgValue = 0.0;\n\n          for (int wR = 0; wR < ${effectiveFilterHeight};\n
  wR += ${dilationHeight}) {\n            int xR = xRCorner + wR;\n\n            if (xR < 0 || xR >=
${convInfo.inHeight}) {\n              continue;\n            }\n\n            for (int wC = 0; wC < ${effectiveFilterWidth};\n
            wC += ${dilationWidth}) {\n              int xC = xCCorner + wC;\n\n              if (xC < 0 || xC >=
${convInfo.inWidth}) {\n                continue;\n              }\n\n              float value = getX(batch, xR, xC, d);\n\n
  // If a min / max value has already been found, use it. If not,\n              // use the current value.\n              float
currMinMaxValue = mix(\n
                  value, minMaxValue, minMaxValueFound);\n              if (value ${compareOp} currMinMaxValue) {\n
          minMaxValue = value;\n                minMaxValueFound = 1.0;\n                minMaxPosition = ${\n
flattenPositions ? (includeBatchInIndex ? batchFlattenPositionStr :\n
flattenPositionStr) :\n                    `wR * ${effectiveFilterWidth} + wC`};\n              }\n            }\n          }\n
  setOutput(float(minMaxPosition));\n        }\n      `;\n      return;\n    }\n\n    const compareOp = 'max';\n\n    let
returnValue = `${poolType}(${poolType}(${poolType}(` +\n        'minMaxValue[0], minMaxValue[1]),
minMaxValue[2]), minMaxValue[3])';\n    if (poolType === 'avg') {\n      returnValue = `avgValue / count`;\n
}\n\n    const filterWidthNearestVec4 = Math.floor(filterWidth / 4) * 4;\n    const filterWidthVec4Remainder =
filterWidth % 4;\n\n    const updateSnippet = `\n
    if (${isAvgPool}) {\n        avgValue += dot(values, ones);\n      } else {\n        minMaxValue =
${compareOp}(values, minMaxValue);\n      }\n    `;\n\n    this.userCode = `\n      const ivec2 strides =
ivec2(${strideHeight}, ${strideWidth});\n      const ivec2 pads = ivec2(${padTop}, ${padLeft});\n      const float
initializationValue = ${initializationValue};\n      const vec4 ones = vec4(1.0, 1.0, 1.0, 1.0);\n\n      float count =
0.0;\n\n      float getValue(int batch, int xR, int xC, int d) {\n        if (xC < 0 || xC >= ${convInfo.inWidth}) {\n
return initializationValue;\n        }\n        count += 1.0;\n        return getX(batch, xR, xC, d);\n      }\n\n      void
main() {\n        ivec4 coords = getOutputCoords();\n        int batch = coords[0];\n        int d = coords[3];\n\n
ivec2 xRCCorner = coords.yz * strides - pads;\n        int xRCorner = xRCCorner.x;\n        int xCCorner =
xRCCorner.y;\n\n        // max/min x(?, ?, d) to get y(yR, yC, d).\n
    // ? = to be determined\n        vec4 minMaxValue = vec4(${initializationValue});\n        float avgValue = 0.0;\n
 count = 0.0;\n\n        for (int wR = 0; wR < ${effectiveFilterHeight};\n            wR += ${dilationHeight}) {\n
int xR = xRCorner + wR;\n\n          if (xR < 0 || xR >= ${convInfo.inHeight}) {\n            continue;\n          }\n\n
for (int wC = 0; wC < ${filterWidthNearestVec4}; wC += 4) {\n            int xC = xCCorner + wC *
${dilationWidth};\n\n            vec4 values = vec4(\n              getValue(batch, xR, xC, d),\n              getValue(batch,
xR, xC + ${dilationWidth}, d),\n              getValue(batch, xR, xC + 2 * ${dilationWidth}, d),\n
getValue(batch, xR, xC + 3 * ${dilationWidth}, d)\n            );\n\n            ${updateSnippet}\n          }\n\n          int xC
= xCCorner + ${filterWidthNearestVec4};\n          if (${filterWidthVec4Remainder === 1}) {\n            vec4 values
= vec4(\n              getValue(batch,
 xR, xC, d),\n              initializationValue,\n              initializationValue,\n              initializationValue\n            );\n\n
        ${updateSnippet}\n          } else if (${filterWidthVec4Remainder === 2}) {\n            vec4 values = vec4(\n
```

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    getValue(batch, xR, xC, d),\n          getValue(batch, xR, xC + ${dilationWidth}, d),\n
initializationValue,\n          initializationValue\n        );\n\n        ${updateSnippet}\n      } else if
(${filterWidthVec4Remainder === 3}) {\n        vec4 values = vec4(\n          getValue(batch, xR, xC, d),\n
  getValue(batch, xR, xC + ${dilationWidth}, d),\n          getValue(batch, xR, xC + 2 * ${dilationWidth}, d),\n
      initializationValue\n        );\n\n        ${updateSnippet}\n      }\n    }\n
setOutput(${returnValue});\n    }\n  `;\n}\n\nexport class Pool3DProgram implements GPGPUProgram {\n
variableNames = ['x'];\n
 outputShape: number[];\n  userCode: string;\n\n  constructor(\n    convInfo: backend_util.Conv3DInfo, poolType:
'max'|'avg',\n    computePositions: boolean, flattenPositions = false,\n    includeBatchInIndex = false) {\n  if
(poolType === 'avg' && computePositions) {\n    throw new Error('Cannot compute positions for average
pool.');\n  }\n\n  const filterWidth = convInfo.filterWidth;\n  const strideDepth = convInfo.strideDepth;\n  const
strideHeight = convInfo.strideHeight;\n  const strideWidth = convInfo.strideWidth;\n  const dilationDepth =
convInfo.dilationDepth;\n  const dilationHeight = convInfo.dilationHeight;\n  const dilationWidth =
convInfo.dilationWidth;\n  const effectiveFilterDepth = convInfo.effectiveFilterDepth;\n  const
effectiveFilterHeight = convInfo.effectiveFilterHeight;\n  const effectiveFilterWidth =
convInfo.effectiveFilterWidth;\n\n  const padFront = convInfo.padInfo.front;\n  const padTop =
convInfo.padInfo.top;\n  const padLeft
 = convInfo.padInfo.left;\n  this.outputShape = convInfo.outShape;\n\n  const isAvgPool = poolType ===
'avg';\n\n  let initializationValue = '0.0';\n  if (!isAvgPool) {\n    // WebGL on Firefox Linux can't compile 1/0 so
we do 1/eps.\n    initializationValue = '-1.0 / 1e-20';\n  }\n\n  if (computePositions) {\n    const compareOp =
'>=';\n\n    this.userCode = `\n      const ivec3 strides =\n          ivec3(${strideDepth}, ${strideHeight},
${strideWidth});\n      const ivec3 pads = ivec3(${padFront}, ${padTop}, ${padLeft});\n\n      void main() {\n
  ivec5 coords = getOutputCoords();\n        int batch = coords.x;\n        int ch = coords.u;\n\n        ivec3 xCorner
= ivec3(coords.y, coords.z, coords.w) * strides - pads;\n        int xDCorner = xCorner.x;\n        int xRCorner =
xCorner.y;\n        int xCCorner = xCorner.z;\n\n        // max/min x(?, ?, ?, ch) to get y(yD, yR, yC, ch).\n        // ?
= to be determined\n        float
 minMaxValue = 0.0;\n        float minMaxValueFound = 0.0;\n        int minMaxPosition = 0;\n\n        for (int wD
= 0; wD < ${effectiveFilterDepth};\n            wD += ${dilationDepth}) {\n          int xD = xDCorner + wD;\n\n
    if (xD < 0 || xD >= ${convInfo.inDepth}) {\n            continue;\n          }\n\n          for (int wR = 0; wR <
${effectiveFilterHeight};\n              wR += ${dilationHeight}) {\n            int xR = xRCorner + wR;\n\n            if
(xR < 0 || xR >= ${convInfo.inHeight}) {\n              continue;\n            }\n\n            for (int wC = 0; wC <
${effectiveFilterWidth};\n                wC += ${dilationWidth}) {\n              int xC = xCCorner + wC;\n\n
if (xC < 0 || xC >= ${convInfo.inWidth}) {\n                continue;\n              }\n\n              float value =
getX(batch, xD, xR, xC, ch);\n\n              // If a min / max value has already been found, use it. If not,\n
        // use the current value.\n              float currMinMaxValue = mix(\n                  value, minMaxValue,
minMaxValueFound);\n              if (value ${compareOp} currMinMaxValue) {\n                minMaxValue =
value;\n                minMaxValueFound = 1.0;\n                minMaxPosition = ${\n        flattenPositions ?\n
(includeBatchInIndex ?\n                `(((batch * ${convInfo.inDepth} + xD) * ${\n
convInfo.inHeight} + xR) * ${convInfo.inWidth} + xC) * ${\n                  convInfo.inChannels} + ch` :\n
    `((xD * ${convInfo.inHeight} + xR) * ${\n                  convInfo.inWidth} + xC) * ${convInfo.inChannels} +
ch`) :\n            `wD * ${effectiveFilterHeight} * ${effectiveFilterWidth} +\n                wR *
${effectiveFilterWidth} + wC`};\n              }\n            }\n          }\n        }\n
setOutput(float(minMaxPosition));\n      }\n    `;\n
  return;\n  }\n\n  const compareOp = 'max';\n\n  let returnValue = `${poolType}(${poolType}(${poolType}(`
+\n      'minMaxValue[0], minMaxValue[1]), minMaxValue[2]), minMaxValue[3])';\n  if (poolType === 'avg')
{\n    returnValue = `avgValue / count`;\n  }\n\n  const filterWidthNearestVec4 = Math.floor(filterWidth / 4) *
4;\n  const filterWidthVec4Remainder = filterWidth % 4;\n\n  const updateSnippet = `\n    if (${isAvgPool}) {\n
    avgValue += dot(values, ones);\n    } else {\n      minMaxValue = ${compareOp}(values, minMaxValue);\n
```

```
}\n    `;\n\n    this.userCode = `\n      const ivec3 strides =\n          ivec3(${strideDepth}, ${strideHeight},
${strideWidth});\n      const ivec3 pads = ivec3(${padFront}, ${padTop}, ${padLeft});\n      const float
initializationValue = ${initializationValue};\n      const vec4 ones = vec4(1.0, 1.0, 1.0, 1.0);\n\n      float count =
0.0;\n\n      float getValue(int batch, int xD, int xR, int xC, int ch) {\n        if (xC
< 0 || xC >= ${convInfo.inWidth}) {\n          return initializationValue;\n        }\n        count += 1.0;\n        return
getX(batch, xD, xR, xC, ch);\n      }\n\n      void main() {\n        ivec5 coords = getOutputCoords();\n        int batch =
coords.x;\n        int ch = coords.u;\n\n        ivec3 xCorner = ivec3(coords.y, coords.z, coords.w) * strides - pads;\n
int xDCorner = xCorner.x;\n        int xRCorner = xCorner.y;\n        int xCCorner = xCorner.z;\n\n        // max/min
x(?, ?, ?, d) to get y(yD, yR, yC, ch).\n        // ? = to be determined\n        vec4 minMaxValue =
vec4(${initializationValue});\n        float avgValue = 0.0;\n        count = 0.0;\n\n        for (int wD = 0; wD <
${effectiveFilterDepth};\n            wD += ${dilationDepth}) {\n          int xD = xDCorner + wD;\n\n          if (xD < 0
|| xD >= ${convInfo.inDepth}) {\n            continue;\n          }\n\n          for (int wR = 0; wR <
${effectiveFilterHeight};\n              wR += ${dilationHeight})
{\n            int xR = xRCorner + wR;\n\n            if (xR < 0 || xR >= ${convInfo.inHeight}) {\n              continue;\n
}\n\n            for (int wC = 0; wC < ${filterWidthNearestVec4}; wC += 4) {\n              int xC = xCCorner + wC *
${dilationWidth};\n\n              vec4 values = vec4(\n                getValue(batch, xD, xR, xC, ch),\n
getValue(batch, xD, xR, xC + ${dilationWidth}, ch),\n                getValue(batch, xD, xR, xC + 2 *
${dilationWidth}, ch),\n                getValue(batch, xD, xR, xC + 3 * ${dilationWidth}, ch)\n              );\n\n
${updateSnippet}\n            }\n\n            int xC = xCCorner + ${filterWidthNearestVec4};\n            if
(${filterWidthVec4Remainder === 1}) {\n              vec4 values = vec4(\n                getValue(batch, xD, xR, xC,
ch),\n                initializationValue,\n                initializationValue,\n                initializationValue\n              );\n\n
${updateSnippet}\n
            } else if (${filterWidthVec4Remainder === 2}) {\n              vec4 values = vec4(\n                getValue(batch,
xD, xR, xC, ch),\n                getValue(batch, xD, xR, xC + ${dilationWidth}, ch),\n                initializationValue,\n
initializationValue\n              );\n\n              ${updateSnippet}\n            } else if (${filterWidthVec4Remainder
=== 3}) {\n              vec4 values = vec4(\n                getValue(batch, xD, xR, xC, ch),\n                getValue(batch,
xD, xR, xC + ${dilationWidth}, ch),\n                getValue(batch, xD, xR, xC + 2 * ${dilationWidth}, ch),\n
initializationValue\n              );\n\n              ${updateSnippet}\n            }\n          }\n
setOutput(${returnValue});\n        }\n      }\n    `;\n  }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\nimport {AvgPool, AvgPoolAttrs, AvgPoolInputs, backend_util, KernelConfig, KernelFunc, TensorInfo, util}
from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport
{Pool2DProgram} from '../pool_gpu';\nimport {assertNotComplex} from '../webgl_util';\nimport {identity} from
'./Identity';\n\nexport function avgPool(args: {\n  inputs: AvgPoolInputs,\n  backend: MathBackendWebGL,\n  attrs:
AvgPoolAttrs\n}): TensorInfo
{\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  assertNotComplex(x, 'avgPool');\n  const
{filterSize, strides, pad, dimRoundingMode} = attrs;\n  const dilations = 1;\n\n  util.assert(\n
backend_util.eitherStridesOrDilationsAreOne(strides, dilations),\n      () => 'Error in avgPool: Either strides or
dilations must be 1. ' +\n          `Got strides ${strides} and dilations '${dilations}'`);\n\n  const convInfo =
backend_util.computePool2DInfo(\n      x.shape as [number, number, number, number], filterSize, strides,\n
dilations, pad, dimRoundingMode);\n  if (convInfo.filterWidth === 1 && convInfo.filterHeight === 1 &&\n
util.arraysEqual(convInfo.inShape, convInfo.outShape)) {\n    return identity({inputs: {x}, backend});\n  }\n  const
```

```
avgPoolProgram = new Pool2DProgram(convInfo, 'avg', false);\n  return
backend.runWebGLProgram(avgPoolProgram, [x], 'float32');\n}\n\nexport const avgPoolConfig: KernelConfig =
{\n  kernelName: AvgPool,\n  backendName:
 'webgl',\n  kernelFunc: avgPool as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All
Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this
file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\nimport {AvgPool3D, AvgPool3DAttrs, AvgPool3DInputs, backend_util, KernelConfig, KernelFunc,
TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport
{Pool3DProgram}
 from '../pool_gpu';\n\nexport function avgPool3D(args: {\n  inputs: AvgPool3DInputs,\n  backend:
MathBackendWebGL,\n  attrs: AvgPool3DAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const
{x} = inputs;\n  const {filterSize, strides, pad, dimRoundingMode, dataFormat} = attrs;\n  const dilations: [number,
number, number] = [1, 1, 1];\n\n  const convInfo = backend_util.computePool3DInfo(\n      x.shape as [number,
number, number, number, number], filterSize, strides,\n      dilations, pad, dimRoundingMode, dataFormat);\n  const
avgPoolProgram = new Pool3DProgram(convInfo, 'avg', false);\n  return
backend.runWebGLProgram(avgPoolProgram, [x], 'float32');\n}\n\nexport const avgPool3DConfig: KernelConfig =
{\n  kernelName: AvgPool3D,\n  backendName: 'webgl',\n  kernelFunc: avgPool3D as {} as
KernelFunc\n};\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this
 file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nexport class AvgPool2DBackpropProgram implements GPGPUProgram {\n  variableNames =
['dy'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(convInfo: backend_util.Conv2DInfo) {\n
this.outputShape = convInfo.inShape;\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth =
convInfo.filterWidth;\n    const
 strideHeight = convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const dilationHeight =
convInfo.dilationHeight;\n    const dilationWidth = convInfo.dilationWidth;\n    const effectiveFilterHeight =
convInfo.effectiveFilterHeight;\n    const effectiveFilterWidth = convInfo.effectiveFilterWidth;\n\n    const padTop
= effectiveFilterHeight - 1 - convInfo.padInfo.top;\n    const padLeft = effectiveFilterWidth - 1 -
convInfo.padInfo.left;\n\n    const avgMultiplier = 1 / (filterHeight * filterWidth);\n\n    this.userCode = `\n      const
ivec2 pads = ivec2(${padTop}, ${padLeft});\n      const float avgMultiplier = float(${avgMultiplier});\n\n      void
main() {\n        ivec4 coords = getOutputCoords();\n        int b = coords[0];\n        int d = coords[3];\n\n        ivec2
dyRCCorner = coords.yz - pads;\n        int dyRCorner = dyRCCorner.x;\n        int dyCCorner = dyRCCorner.y;\n\n
  // Convolve dy(?, ?, d) with pos mask(:, :, d) to get dx(xR, xC, d).\n
      // ? = to be determined. : = across all values in that axis.\n        float dotProd = 0.0;\n        for (int wR = 0; wR <
${effectiveFilterHeight};\n            wR += ${dilationHeight}) {\n          float dyR = float(dyRCorner + wR) /
${strideHeight}.0;\n\n          if (dyR < 0.0 || dyR >= ${convInfo.outHeight}.0 || fract(dyR) > 0.0) {\n
continue;\n          }\n          int idyR = int(dyR);\n\n          for (int wC = 0; wC < ${effectiveFilterWidth};\n
```

wC+= ${dilationWidth}) {\n float dyC = float(dyCCorner + wC) / ${strideWidth}.0;\n\n if (dyC < 0.0 || dyC >= ${convInfo.outWidth}.0 ||\n fract(dyC) > 0.0) {\n continue;\n }\n int idyC = int(dyC);\n\n float dyValue = getDy(b, idyR, idyC, d);\n\n dotProd += dyValue * avgMultiplier;\n }\n }\n setOutput(dotProd);\n }\n `;\n }\n}\n\nexport class AvgPool3DBackpropProgram implements GPGPUProgram {\n variableNames = ['dy'];\n outputShape: number[];\n userCode: string;\n\n constructor(convInfo: backend_util.Conv3DInfo) {\n this.outputShape = convInfo.inShape;\n const filterDepth = convInfo.filterDepth;\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n const strideDepth = convInfo.strideDepth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const dilationDepth = convInfo.dilationDepth;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const effectiveFilterDepth = convInfo.effectiveFilterDepth;\n const effectiveFilterHeight = convInfo.effectiveFilterHeight;\n const effectiveFilterWidth = convInfo.effectiveFilterWidth;\n\n const padFront = effectiveFilterDepth - 1 - convInfo.padInfo.front;\n const padTop = effectiveFilterHeight - 1 - convInfo.padInfo.top;\n const padLeft = effectiveFilterWidth - 1 - convInfo.padInfo.left;\n\n const avgMultiplier = 1 / (filterDepth * filterHeight * filterWidth);\n\n this.userCode = `\n const ivec3 pads = ivec3(${padFront}, ${padTop}, ${padLeft});\n const float avgMultiplier = float(${avgMultiplier});\n\n void main() {\n ivec5 coords = getOutputCoords();\n int batch = coords.x;\n int ch = coords.u;\n\n ivec3 dyCorner = ivec3(coords.y, coords.z, coords.w) - pads;\n int dyDCorner = dyCorner.x;\n int dyRCorner = dyCorner.y;\n int dyCCorner = dyCorner.z;\n\n // Convolve dy(?, ?, ?, d) with pos mask(:, :, :, ch) to get\n // dx(xD, xR, xC, ch).\n // ? = to be determined. : = across all values in that axis.\n float dotProd = 0.0;\n\n for (int wD = 0; wD < ${effectiveFilterDepth};\n wD += ${dilationDepth}) {\n float dyD = float(dyDCorner + wD) / ${strideDepth}.0;\n\n if (dyD < 0.0 || dyD >= ${convInfo.outDepth}.0 || fract(dyD) > 0.0) {\n continue;\n }\n int idyD = int(dyD);\n\n for (int wR = 0; wR < ${effectiveFilterHeight};\n wR += ${dilationHeight}) {\n float dyR = float(dyRCorner + wR) / ${strideHeight}.0;\n\n if (dyR < 0.0 || dyR >= ${convInfo.outHeight}.0 ||\n fract(dyR) > 0.0) {\n continue;\n }\n int idyR = int(dyR);\n\n for (int wC = 0; wC < ${effectiveFilterWidth};\n wC += ${dilationWidth}) {\n float dyC = float(dyCCorner + wC) / ${strideWidth}.0;\n\n if (dyC < 0.0 || dyC >= ${convInfo.outWidth}.0 ||\n fract(dyC) > 0.0) {\n continue;\n }\n int idyC = int(dyC);\n\n float dyValue = getDy(batch, idyD, idyR, idyC, ch);\n\n dotProd += dyValue * avgMultiplier;\n }\n }\n }\n setOutput(dotProd);\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\nimport {AvgPool3DGrad, AvgPool3DGradAttrs, AvgPool3DGradInputs, backend_util, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {AvgPool3DBackpropProgram} from '../avg_pool_backprop_gpu';\nimport {MathBackendWebGL} from '../backend_webgl';\n\nexport function avgPool3DGrad(args: {\n inputs: AvgPool3DGradInputs,\n backend: MathBackendWebGL,\n attrs: AvgPool3DGradAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {dy, input} = inputs;\n const x = input;\n const {filterSize, strides, pad, dimRoundingMode} = attrs;\n const dilations: [number, number, number] = [1, 1, 1];\n\n const convInfo = backend_util.computePool3DInfo(\n x.shape as [number, number, number, number, number], filterSize, strides,\n dilations, pad, dimRoundingMode);\n const avgPoolBackpropProgram = new AvgPool3DBackpropProgram(convInfo);\n return

backend.runWebGLProgram(avgPoolBackpropProgram, [dy], x.dtype);\n}\n\nexport const avgPoolGrad3DConfig: KernelConfig = {\n kernelName: AvgPool3DGrad,\n backendName: 'webgl',\n kernelFunc: avgPool3DGrad as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n
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==\n
*/\nimport {AvgPoolGrad, AvgPoolGradAttrs, AvgPoolGradInputs, backend_util, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {AvgPool2DBackpropProgram} from '../avg_pool_backprop_gpu';\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {assertNotComplex} from '../webgl_util';\n\nexport function avgPoolGrad(args: {\n inputs: AvgPoolGradInputs,\n backend: MathBackendWebGL,\n attrs:
 AvgPoolGradAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {dy, input} = inputs;\n const x = input;\n assertNotComplex([dy, input], 'avgPoolGrad');\n const {filterSize, strides, pad} = attrs;\n\n const convInfo = backend_util.computePool2DInfo(\n   x.shape as [number, number, number, number], filterSize, strides,\n   1 /* dilations */, pad);\n const avgPoolBackpropProgram = new AvgPool2DBackpropProgram(convInfo);\n return backend.runWebGLProgram(avgPoolBackpropProgram, [dy], x.dtype);\n}\n\nexport const avgPoolGradConfig: KernelConfig = {\n kernelName: AvgPoolGrad,\n backendName: 'webgl',\n kernelFunc: avgPoolGrad as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n
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==\n
*/\n\nimport {BatchMatMul, BatchMatMulAttrs, BatchMatMulInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {batchMatMulImpl} from './BatchMatMul_impl';\n\nexport function batchMatMul(args: {\n inputs: BatchMatMulInputs,\n attrs: BatchMatMulAttrs,\n backend: MathBackendWebGL\n}) {\n const {inputs, backend, attrs} = args;\n const {a, b} = inputs;\n const {transposeA, transposeB} = attrs;\n\n return batchMatMulImpl({a, b, transposeA, transposeB, backend});\n}\n\nexport const batchMatMulConfig: KernelConfig
 = {\n kernelName: BatchMatMul,\n backendName: 'webgl',\n kernelFunc: batchMatMul as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class BatchNormProgram implements GPGPUProgram {\n

```
  variableNames: string[];\n  outputShape: number[] = [];\n  userCode: string;\n\n  constructor(\n      xShape:
number[], meanShape: number[], varianceShape: number[],\n      offsetShape: number[]|null, scaleShape:
number[]|null,\n      varianceEpsilon: number) {\n    this.variableNames = ['x', 'mean', 'variance'];\n
backend_util.assertAndGetBroadcastShape(xShape, meanShape);\n
backend_util.assertAndGetBroadcastShape(xShape, varianceShape);\n\n    let offsetSnippet = '0.0';\n    if
(offsetShape != null) {\n      backend_util.assertAndGetBroadcastShape(xShape, offsetShape);\n
this.variableNames.push('offset');\n      offsetSnippet = 'getOffsetAtOutCoords()';\n    }\n\n    let scaleSnippet =
'1.0';\n    if (scaleShape != null) {\n      backend_util.assertAndGetBroadcastShape(xShape, scaleShape);\n
this.variableNames.push('scale');\n      scaleSnippet = 'getScaleAtOutCoords()';\n    }\n\n    this.outputShape =
xShape;\n    this.userCode = `\n      void main() {\n        float
 x = getXAtOutCoords();\n        float mean = getMeanAtOutCoords();\n        float variance =
getVarianceAtOutCoords();\n        float offset = ${offsetSnippet};\n        float scale = ${scaleSnippet};\n        float
inv = scale * inversesqrt(variance + float(${varianceEpsilon}));\n        setOutput(dot(vec3(x, -mean, offset),
vec3(inv, inv, 1)));\n      }\n    `;\n  }\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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==========================================================================\n
*/\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nexport class BatchNormPackedProgram implements GPGPUProgram {\n  variableNames:
string[];\n  outputShape: number[];\n  userCode: string;\n  packedInputs = true;\n  packedOutput = true;\n\n
constructor(\n      xShape: number[], meanShape: number[], varianceShape: number[],\n      offsetShape:
number[]|null, scaleShape: number[]|null,\n      varianceEpsilon: number) {\n    this.variableNames = ['x', 'mean',
'variance'];\n    backend_util.assertAndGetBroadcastShape(xShape, meanShape);\n
backend_util.assertAndGetBroadcastShape(xShape, varianceShape);\n\n    let offsetSnippet = 'vec4(0.0)';\n    if
(offsetShape != null) {\n      backend_util.assertAndGetBroadcastShape(xShape, offsetShape);\n
this.variableNames.push('offset');\n      offsetSnippet = 'getOffsetAtOutCoords()';\n    }\n\n
    let scaleSnippet = 'vec4(1.0)';\n    if (scaleShape != null) {\n
backend_util.assertAndGetBroadcastShape(xShape, scaleShape);\n      this.variableNames.push('scale');\n
scaleSnippet = 'getScaleAtOutCoords()';\n    }\n\n    this.outputShape = xShape;\n    this.userCode = `\n      void
main() {\n        vec4 offset = ${offsetSnippet};\n        vec4 scale = ${scaleSnippet};\n\n        vec4 x =
getXAtOutCoords();\n        vec4 mean = getMeanAtOutCoords();\n        vec4 variance =
getVarianceAtOutCoords();\n\n        vec4 inv = scale * inversesqrt(variance + vec4(${varianceEpsilon}));\n\n
setOutput((x - mean) * inv + offset);\n      }\n    `;\n  }\n}\n","\n/**\n * @license\n * Copyright 2020 Google LLC.
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==========================================================================\n
*/\n\nimport {env, FusedBatchNorm, FusedBatchNormAttrs, FusedBatchNormInputs, KernelConfig, KernelFunc,
TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport
{BatchNormProgram} from '../batchnorm_gpu';\nimport {BatchNormPackedProgram} from
```

'../batchnorm_packed_gpu';\n\nexport const batchNorm: (params: {\n inputs: FusedBatchNormInputs,\n backend: MathBackendWebGL,\n attrs: FusedBatchNormAttrs\n}) => TensorInfo = ({inputs, backend, attrs}) => {\n const {x, mean, variance, offset, scale} = inputs;\n\n util.assert(\n   mean.shape.length === variance.shape.length,\n   () => 'Batch normalization gradient requires mean and variance to have ' +\n 'equal ranks.');\n util.assert(\n   offset == null || mean.shape.length === offset.shape.length,\n   () => 'Batch normalization gradient requires mean and offset to have ' +\n   'equal ranks.');\n util.assert(\n   scale == null || mean.shape.length === scale.shape.length,\n   () => 'Batch normalization gradient requires mean and scale to have ' +\n   'equal ranks.');\n\n let {varianceEpsilon} = attrs;\n if (varianceEpsilon == null) {\n   varianceEpsilon = 0.001;\n }\n\n const finalInputs = [x, mean, variance];\n\n let offsetShape = null;\n if (offset != null) {\n   offsetShape = offset.shape;\n   finalInputs.push(offset);\n }\n\n let scaleShape = null;\n if (scale != null) {\n   scaleShape = scale.shape;\n   finalInputs.push(scale);\n }\n\n const program = env().getBool('WEBGL_PACK_NORMALIZATION') ?\n   new BatchNormPackedProgram(\n   x.shape, mean.shape, variance.shape, offsetShape, scaleShape,\n   varianceEpsilon) :\n   new BatchNormProgram(\n   x.shape, mean.shape, variance.shape, offsetShape, scaleShape,\n varianceEpsilon);\n const output =\n   backend.runWebGLProgram(program, finalInputs, finalInputs[0].dtype);\n\n return output;\n};\n\nexport const batchNormConfig: KernelConfig = {\n kernelName: FusedBatchNorm,\n backendName: 'webgl',\n kernelFunc: batchNorm as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {GPGPUContext} from './gpgpu_context';\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class SliceProgram implements GPGPUProgram {\n variableNames = ['source'];\n outputShape: number[];\n userCode: string;\n rank: number;\n\n // Caching uniform location for speed.\n startLoc: WebGLUniformLocation;\n\n constructor(destSize: number[]) {\n   this.outputShape = destSize;\n   this.rank = destSize.length;\n\n   const dtype = getCoordsDataType(this.rank);\n   const uniformPart = `uniform int start[${this.rank}];`;\n   const sourceCoords = getCoords(this.rank);\n\n   let body: string;\n   const coordSum = destSize.map((_, i) => {\n   return `sourceLoc.${coords[i]} = start[${i}] + coords.${coords[i]};`;\n   });\n   body = `\n      ${dtype} sourceLoc;\n      ${dtype} coords = getOutputCoords();\n      ${coordSum.join('\\n')}\n    `;\n   this.userCode = `\n      ${uniformPart}\n      void main() {\n        ${body}\n        setOutput(getSource(${sourceCoords}));\n      }\n    `;\n }\n\n getCustomSetupFunc(start: number[]) {\n   if (start.length !== this.rank) {\n   throw Error(\n   `The rank (${this.rank}) of the program must match the ` +\n   `length of start (${start.length})`);\n   }\n   return (gpgpu: GPGPUContext, webGLProgram: WebGLProgram) => {\n   if (this.startLoc == null) {\n   this.startLoc = gpgpu.getUniformLocationNoThrow(webGLProgram, 'start');\n   if (this.startLoc == null) {\n   // This means the compiler has optimized and realized it doesn't need\n   // the uniform.\n   return;\n   }\n   }\n   gpgpu.gl.uniform1iv(this.startLoc, start);\n   };\n }\n}\n\nconst
 coords = ['x', 'y', 'z', 'w', 'u', 'v'];\n\nfunction getCoords(rank: number): string {\n if (rank === 1) {\n   return 'sourceLoc';\n } else if (rank <= 6) {\n   return coords.slice(0, rank).map(x => 'sourceLoc.' + x).join(',');\n } else {\n   throw Error(`Slicing for rank ${rank} is not yet supported`);\n }\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES

OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {GPGPUContext} from './gpgpu_context';\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getChannels} from './packing_util';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class SlicePackedProgram implements GPGPUProgram {\n variableNames = ['source'];\n packedInputs = true;\n packedOutput = true;\n outputShape: number[];\n userCode: string;\n rank: number;\n\n // Caching uniform location for speed.\n startLoc: WebGLUniformLocation;\n\n constructor(destSize: number[]) {\n this.outputShape = destSize;\n this.rank = destSize.length;\n\n const dtype = getCoordsDataType(this.rank);\n const coords = getChannels('coords', this.rank);\n const sourceLoc = getChannels('sourceLoc', this.rank);\n\n const innerDims =\n this.rank === 1 ? 'sourceLoc' : `vec2(${sourceLoc.slice(-2).join()})`;\n const getChannel =\n `getChannel(getSource(${sourceLoc.join()}), ${innerDims})`;\n const upperRow = `\n result.x = ${getChannel};\n if (++${coords[this.rank - 1]} < ${destSize[this.rank - 1]}) {\n ++${sourceLoc[this.rank - 1]};\n result.y = ${getChannel};\n --${sourceLoc[this.rank - 1]};\n }\n `;\n const lowerRow = this.rank === 1 ? '' : `\n --${coords[this.rank - 1]};\n if (++${coords[this.rank - 2]} < ${destSize[this.rank - 2]}) {\n ++${sourceLoc[this.rank - 2]};\n result.z = ${getChannel};\n if (++${coords[this.rank - 1]} < ${destSize[this.rank - 1]}) {\n ++${sourceLoc[this.rank - 1]};\n result.w = ${getChannel};\n }\n }\n `;\n\n const sourceLocSetup = this.rank <= 4 ?\n `sourceLoc = coords +\n ${dtype}(${destSize.map((_, i) => `start[${i}]`).join()});` :\n destSize.map((_, i) => `${sourceLoc[i]} = ${coords[i]} + start[${i}];`)\n .join('\\n');\n this.userCode = `\n uniform int start[${this.rank}];\n void main() {\n ${dtype} coords = getOutputCoords();\n ${dtype} sourceLoc;\n ${sourceLocSetup}\n vec4 result = vec4(0.);\n ${upperRow}\n ${lowerRow}\n setOutput(result);\n }\n `;\n }\n\n getCustomSetupFunc(start: number[]) {\n if (start.length !== this.rank) {\n throw Error(\n `The rank (${this.rank}) of the program must match the ` +\n `length of start (${start.length})`);\n }\n return (gpgpu: GPGPUContext, webGLProgram: WebGLProgram) => {\n if (this.startLoc == null) {\n this.startLoc = gpgpu.getUniformLocationNoThrow(webGLProgram, 'start');\n if (this.startLoc == null) {\n // This means the compiler has optimized and realized it doesn't need\n // the uniform.\n return;\n }\n }\n gpgpu.gl.uniform1iv(this.startLoc, start);\n };\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {backend_util, BatchToSpaceND, BatchToSpaceNDAttrs, BatchToSpaceNDInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\n\nimport {reshape} from './Reshape';\nimport {slice} from './Slice';\nimport {transpose} from './Transpose';\n\nexport const batchToSpaceND = (args: {\n inputs: BatchToSpaceNDInputs,\n backend: MathBackendWebGL,\n attrs: BatchToSpaceNDAttrs\n}): TensorInfo => {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {blockShape, crops} = attrs;\n\n util.assert(\n x.shape.length <= 4,\n () => 'batchToSpaceND for rank > 4 with a WebGL backend not ' +\n 'implemented yet');\n const prod = blockShape.reduce((a, b) => a * b);\n\n const reshaped = backend_util.getReshaped(x.shape, blockShape, prod);\n const permuted = backend_util.getPermuted(reshaped.length, blockShape.length);\n const reshapedPermuted =\n backend_util.getReshapedPermuted(x.shape, blockShape, prod);\n const sliceBeginCoords =\n backend_util.getSliceBeginCoords(crops, blockShape.length);\n const sliceSize =\n backend_util.getSliceSize(reshapedPermuted, crops, blockShape.length);\n\n const toDispose = [];\n\n const reshapedIntermediate =\n reshape({inputs: {x}, backend, attrs: {shape: reshaped}});\n const

transposedIntermediate
= transpose(\n {inputs: {x: reshapedIntermediate}, backend, attrs: {perm: permuted}});\n const reshapedIntermediate2 = reshape({\n inputs: {x: transposedIntermediate},\n backend,\n attrs: {shape: reshapedPermuted}\n });\n const sliced = slice({\n inputs: {x: reshapedIntermediate2},\n backend,\n attrs: {begin: sliceBeginCoords, size: sliceSize}\n });\n\n toDispose.push(reshapedIntermediate);\n toDispose.push(transposedIntermediate);\n toDispose.push(reshapedIntermediate2);\n\n toDispose.forEach(t => backend.disposeIntermediateTensorInfo(t));\n\n return sliced;\n};\n\nexport const batchToSpaceNDConfig: KernelConfig = {\n kernelName: BatchToSpaceND,\n backendName: 'webgl',\n kernelFunc: batchToSpaceND as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may
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==========\n */\n\nimport {Bincount, BincountAttrs, BincountInputs, KernelConfig, KernelFunc, TensorInfo, TypedArray} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {bincountImplCPU} from '../kernel_utils/shared';\n\nexport function bincount(args: {\n inputs: BincountInputs,\n backend: MathBackendWebGL,\n attrs: BincountAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x, weights} = inputs;\n const {size} = attrs;\n\n const xVals =
backend.readSync(x.dataId) as TypedArray;\n const weightsVals = backend.readSync(weights.dataId) as TypedArray;\n\n const outVals =\n bincountImplCPU(xVals, weightsVals, weights.dtype, weights.shape, size);\n\n return backend.makeTensorInfo([size], weights.dtype, outVals);\n}\n\nexport const bincountConfig: KernelConfig = {\n kernelName: Bincount,\n backendName: 'webgl',\n kernelFunc: bincount as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {UnaryOpProgram} from '../unaryop_gpu';\n\nconst TO_INT = `return float(int(x));`;\n\nexport function int(input: TensorInfo, backend: MathBackendWebGL): TensorInfo {\n const program = new UnaryOpProgram(input.shape, TO_INT);\n const output = backend.runWebGLProgram(program, [input], 'int32');\n return {dataId: output.dataId, shape: output.shape, dtype: output.dtype};\n}\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or
agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {GPGPUContext} from './gpgpu_context';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class ClipProgram implements GPGPUProgram {\n variableNames = ['A'];\n userCode: string;\n outputShape:

number[];\n\n // Caching uniform locations for speed.\n minLoc: WebGLUniformLocation;\n maxLoc: WebGLUniformLocation;\n\n constructor(aShape: number[]) {\n   this.outputShape = aShape;\n   this.userCode = `\n      uniform float minVal;\n      uniform float maxVal;\n\n      void main() {\n        float value = getAAtOutCoords();\n        if (isnan(value)) {\n          setOutput(value);\n          return;\n        }\n\n        setOutput(clamp(value, minVal, maxVal));\n      }\n    `;\n }\n\n getCustomSetupFunc(min: number, max: number) {\n   return (gpgpu: GPGPUContext, webGLProgram: WebGLProgram) => {\n   if (this.minLoc == null) {\n   this.minLoc = gpgpu.getUniformLocationNoThrow(webGLProgram, 'minVal');\n   this.maxLoc = gpgpu.getUniformLocationNoThrow(webGLProgram, 'maxVal');\n   }\n   gpgpu.gl.uniform1f(this.minLoc, min);\n   gpgpu.gl.uniform1f(this.maxLoc, max);\n   };\n }\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS
 OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {GPGPUContext} from './gpgpu_context';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class ClipPackedProgram implements GPGPUProgram {\n variableNames = ['A'];\n packedInputs = true;\n packedOutput = true;\n userCode: string;\n outputShape: number[];\n\n // Caching uniform locations for speed.\n minLoc: WebGLUniformLocation;\n maxLoc: WebGLUniformLocation;\n\n constructor(aShape: number[]) {\n   this.outputShape = aShape;\n   this.userCode = `\n      uniform float minVal;\n      uniform float maxVal;\n\n      void main() {\n        vec4 value = getAAtOutCoords();\n\n        if (any(isnan(value))) {\n          setOutput(value);\n          return;\n        }\n\n        setOutput(clamp(value, vec4(minVal), vec4(maxVal)));\n      }\n    `;\n }\n\n getCustomSetupFunc(min: number, max: number) {\n   return (gpgpu: GPGPUContext, webGLProgram: WebGLProgram) => {\n   if (this.minLoc == null) {\n   this.minLoc = gpgpu.getUniformLocationNoThrow(webGLProgram, 'minVal');\n   this.maxLoc = gpgpu.getUniformLocationNoThrow(webGLProgram, 'maxVal');\n   }\n   gpgpu.gl.uniform1f(this.minLoc, min);\n   gpgpu.gl.uniform1f(this.maxLoc, max);\n   };\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for
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*/\n\nimport {ClipByValue, ClipByValueAttrs, ClipByValueInputs, env, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {ClipProgram} from '../clip_gpu';\nimport {ClipPackedProgram} from '../clip_packed_gpu';\n\nexport function clipByValue(args: {\n inputs: ClipByValueInputs,\n backend: MathBackendWebGL,\n attrs: ClipByValueAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {clipValueMin, clipValueMax} = attrs;\n\n let program;\n if (env().getBool('WEBGL_PACK_CLIP')) {\n   program = new ClipPackedProgram(x.shape);\n } else {\n   program = new ClipProgram(x.shape);\n }\n const customSetup = program.getCustomSetupFunc(clipValueMin, clipValueMax);\n return backend.runWebGLProgram(program,
 [x], x.dtype, customSetup);\n}\n\nexport const clipByValueConfig: KernelConfig = {\n kernelName: ClipByValue,\n backendName: 'webgl',\n kernelFunc: clipByValue as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the

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```
offsets[0] = shapes[0][1];\n    for (let i = 1; i < offsets.length; i++) {\n      offsets[i] = offsets[i - 1] + shapes[i][1];\n    }\n\n    const snippets = [`if (yC < ${offsets[0]}) setOutput(getT0(yR, yC));`];\n    for (let i = 1; i < offsets.length; i++) {\n      const shift = offsets[i - 1];\n      snippets.push(\n          `else if (yC < ${offsets[i]}) ` +\n          `setOutput(getT${i}(yR, yC-${shift}));`);\n    }\n    const lastIndex = offsets.length;\n    const lastShift = offsets[offsets.length - 1];\n    snippets.push(`else setOutput(getT${lastIndex}(yR, yC-${lastShift}));`);\n\n    this.userCode = `\n      void main() {\n        ivec2 coords = getOutputCoords();\n        int yR = coords.x;\n        int yC = coords.y;\n\n        ${snippets.join('\n        ')}\n      }\n    `;\n  }\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance
 with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport {GPGPUProgram} from
'./gpgpu_math';\nimport {getChannels} from './packing_util';\nimport {getCoordsDataType} from
'./shader_compiler';\n\nexport class ConcatPackedProgram implements GPGPUProgram {\n  variableNames:
string[];\n  packedInputs = true;\n  packedOutput = true;\n  outputShape: number[] = [];\n  userCode: string;\n\n
constructor(shapes: number[][], axis: number) {\n    this.outputShape =
 backend_util.computeOutShape(shapes, axis);\n    const shape = this.outputShape;\n    const rank = shape.length;\n
const dtype = getCoordsDataType(rank);\n    const coords = getChannels('coords', rank);\n    const channels = ['x',
'y', 'z', 'w', 'u', 'v'].slice(0, rank);\n    this.variableNames = shapes.map((_, i) => `T${i}`);\n\n    const offsets:
number[] = new Array(shapes.length - 1);\n    offsets[0] = shapes[0][axis];\n    for (let i = 1; i < offsets.length; i++)
{\n      offsets[i] = offsets[i - 1] + shapes[i][axis];\n    }\n\n    const channel = channels[axis];\n    const lastChannels
= channels.slice(-2);\n    const allChannels = channels.join();\n\n    let getValueSnippet = `if (${channel} <
${offsets[0]}) {\n        return getChannel(\n            getT0(${allChannels}), vec2(${lastChannels.join()}));\n
}`;\n    for (let i = 1; i < offsets.length; i++) {\n      const shift = offsets[i - 1];\n      // Note: the >= comparison below
may seem unnecessary given the check\n
      // above but is needed to workaround branch execution issues on some\n      // devices. It makes all the
conditions exclusive without relying on\n      // execution order.\n      getValueSnippet += `\n        if (${channel} <
${offsets[i]}  && ${channel} >= ${offsets[i - 1]}) {\n          return getChannel(\n
getT${i}(${shiftedChannels(channels, channel, shift)}),\n              vec2(${shiftedChannels(lastChannels, channel,
shift)}));\n        }`;\n    }\n    const lastIndex = offsets.length;\n    const shift = offsets[offsets.length - 1];\n
getValueSnippet += `\n        return getChannel(\n            getT${lastIndex}(${shiftedChannels(channels, channel,
shift)}),\n            vec2(${shiftedChannels(lastChannels, channel, shift)}));`;\n\n    this.userCode = `\n      float
getValue(${channels.map(x => 'int ' + x)}) {\n        ${getValueSnippet}\n      }\n\n      void main() {\n        ${dtype}
coords = getOutputCoords();\n        vec4 result = vec4(getValue(${coords}), 0.,
 0., 0.);\n\n        ${coords[rank - 1]} = ${coords[rank - 1]} + 1;\n        if (${coords[rank - 1]} < ${shape[rank - 1]})
{\n          result.g = getValue(${coords});\n        }\n\n        ${coords[rank - 2]} = ${coords[rank - 2]} + 1;\n        if
(${coords[rank - 2]} < ${shape[rank - 2]}) {\n          result.a = getValue(${coords});\n        }\n\n        ${coords[rank
- 1]} = ${coords[rank - 1]} - 1;\n        if (${coords[rank - 2]} < ${shape[rank - 2]} &&\n            ${coords[rank - 1]}
< ${shape[rank - 1]}) {\n          result.b = getValue(${coords});\n        }\n        setOutput(result);\n      }\n    `;\n
}\n}\n\n/**\n * Return an expression for coordinates into a vector where a given channel\n * will be offset by
[shift].\n *\n * @param channels the channels to consider\n * @param channel the channel we want shifted\n *
@param shift  the amount to subtract from the channel.\n *\n * @returns a string of the form 'x, y-[shift], z' where
any one channel can\n * have the shift
```

applied.\n */\nfunction shiftedChannels(channels: string[], channel: string, shift: number) {\n const channelIdx = channels.indexOf(channel);\n const res = channels.map((c, idx) => {\n   if (idx === channelIdx) {\n   return `${c} - ${shift}`;\n   } else {\n   return c;\n   }\n });\n return res.join();\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {Imag, ImagInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {identity} from './Identity';\n\nexport function imag(args: {inputs: ImagInputs, backend: MathBackendWebGL}):\n   TensorInfo {\n const {inputs, backend} = args;\n const {input} = inputs;\n const inputData = backend.texData.get(input.dataId);\n\n return identity({inputs: {x: inputData.complexTensorInfos.imag}, backend});\n}\n\nexport const imagConfig: KernelConfig = {\n kernelName: Imag,\n backendName: 'webgl',\n kernelFunc: imag as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required\n by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {backend_util, Concat, ConcatAttrs, ConcatInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {concatImpl} from './Concat_impl';\nimport {identity} from './Identity';\n\nexport function concat(\n   args:\n   {inputs: ConcatInputs, attrs: ConcatAttrs, backend: MathBackendWebGL}):\n   TensorInfo {\n const {inputs, backend, attrs} = args;\n const {axis} = attrs;\n\n const $axis = util.parseAxisParam(axis, inputs[0].shape)[0];\n const outShape =\n   backend_util.computeOutShape(inputs.map(t\n => t.shape), $axis);\n\n if (util.sizeFromShape(outShape) === 0) {\n   return backend.makeTensorInfo(outShape, inputs[0].dtype, []);\n }\n\n // Keep only non-empty tensors (ignore tensors with 0 in their shape).\n const $inputs = inputs.filter(t => util.sizeFromShape(t.shape) > 0);\n if ($inputs.length === 1) {\n   return identity({inputs: {x: $inputs[0]}, backend});\n }\n\n const shapes = $inputs.map(t => t.shape);\n backend_util.assertParamsConsistent(shapes, $axis);\n\n return concatImpl($inputs, $axis, backend);\n}\n\nexport const concatConfig: KernelConfig = {\n kernelName: Concat,\n backendName: 'webgl',\n kernelFunc: concat as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless\n required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class Conv2DProgram implements GPGPUProgram {\n variableNames = ['x', 'W'];\n outputShape: number[];\n userCode: string;\n\n constructor(\n   convInfo: backend_util.Conv2DInfo, addBias = false,\n   activation: string = null, hasPreluActivationWeights = false,\n   hasLeakyreluAlpha = false) {\n   this.outputShape = convInfo.outShape;\n   const padTop = convInfo.padInfo.top;\n   const padLeft =

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convInfo.padInfo.left;\n    const strideHeight = convInfo.strideHeight;\n
    const strideWidth = convInfo.strideWidth;\n    const dilationHeight = convInfo.dilationHeight;\n    const
dilationWidth = convInfo.dilationWidth;\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth =
convInfo.filterWidth;\n\n    const inputDepthNearestVec4 = Math.floor(convInfo.inChannels / 4) * 4;\n    const
inputDepthVec4Remainder = convInfo.inChannels % 4;\n    const isChannelsLast = convInfo.dataFormat ===
'channelsLast';\n\n    const rowDim = isChannelsLast ? 1 : 2;\n    const colDim = isChannelsLast ? 2 : 3;\n    const
channelDim = isChannelsLast ? 3 : 1;\n\n    let activationSnippet = '', applyActivationSnippet = '';\n    if (activation)
{\n      if (hasPreluActivationWeights) {\n        activationSnippet = `float activation(float a) {\n          float b =
getPreluActivationWeightsAtOutCoords();\n          ${activation}\n        }`;\n      } else if (hasLeakyreluAlpha) {\n
activationSnippet = `float activation(float a) {\n          float b = getLeakyreluAlphaAtOutCoords();\n
          ${activation}\n        }`;\n      } else {\n        activationSnippet = `\n          float activation(float x) {\n
${activation}\n        }\n        `;\n      }\n\n      applyActivationSnippet = `result = activation(result);`;\n    }\n\n
const addBiasSnippet = addBias ? 'result += getBiasAtOutCoords();' : '';\n    if (addBias) {\n
this.variableNames.push('bias');\n    }\n\n    if (hasPreluActivationWeights) {\n
this.variableNames.push('preluActivationWeights');\n    }\n\n    if (hasLeakyreluAlpha) {\n
this.variableNames.push('leakyreluAlpha');\n    }\n\n    this.userCode = `\n      ${activationSnippet}\n\n      const
ivec2 strides = ivec2(${strideHeight}, ${strideWidth});\n      const ivec2 pads = ivec2(${padTop}, ${padLeft});\n\n
  void main() {\n        ivec4 coords = getOutputCoords();\n        int batch = coords[0];\n        int d2 =
coords[${channelDim}];\n\n        ivec2 xRCCorner =\n            ivec2(coords[${rowDim}],
 coords[${colDim}]) * strides - pads;\n        int xRCorner = xRCCorner.x;\n        int xCCorner = xRCCorner.y;\n\n
  // Convolve x(?, ?, d1) with w(:, :, d1, d2) to get y(yR, yC, d2).\n        // ? = to be determined. : = across all values
in that axis.\n        float dotProd = 0.0;\n        for (int wR = 0; wR < ${filterHeight}; wR++) {\n          int xR =
xRCorner + wR * ${dilationHeight};\n\n          if (xR < 0 || xR >= ${convInfo.inHeight}) {\n            continue;\n
}\n\n          for (int wC = 0; wC < ${filterWidth}; wC++) {\n            int xC = xCCorner + wC *
${dilationWidth};\n\n            if (xC < 0 || xC >= ${convInfo.inWidth}) {\n              continue;\n            }\n\n
for (int d1 = 0; d1 < ${inputDepthNearestVec4}; d1 += 4) {\n              vec4 wValues = vec4(\n                getW(wR,
wC, d1, d2),\n                getW(wR, wC, d1 + 1, d2),\n                getW(wR, wC, d1 + 2, d2),\n                getW(wR,
wC, d1 + 3, d2)\n
          );\n\n            if (${isChannelsLast}) {\n              vec4 xValues = vec4(\n                getX(batch, xR, xC,
d1),\n                getX(batch, xR, xC, d1 + 1),\n                getX(batch, xR, xC, d1 + 2),\n                getX(batch, xR,
xC, d1 + 3)\n              );\n              dotProd += dot(xValues, wValues);\n            } else {\n              vec4 xValues
= vec4(\n                getX(batch, d1, xR, xC),\n                getX(batch, d1 + 1, xR, xC),\n                getX(batch, d1
+ 2, xR, xC),\n                getX(batch, d1 + 3, xR, xC)\n              );\n              dotProd += dot(xValues,
wValues);\n            }\n          }\n\n          if (${inputDepthVec4Remainder === 1}) {\n\n            if
(${isChannelsLast}) {\n              dotProd +=\n                getX(batch, xR, xC, ${inputDepthNearestVec4}) *\n
            getW(wR, wC, ${inputDepthNearestVec4}, d2);\n            } else {\n
  dotProd +=\n                getX(batch, ${inputDepthNearestVec4}, xR, xC) *\n                getW(wR, wC,
${inputDepthNearestVec4}, d2);\n            }\n\n          } else if (${inputDepthVec4Remainder === 2}) {\n
vec2 wValues = vec2(\n              getW(wR, wC, ${inputDepthNearestVec4}, d2),\n              getW(wR, wC,
${inputDepthNearestVec4} + 1, d2)\n            );\n\n            if (${isChannelsLast}) {\n              vec2 xValues =
vec2(\n                getX(batch, xR, xC, ${inputDepthNearestVec4}),\n                getX(batch, xR, xC,
${inputDepthNearestVec4} + 1)\n              );\n              dotProd += dot(xValues, wValues);\n            } else {\n
            vec2 xValues = vec2(\n                getX(batch, ${inputDepthNearestVec4}, xR, xC),\n                getX(batch,
${inputDepthNearestVec4} + 1, xR, xC)\n              );\n              dotProd += dot(xValues, wValues);\n
}\n\n          } else if
 (${inputDepthVec4Remainder === 3}) {\n            vec3 wValues = vec3(\n              getW(wR, wC,
${inputDepthNearestVec4}, d2),\n              getW(wR, wC, ${inputDepthNearestVec4} + 1, d2),\n
getW(wR, wC, ${inputDepthNearestVec4} + 2, d2)\n            );\n\n            if (${isChannelsLast}) {\n
```

```
vec3 xValues = vec3(\n getX(batch, xR, xC, ${inputDepthNearestVec4}),\n getX(batch, xR, xC, ${inputDepthNearestVec4} + 1),\n getX(batch, xR, xC, ${inputDepthNearestVec4} + 2)\n );\n dotProd += dot(xValues, wValues);\n } else {\n vec3 xValues = vec3(\n getX(batch, ${inputDepthNearestVec4}, xR, xC),\n getX(batch, ${inputDepthNearestVec4} + 1, xR, xC),\n getX(batch, ${inputDepthNearestVec4} + 2, xR, xC)\n );\n dotProd += dot(xValues, wValues);\n }\n\n }\n }\n }\n\n float result = dotProd;\n ${addBiasSnippet}\n ${applyActivationSnippet}\n setOutput(result);\n }\n `;\n }\n}\n\nexport class Conv3DProgram implements GPGPUProgram {\n variableNames = ['x', 'W'];\n outputShape: number[];\n userCode: string;\n\n constructor(convInfo: backend_util.Conv3DInfo) {\n this.outputShape = convInfo.outShape;\n const padFront = convInfo.padInfo.front;\n const padTop = convInfo.padInfo.top;\n const padLeft = convInfo.padInfo.left;\n const strideDepth = convInfo.strideDepth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n const dilationDepth = convInfo.dilationDepth;\n const dilationHeight = convInfo.dilationHeight;\n const dilationWidth = convInfo.dilationWidth;\n const filterDepth = convInfo.filterDepth;\n const filterHeight = convInfo.filterHeight;\n const filterWidth = convInfo.filterWidth;\n\n const inputDepthNearestVec4 = Math.floor(convInfo.inChannels / 4) * 4;\n const inputDepthVec4Remainder = convInfo.inChannels % 4;\n\n this.userCode = `\n const ivec3 strides = ivec3(${strideDepth}, ${strideHeight}, ${\n strideWidth});\n const ivec3 pads = ivec3(${padFront}, ${padTop}, ${padLeft});\n\n void main() {\n ivec5 coords = getOutputCoords();\n int batch = coords.x;\n int d2 = coords.u;\n\n ivec3 xFRCCorner = ivec3(coords.y, coords.z, coords.w) * strides - pads;\n int xFCorner = xFRCCorner.x;\n int xRCorner = xFRCCorner.y;\n int xCCorner = xFRCCorner.z;\n\n // Convolve x(?, ?, ?, d1) with w(:, :, :, d1, d2) to get\n // y(yF, yR, yC, d2). ? = to be determined. : = across all\n // values in that axis.\n float dotProd = 0.0;\n for (int wF = 0; wF < ${filterDepth}; wF++) {\n int xF = xFCorner + wF * ${dilationDepth};\n\n if (xF < 0 || xF >= ${convInfo.inDepth}) {\n continue;\n }\n\n for (int wR = 0; wR < ${filterHeight}; wR++) {\n int xR = xRCorner + wR * ${dilationHeight};\n\n if (xR < 0 || xR >= ${convInfo.inHeight}) {\n continue;\n }\n\n for (int wC = 0; wC < ${filterWidth}; wC++) {\n int xC = xCCorner + wC * ${dilationWidth};\n\n if (xC < 0 || xC >= ${convInfo.inWidth}) {\n continue;\n }\n\n for (int d1 = 0; d1 < ${inputDepthNearestVec4}; d1 += 4) {\n vec4 xValues = vec4(\n getX(batch, xF, xR, xC, d1),\n getX(batch, xF, xR, xC, d1 + 1),\n getX(batch, xF, xR, xC, d1 + 2),\n getX(batch, xF, xR, xC, d1 + 3)\n );\n vec4 wValues = vec4(\n getW(wF, wR, wC, d1, d2),\n getW(wF, wR, wC, d1 + 1, d2),\n getW(wF, wR, wC, d1 + 2, d2),\n getW(wF, wR, wC, d1 + 3, d2)\n );\n\n dotProd += dot(xValues, wValues);\n }\n\n if (${inputDepthVec4Remainder === 1}) {\n dotProd +=\n getX(batch, xF, xR, xC, ${inputDepthNearestVec4}) *\n getW(wF, wR, wC, ${inputDepthNearestVec4}, d2);\n } else if (${inputDepthVec4Remainder === 2}) {\n vec2 xValues = vec2(\n getX(batch, xF, xR, xC, ${inputDepthNearestVec4}),\n getX(batch, xF, xR, xC, ${inputDepthNearestVec4} + 1)\n );\n vec2 wValues = vec2(\n getW(wF, wR, wC, ${inputDepthNearestVec4}, d2),\n getW(wF, wR, wC, ${inputDepthNearestVec4} + 1, d2)\n );\n dotProd += dot(xValues, wValues);\n } else if (${inputDepthVec4Remainder === 3}) {\n vec3 xValues = vec3(\n getX(batch, xF,\n xR, xC, ${inputDepthNearestVec4}),\n getX(batch, xF, xR, xC, ${inputDepthNearestVec4} + 1),\n getX(batch, xF, xR, xC, ${inputDepthNearestVec4} + 2)\n );\n vec3 wValues = vec3(\n getW(wF, wR, wC, ${inputDepthNearestVec4}, d2),\n getW(wF, wR, wC,\n ${inputDepthNearestVec4} + 1, d2),\n getW(wF, wR, wC, ${inputDepthNearestVec4} + 2, d2)\n );\n dotProd += dot(xValues, wValues);\n }\n }\n }\n }\n setOutput(dotProd);\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights
```

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==========\n */\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {getGlslDifferences} from './glsl_version';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class Im2ColPackedProgram implements GPGPUProgram {\n variableNames = ['A'];\n packedInputs = true;\n packedOutput = true;\n outputShape: number[];\n userCode: string;\n\n constructor(\n outputShape: number[], inputShape: number[],\n convInfo: backend_util.Conv2DInfo) {\n this.outputShape = outputShape;\n\n const {\n filterWidth,\n inChannels,\n strideWidth,\n strideHeight,\n padInfo,\n outWidth,\n dilationWidth,\n dilationHeight,\n dataFormat\n } = convInfo;\n const {left, top} = padInfo;\n const itemsPerBlockRow = inChannels * filterWidth;\n const glsl = getGlslDifferences();\n const isChannelsLast = dataFormat === 'channelsLast';\n const rowDim = isChannelsLast ? 0 : 1;\n const colDim = isChannelsLast ? 1 : 2;\n\n let unrolled = ``;\n\n for (let row = 0; row <= 1; row++) {\n for (let col = 0; col <= 1; col++) {\n unrolled += `\n blockIndex = rc.y + ${col};\n pos = rc.x + ${row};\n\n if(blockIndex < ${outputShape[1]} && pos < ${outputShape[0]}) {\n offsetY = int(blockIndex / (${outWidth})) * ${strideHeight} - ${\n top};\n d0 = offsetY + ${dilationHeight} * (pos / ${itemsPerBlockRow});\n\n if(d0 < ${inputShape[rowDim]} && d0 >= 0) {\n\n offsetX = int(mod(float(blockIndex), ${outWidth}.) * ${\n strideWidth}. - ${left}.);\n d1 = offsetX + ${dilationWidth}\n * (int(mod(float(pos), ${\n itemsPerBlockRow}.) / ${inChannels}.));\n\n if(d1 < ${inputShape[colDim]} && d1 >= 0) {\n\n ch = int(mod(float(pos), ${inChannels}.));\n\n if (${isChannelsLast}) {\n innerDims = vec2(d1, ch);\n result[${row * 2 + col}] = getChannel(\n getA(d0, int(innerDims.x),\n int(innerDims.y)), innerDims);\n } else {\n innerDims = vec2(d0, d1);\n result[${row * 2 + col}] = getChannel(\n getA(ch, int(innerDims.x),\n int(innerDims.y)), innerDims);\n }\n }\n }\n }\n `;\n }\n }\n\n this.userCode = `\n void main() {\n ivec2 rc = getOutputCoords();\n\n vec4 result = vec4(0);\n\n int blockIndex, pos, offsetY, d0, offsetX, d1, ch;\n vec2 innerDims;\n\n ${unrolled}\n\n ${glsl.output} = result;\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {backend_util, env, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {Im2ColPackedProgram} from '../im2col_packed_gpu';\nimport {mapActivationToShaderProgram}
from '../kernel_utils/kernel_funcs_utils';\nimport {MatMulPackedProgram} from '../mulmat_packed_gpu';\nimport * as webgl_util from '../webgl_util';\n\nimport {batchMatMulImpl, MATMUL_SHARED_DIM_THRESHOLD} from './BatchMatMul_impl';\nimport {identity} from './Identity';\nimport {reshape} from './Reshape';\n\ntype Conv2DConfig = {\n x: TensorInfo,\n filter: TensorInfo,\n convInfo: backend_util.Conv2DInfo,\n backend: MathBackendWebGL,\n bias?: TensorInfo,\n preluActivationWeights?: TensorInfo,\n leakyreluAlpha?: number,\n activation?: backend_util.Activation\n};\n\n// For 1x1 kernels that iterate through every point in the input, convolution\n// can be expressed as matrix multiplication (without need for memory\n// remapping).\nexport

```
function conv2dByMatMul({\n  x,\n  filter,\n  convInfo,\n  backend,\n  bias = null,\n  preluActivationWeights =
null,\n  leakyreluAlpha = 0,\n  activation = null\n}: Conv2DConfig) {\n  // Reshapes conv2D input to 2D tensors,
uses
 matMul and then reshape the\n  // result from 2D to 4D.\n  const xShape = x.shape;\n  const xTexData =
backend.texData.get(x.dataId);\n  const sharedMatMulDim = convInfo.inChannels;\n  const outerShapeX =
xShape[0] * xShape[1] * xShape[2];\n  const outerShapeFilter = convInfo.outChannels;\n  const isChannelsLast =
convInfo.dataFormat === 'channelsLast';\n  const transposeA = false;\n  const transposeB = false;\n\n  let out:
TensorInfo;\n  const intermediates: TensorInfo[] = [];\n\n  // TODO: Once reduction ops are packed, batchMatMul
will always be packed\n  // and we can remove this condition.\n  const batchMatMulWillBeUnpacked =\n
(outerShapeX === 1 || outerShapeFilter === 1) &&\n      sharedMatMulDim >
MATMUL_SHARED_DIM_THRESHOLD;\n  const reshapeWillBeExpensive = xShape[2] % 2 !== 0 &&
!!xTexData.isPacked;\n\n  if (batchMatMulWillBeUnpacked || !env().getBool('WEBGL_LAZILY_UNPACK') ||\n
 !env().getBool('WEBGL_PACK_BINARY_OPERATIONS') ||\n      !reshapeWillBeExpensive) {\n
    const targetShape = isChannelsLast ? xShape[0] * xShape[1] * xShape[2] :\n                                    xShape[0]
* xShape[2] * xShape[3];\n    const xReshaped = reshape({\n      inputs: {x},\n      backend,\n      attrs: {shape: [1,
targetShape, convInfo.inChannels]}\n    });\n    const filterReshaped = reshape({\n      inputs: {x: filter},\n
backend,\n      attrs: {shape: [1, convInfo.inChannels, convInfo.outChannels]}\n    });\n    const result =
batchMatMulImpl({\n      a: xReshaped,\n      b: filterReshaped,\n      transposeA,\n      transposeB,\n      backend,\n
 bias,\n      activation,\n      preluActivationWeights,\n      leakyreluAlpha\n    });\n\n    out = reshape(\n      {inputs:
{x: result}, backend, attrs: {shape: convInfo.outShape}});\n\n    intermediates.push(xReshaped);\n
intermediates.push(filterReshaped);\n    intermediates.push(result);\n  } else {\n    // Following optimization is
specific to packed |x| with odd row count\n    // (For
 example, in channelLast mode, 'row count' refers to x.shape[2]):\n    // we avoid expensive packed 2x2 reshape by
padding row count to next,\n    // even number. When x.shape[2] is odd, the result of packed batchMatMul is\n    //
the same (has the same texture layout and and values in the texture) as\n    // it is for even x.shape[2] + 1. We make
the odd-rows tensor to look like\n    // even-rows tensor before the operation and, after the batchMatMul,\n    // fix
the even-rows result to have odd number of rows.\n    const targetShape = isChannelsLast ?\n        xShape[0] *
xShape[1] * (xShape[2] + 1) :\n        xShape[0] * xShape[2] * (xShape[3] + 1);\n    const xReshaped: TensorInfo =
{\n      dataId: x.dataId,\n      shape: [1, targetShape, convInfo.inChannels],\n      dtype: x.dtype\n    };\n    //
xTexData.shape gets referenced from GPGPUBinary.inShapeInfos.\n    // Decrementing row count, after
batchMatMul->...->compileProgram leads to\n    // invalid row count within the reference
 in GPGPUBinary.inShapeInfos.\n    // Alternative fix would be to provide a copy to GPGPUBinary.inShapeInfos\n
// in compileProgram method, but that would affect compilation of all\n    // programs - instead, provide a copy here,
with even row count, before\n    // calling batchMatMul->...->compileProgram and after that, the original\n    //
xTexData.shape is restored.\n    const originalXTexDataShape = xTexData.shape;\n    xTexData.shape =
xTexData.shape.slice();\n    xTexData.shape[xTexData.shape.length - 2]++;\n    util.assert(\n
webgl_util.isReshapeFree(xTexData.shape, xReshaped.shape),\n        () => `packed reshape ${xTexData.shape} to
${\n            xReshaped.shape} isn't free`);\n    const filterReshaped = reshape({\n      inputs: {x: filter},\n
backend,\n      attrs: {shape: [1, convInfo.inChannels, convInfo.outChannels]}\n    });\n
intermediates.push(filterReshaped);\n    const pointwiseConv = batchMatMulImpl({\n      a: xReshaped,\n      b:
filterReshaped,\n
     backend,\n      transposeA,\n      transposeB,\n      bias,\n      activation,\n      preluActivationWeights,\n
leakyreluAlpha\n    });\n\n    const pointwiseConvTexData = backend.texData.get(pointwiseConv.dataId);\n
util.assert(\n        pointwiseConvTexData.isPacked,\n        () => 'batchMatMul result is expected to be packed');\n
// Restore the input shape to original.\n    xTexData.shape = originalXTexDataShape;\n    // Set the output shape -
there is no need for expensive reshape as data\n    // layout is already correct.\n    pointwiseConvTexData.shape =
convInfo.outShape;\n\n    out = identity({inputs: {x: pointwiseConv}, backend});\n    out.shape =
convInfo.outShape;\n\n    intermediates.push(pointwiseConv);\n  }\n\n  for (const i of intermediates) {\n
```

backend.disposeIntermediateTensorInfo(i);\n }\n\n return out;\n}\n\n// Implements the im2row algorithm as outlined in \"High Performance\n// Convolutional Neural Networks for Document Processing\" (Suvisoft, 2006)\nexport function conv2dWithIm2Row({\n x,\n filter,\n convInfo,\n backend,\n bias = null,\n preluActivationWeights = null,\n leakyreluAlpha = 0,\n activation = null\n}: Conv2DConfig) {\n // Rearranges conv2d input so each block to be convolved over forms the\n // column of a new matrix with shape [filterWidth * filterHeight *\n // inChannels, outHeight * outWidth]. The filter is also rearranged so each\n // output channel forms a row of a new matrix with shape [outChannels,\n // filterWidth * filterHeight * inChannels]. The convolution is then\n // computed by multiplying these matrices and reshaping the result.\n const {\n filterWidth,\n filterHeight,\n inChannels,\n outWidth,\n outHeight,\n dataFormat\n } = convInfo;\n\n const isChannelsLast = dataFormat === 'channelsLast';\n\n const sharedDim = filterWidth * filterHeight * inChannels;\n const numCols = outHeight * outWidth;\n const x2ColShape = [sharedDim, numCols];\n const transposeA
  = true;\n const transposeB = false;\n\n const intermediates: TensorInfo[] = [];\n\n const xSqueezed =\n reshape({inputs: {x}, backend, attrs: {shape: x.shape.slice(1)}});\n const w2Row = reshape({\n   inputs: {x: filter},\n   backend,\n   attrs: {shape: [1, sharedDim, util.sizeFromShape(filter.shape) / sharedDim]}\n });\n\n intermediates.push(xSqueezed);\n intermediates.push(w2Row);\n\n const im2ColProgram =\n   new Im2ColPackedProgram(x2ColShape, xSqueezed.shape, convInfo);\n const im2Col =
  backend.runWebGLProgram(im2ColProgram, [xSqueezed], 'float32');\n const im2ColReshaped = reshape({\n inputs: {x: im2Col},\n   backend,\n   attrs: {shape: [1, x2ColShape[0], x2ColShape[1]]}\n });\n\n intermediates.push(im2Col);\n intermediates.push(im2ColReshaped);\n\n const hasBias = bias != null;\n const hasPreluActivationWeights = preluActivationWeights != null;\n const hasLeakyreluAlpha = activation ===
  'leakyrelu';\n const fusedActivation =\n   activation ?
  mapActivationToShaderProgram(activation, true) : null;\n const matmulProgram = new MatMulPackedProgram(\n   im2ColReshaped.shape as [number, number, number],\n   w2Row.shape as [number, number, number],\n   [1, numCols, convInfo.outChannels], transposeA, transposeB, hasBias,\n   fusedActivation,
  hasPreluActivationWeights, hasLeakyreluAlpha);\n const inputs: TensorInfo[] = [im2ColReshaped, w2Row];\n if (bias) {\n   inputs.push(bias);\n }\n if (hasPreluActivationWeights) {\n   inputs.push(preluActivationWeights);\n }\n if (hasLeakyreluAlpha) {\n   const $leakyreluAlpha = backend.makeTensorInfo(\n   [], 'float32',\n util.createScalarValue(leakyreluAlpha as {} as 'float32', 'float32'));\n   inputs.push($leakyreluAlpha);\n intermediates.push($leakyreluAlpha);\n }\n const product = backend.runWebGLProgram(matmulProgram, inputs,
  'float32');\n\n const outShape = isChannelsLast ?\n   [1, outHeight, outWidth, convInfo.outChannels] :\n   [1, convInfo.outChannels,
  outHeight, outWidth];\n const out =\n   reshape({inputs: {x: product}, backend, attrs: {shape: outShape}});\n\n intermediates.push(product);\n for (const i of intermediates) {\n   backend.disposeIntermediateTensorInfo(i);\n }\n\n return out;\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport
  {backend_util, Conv2D, Conv2DAttrs, Conv2DInputs, env, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {Conv2DProgram} from '../conv_gpu';\nimport {conv2dByMatMul, conv2dWithIm2Row} from './Conv2D_impl';\nimport {reshape} from './Reshape';\n\nexport function conv2d(\n   args:\n   {inputs: Conv2DInputs, attrs: Conv2DAttrs, backend: MathBackendWebGL}) {\n const {inputs, backend, attrs} = args;\n const {x, filter} = inputs;\n const {strides, pad,

dataFormat, dilations, dimRoundingMode} = attrs;\n\n const $dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n x.shape as [number, number, number, number],\n   filter.shape as [number, number, number, number], strides, dilations, pad,\n   dimRoundingMode, false /* depthwise */, $dataFormat);\n let out: TensorInfo;\n\n if (convInfo.filterHeight === 1 && convInfo.filterWidth ===
 1 &&\n   convInfo.dilationHeight === 1 && convInfo.dilationWidth === 1 &&\n   convInfo.strideHeight === 1 && convInfo.strideWidth === 1 &&\n   (convInfo.padInfo.type === 'SAME' || convInfo.padInfo.type === 'VALID')) {\n   out = conv2dByMatMul({x, filter, convInfo, backend});\n } else if (env().getBool('WEBGL_CONV_IM2COL') && x.shape[0] === 1) {\n   out = conv2dWithIm2Row({x, filter, convInfo, backend});\n } else {\n   const program = new Conv2DProgram(convInfo);\n   out = backend.runWebGLProgram(program, [x, filter], 'float32');\n }\n\n const outReshaped =\n   reshape({inputs: {x: out}, backend, attrs: {shape: convInfo.outShape}});\n backend.disposeIntermediateTensorInfo(out);\n\n return outReshaped;\n}\n\nexport const conv2DConfig: KernelConfig = {\n kernelName: Conv2D,\n backendName: 'webgl',\n kernelFunc: conv2d as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
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==\n */\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class Conv2DDerFilterProgram implements GPGPUProgram {\n variableNames = ['x', 'dy'];\n outputShape: number[];\n userCode: string;\n\n constructor(convInfo: backend_util.Conv2DInfo) {\n   this.outputShape = convInfo.filterShape;\n\n   const strideHeight = convInfo.strideHeight;\n   const strideWidth = convInfo.strideWidth;\n   const padTop = convInfo.padInfo.top;\n   const padLeft = convInfo.padInfo.left;\n   const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n\n   this.userCode = `\n   void main() {\n   ivec4 coords = getOutputCoords();\n   int wR = coords.x;\n   int wC = coords.y;\n   int d1 = coords.z;\n   int d2 = coords.w;\n\n   // Convolve x(?, ?, d1) with dy(:, :, d2) to get dw(wR, wC, d1, d2).\n   // ? = to be determined. : = across all values in that axis.\n   float dotProd = 0.0;\n\n   for (int b = 0; b < ${convInfo.batchSize}; b++) {\n   for (int yR = 0; yR < ${convInfo.outHeight}; yR++) {\n   int xR = wR + yR * ${strideHeight} - ${padTop};\n\n   if (xR < 0 || xR >= ${convInfo.inHeight}) {\n   continue;\n   }\n\n   for (int yC = 0; yC < ${convInfo.outWidth}; yC++) {\n   int xC = wC + yC * ${strideWidth} - ${padLeft};\n\n
              if (xC < 0 || xC >= ${convInfo.inWidth}) {\n   continue;\n   }\n\n   if (${isChannelsLast}) {\n   float dyValue = getDy(b, yR, yC, d2);\n   float xValue = getX(b, xR, xC, d1);\n   dotProd += (xValue * dyValue);\n   } else {\n   float dyValue = getDy(b, d2, yR, yC);\n   float xValue = getX(b, d1, xR, xC);\n   dotProd += (xValue * dyValue);\n   }\n\n   }\n   }\n   }\n   setOutput(dotProd);\n   }\n   `;\n }\n}\n\nexport class Conv2DDerInputProgram implements GPGPUProgram {\n variableNames = ['dy', 'W'];\n outputShape: number[];\n userCode: string;\n\n constructor(convInfo: backend_util.Conv2DInfo) {\n   this.outputShape = convInfo.inShape;\n\n   const filterHeight = convInfo.filterHeight;\n   const filterWidth = convInfo.filterWidth;\n   const strideHeight = convInfo.strideHeight;\n   const strideWidth
 = convInfo.strideWidth;\n   const isChannelsLast = convInfo.dataFormat === 'channelsLast';\n\n   const padTop = filterHeight - 1 - convInfo.padInfo.top;\n   const padLeft = filterWidth - 1 - convInfo.padInfo.left;\n\n   const rowDim = isChannelsLast ? 1 : 2;\n   const colDim = isChannelsLast ? 2 : 3;\n   const channelDim = isChannelsLast ? 3 : 1;\n\n   this.userCode = `\n   const ivec2 pads = ivec2(${padTop}, ${padLeft});\n\n   void main() {\n   ivec4 coords = getOutputCoords();\n   int batch = coords[0];\n   int d1 =

```
coords[${channelDim}];\n\n        ivec2 dyCorner = ivec2(coords[${rowDim}], coords[${colDim}]) - pads;\n        int dyRCorner = dyCorner.x;\n        int dyCCorner = dyCorner.y;\n\n        // Convolve dy(?, ?, d2) with w(:, :, d1, d2) to compute dx(xR, xC, d1).\n        // ? = to be determined. : = across all values in that axis.\n        float dotProd = 0.0;\n    for (int wR = 0; wR < ${filterHeight}; wR++) {\n          float dyR = float(dyRCorner + wR) / ${strideHeight}.0;\n\n          if (dyR < 0.0 || dyR >= ${convInfo.outHeight}.0 || fract(dyR) > 0.0) {\n            continue;\n          }\n          int idyR = int(dyR);\n\n          int wRPerm = ${filterHeight} - 1 - wR;\n\n          for (int wC = 0; wC < ${filterWidth}; wC++) {\n            float dyC = float(dyCCorner + wC) / ${strideWidth}.0;\n\n            if (dyC < 0.0 || dyC >= ${convInfo.outWidth}.0 ||\n                fract(dyC) > 0.0) {\n              continue;\n            }\n            int idyC = int(dyC);\n\n            int wCPerm = ${filterWidth} - 1 - wC;\n\n            for (int d2 = 0; d2 < ${convInfo.outChannels}; d2++) {\n\n              if (${isChannelsLast}) {\n                float xValue = getDy(batch, idyR, idyC, d2);\n                float wValue = getW(wRPerm, wCPerm, d1, d2);\n                dotProd += xValue * wValue;\n              } else {\n                float xValue = getDy(batch, d2, idyR, idyC);\n                float wValue = getW(wRPerm,\n                  wCPerm, d1, d2);\n                dotProd += xValue * wValue;\n              }\n\n            }\n          }\n        }\n        setOutput(dotProd);\n      }\n    `;\n  }\n}\n\nexport class Conv3DDerFilterProgram implements GPGPUProgram {\n  variableNames = ['x', 'dy'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(convInfo: backend_util.Conv3DInfo) {\n    this.outputShape = convInfo.filterShape;\n\n    const strideDepth = convInfo.strideDepth;\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const padFront = convInfo.padInfo.front;\n    const padTop = convInfo.padInfo.top;\n    const padLeft = convInfo.padInfo.left;\n\n    this.userCode = `\n      void main() {\n        ivec5 coords = getOutputCoords();\n        int wF = coords.x;\n        int wR = coords.y;\n        int wC = coords.z;\n        int d1 = coords.w;\n        int d2 = coords.u;\n\n        float dotProd = 0.0;\n\n        for (int b = 0; b < ${convInfo.batchSize}; b++) {\n          for (int yF = 0; yF < ${convInfo.outDepth}; yF++) {\n            int xF = wF + yF * ${strideDepth} - ${padFront};\n\n            if (xF < 0 || xF >= ${convInfo.inDepth}) {\n              continue;\n            }\n\n            for (int yR = 0; yR < ${convInfo.outHeight}; yR++) {\n              int xR = wR + yR * ${strideHeight} - ${padTop};\n\n              if (xR < 0 || xR >= ${convInfo.inHeight}) {\n                continue;\n              }\n\n              for (int yC = 0; yC < ${convInfo.outWidth}; yC++) {\n                int xC = wC + yC * ${strideWidth} - ${padLeft};\n\n                if (xC < 0 || xC >= ${convInfo.inWidth}) {\n                  continue;\n                }\n\n                float dyValue = getDy(b, yF, yR, yC, d2);\n                float xValue = getX(b, xF, xR, xC, d1);\n                dotProd += (xValue * dyValue);\n              }\n            }\n          }\n        }\n        setOutput(dotProd);\n      }\n    `;\n  }\n}\n\nexport class Conv3DDerInputProgram implements GPGPUProgram {\n  variableNames = ['dy', 'W'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(convInfo: backend_util.Conv3DInfo) {\n    this.outputShape = convInfo.inShape;\n\n    const filterDepth = convInfo.filterDepth;\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth = convInfo.filterWidth;\n    const strideDepth = convInfo.strideDepth;\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n\n    const padFront = filterDepth - 1 - convInfo.padInfo.front;\n    const padTop = filterHeight - 1 - convInfo.padInfo.top;\n    const padLeft = filterWidth - 1 - convInfo.padInfo.left;\n\n    this.userCode = `\n      const ivec3 pads = ivec3(${padFront}, ${padTop}, ${padLeft});\n\n      void main() {\n        ivec5 coords = getOutputCoords();\n        int batch = coords.x;\n        int d1 = coords.u;\n\n\n        ivec3 dyCorner = ivec3(coords.y, coords.z, coords.w)
 - pads;\n        int dyFCorner = dyCorner.x;\n        int dyRCorner = dyCorner.y;\n        int dyCCorner = dyCorner.z;\n\n        float dotProd = 0.0;\n        for (int wF = 0; wF < ${filterDepth}; wF++) {\n          float dyF = float(dyFCorner + wF) / ${strideDepth}.0;\n\n          if (dyF < 0.0 || dyF >= ${convInfo.outDepth}.0 || fract(dyF) > 0.0) {\n            continue;\n          }\n          int idyF = int(dyF);\n\n          int wFPerm = ${filterDepth} - 1 - wF;\n\n          for (int wR = 0; wR < ${filterHeight}; wR++) {\n            float dyR = float(dyRCorner + wR) / ${strideHeight}.0;\n\n            if (dyR < 0.0 || dyR >= ${convInfo.outHeight}.0 ||\n                fract(dyR) > 0.0) {\n              continue;\n            }\n            int idyR = int(dyR);\n\n            int wRPerm = ${filterHeight} - 1 - wR;\n\n            for (int wC = 0; wC < ${filterWidth}; wC++) {\n              float dyC = float(dyCCorner + wC) / ${strideWidth}.0;\n\n              if (dyC < 0.0 || dyC
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>= ${convInfo.outWidth}.0 ||\n fract(dyC) > 0.0) {\n continue;\n }\n int idyC = int(dyC);\n\n int wCPerm = ${filterWidth} - 1 - wC;\n\n for (int d2 = 0; d2 < ${convInfo.outChannels}; d2++) {\n float xValue = getDy(batch, idyF, idyR, idyC, d2);\n float wValue = getW(wFPerm, wRPerm, wCPerm, d1, d2);\n dotProd += xValue * wValue;\n }\n }\n }\n }\n setOutput(dotProd);\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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/\n\nimport {backend_util, Conv2DBackpropFilter, Conv2DBackpropFilterAttrs, Conv2DBackpropFilterInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {Conv2DDerFilterProgram} from '../conv_backprop_gpu';\n\nexport function conv2DBackpropFilter(args: {\n inputs: Conv2DBackpropFilterInputs,\n attrs: Conv2DBackpropFilterAttrs,\n backend: MathBackendWebGL\n}) {\n const {inputs, backend, attrs} = args;\n const {x, dy} = inputs;\n const {strides, pad, dataFormat, dimRoundingMode, filterShape} = attrs;\n\n const $dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n x.shape as [number, number, number, number], filterShape, strides,\n 1 / dilations */, pad, dimRoundingMode, false /* depthwise */,\n $dataFormat);\n\n const program = new Conv2DDerFilterProgram(convInfo);\n return backend.runWebGLProgram(program, [x, dy], 'float32');\n}\n\nexport const conv2DBackpropFilterConfig: KernelConfig = {\n kernelName: Conv2DBackpropFilter,\n backendName: 'webgl',\n kernelFunc: conv2DBackpropFilter as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n
* See the License for the specific language governing permissions and\n * limitations under the License.\n *
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/\n\nimport {backend_util, Conv2DBackpropInput, Conv2DBackpropInputAttrs, Conv2DBackpropInputInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {Conv2DDerInputProgram} from '../conv_backprop_gpu';\n\nexport function conv2DBackpropInput(args: {\n inputs: Conv2DBackpropInputInputs,\n attrs: Conv2DBackpropInputAttrs,\n backend: MathBackendWebGL\n}) {\n const {inputs, backend, attrs} = args;\n const {dy, filter} = inputs;\n const {inputShape, strides, pad, dataFormat, dimRoundingMode} = attrs;\n\n const $dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n inputShape, filter.shape as [number, number, number, number], strides,\n 1 / dilations
*/, pad, dimRoundingMode, false, $dataFormat);\n\n const program = new Conv2DDerInputProgram(convInfo);\n return backend.runWebGLProgram(program, [dy, filter], 'float32');\n}\n\nexport const conv2DBackpropInputConfig: KernelConfig = {\n kernelName: Conv2DBackpropInput,\n backendName: 'webgl',\n kernelFunc: conv2DBackpropInput as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,

software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n
 * ==========\n
*/\n\nimport {backend_util, Conv3D, Conv3DAttrs, Conv3DInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {Conv3DProgram} from '../conv_gpu';\n\nexport function conv3D(\n args:\n {inputs: Conv3DInputs, attrs: Conv3DAttrs, backend: MathBackendWebGL}) {\n const {inputs, backend, attrs} = args;\n const {x, filter} = inputs;\n const {strides, pad, dilations} = attrs;\n\n const convInfo = backend_util.computeConv3DInfo(\n x.shape as [number, number, number, number, number],\n filter.shape as [number, number, number, number, number], strides,\n dilations, pad);\n\n const program = new Conv3DProgram(convInfo);\n return backend.runWebGLProgram(program, [x, filter], 'float32');\n}\n\nexport const conv3DConfig: KernelConfig = {\n kernelName: Conv3D,\n backendName: 'webgl',\n kernelFunc: conv3D as {} as KernelFunc,\n};\n","/**\n
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 * ==========\n
*/\n\nimport {backend_util, Conv3DBackpropFilterV2, Conv3DBackpropFilterV2Attrs, Conv3DBackpropFilterV2Inputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {Conv3DDerFilterProgram} from '../conv_backprop_gpu';\n\nexport
 function conv3DBackpropFilterV2(args: {\n inputs: Conv3DBackpropFilterV2Inputs,\n attrs: Conv3DBackpropFilterV2Attrs,\n backend: MathBackendWebGL\n}) {\n const {inputs, backend, attrs} = args;\n const {x, dy} = inputs;\n const {strides, pad, filterShape} = attrs;\n\n const convInfo = backend_util.computeConv3DInfo(\n x.shape as [number, number, number, number, number], filterShape, strides,\n 1 /* dilations */, pad);\n\n const program = new Conv3DDerFilterProgram(convInfo);\n return backend.runWebGLProgram(program, [x, dy], 'float32');\n}\n\nexport const conv3DBackpropFilterV2Config: KernelConfig = {\n kernelName: Conv3DBackpropFilterV2,\n backendName: 'webgl',\n kernelFunc: conv3DBackpropFilterV2 as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You
 may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 * ==========\n
*/\n\nimport {backend_util, Conv3DBackpropInputV2, Conv3DBackpropInputV2Attrs, Conv3DBackpropInputV2Inputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {Conv3DDerInputProgram} from '../conv_backprop_gpu';\n\nexport function conv3DBackpropInput(args: {\n inputs: Conv3DBackpropInputV2Inputs,\n attrs: Conv3DBackpropInputV2Attrs,\n backend: MathBackendWebGL\n}) {\n const {inputs, backend, attrs} = args;\n const {dy, filter}
 = inputs;\n const {pad, strides, inputShape} = attrs;\n\n const convInfo = backend_util.computeConv3DInfo(\n inputShape, filter.shape as [number, number, number, number, number],\n strides, 1 /* dilations */, pad);\n\n const program = new Conv3DDerInputProgram(convInfo);\n return backend.runWebGLProgram(program, [dy,

filter], 'float32');\n}\n\nexport const conv3DBackpropInputConfig: KernelConfig = {\n kernelName: Conv3DBackpropInputV2,\n backendName: 'webgl',\n kernelFunc: conv3DBackpropInput as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {Cos, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {CHECK_NAN_SNIPPET_UNARY, unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst COS = CHECK_NAN_SNIPPET_UNARY + `\n  return cos(x);\n`;\n\nexport const cos = unaryKernelFunc({opSnippet: COS});\n\nexport const cosConfig: KernelConfig = {\n kernelName: Cos,\n backendName: 'webgl',\n kernelFunc: cos,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
 law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {Cosh, KernelConfig} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst COSH = `\n  float e2x = exp(-x);\n  return (e2x + 1.0 / e2x) / 2.0;\n`;\n\nexport const cosh = unaryKernelFunc({opSnippet: COSH});\n\nexport const coshConfig: KernelConfig = {\n kernelName: Cosh,\n backendName: 'webgl',\n kernelFunc: cosh,\n};\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may
 obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class CropAndResizeProgram implements GPGPUProgram {\n variableNames = ['Image', 'Boxes', 'BoxInd'];\n outputShape: number[] = [];\n userCode: string;\n\n constructor(\n   imageShape: [number, number, number, number], boxShape: [number, number],\n   cropSize: [number, number], method: 'bilinear'|'nearest',\n   extrapolationValue: number) {\n   const [batch, imageHeight, imageWidth, depth] = imageShape;\n   const [numBoxes,
 ] = boxShape;\n   const [cropHeight, cropWidth] = cropSize;\n   this.outputShape = [numBoxes, cropHeight, cropWidth, depth];\n   const methodId = method === 'bilinear' ? 1 : 0;\n\n   const [inputHeightFloat, inputWidthFloat] =\n   [`${imageHeight - 1}.0`, `${imageWidth - 1}.0`];\n\n   const [heightRatio, heightScale, inY] = cropHeight > 1 ?\n   [\n   `${(imageHeight - 1) / (cropHeight - 1)}`,\n   '(y2-y1) * height_ratio',\n   `y1*${inputHeightFloat} + float(y)*(height_scale)`,\n   ] :\n   [\n   '0.0',\n   '0.0',\n   `0.5 * (y1+y2) * ${inputHeightFloat}`,\n   ];\n   const [widthRatio, widthScale, inX] = cropWidth > 1 ?\n   [\n   `${(imageWidth - 1) / (cropWidth - 1)}`,\n   '(x2-x1) * width_ratio',\n   `x1*${inputWidthFloat} + float(x)*(width_scale)`,\n   ] :\n   [\n   '0.0',\n   '0.0',\n   `0.5 * (x1+x2) * ${inputWidthFloat}`,\n   ];\n\n   // Reference
 implementation\n   // tslint:disable-next-line:max-line-length\n   // https://github.com/tensorflow/tensorflow/blob/master/tensorflow/core/kernels/crop_and_resize_op_gpu.cu.cc\n

this.userCode = `\n const float height_ratio = float(${heightRatio});\n const float width_ratio = float(${widthRatio});\n void main() {\n ivec4 coords = getOutputCoords();\n int b = coords[0];\n int y = coords[1];\n int x = coords[2];\n int d = coords[3];\n\n // get box vals\n float y1 = getBoxes(b,0);\n float x1 = getBoxes(b,1);\n float y2 = getBoxes(b,2);\n float x2 = getBoxes(b,3);\n\n // get image in batch index\n int bInd = round(getBoxInd(b));\n if(bInd < 0 || bInd >= ${batch}) {\n return;\n }\n\n float height_scale = ${heightScale};\n float width_scale = ${widthScale};\n\n float in_y = ${inY};\n if(in_y < 0.0 || in_y > ${inputHeightFloat}) {\n setOutput(float(${extrapolationValue}));\n return;\n }\n float in_x = ${inX};\n if(in_x < 0.0 || in_x > ${inputWidthFloat}) {\n setOutput(float(${extrapolationValue}));\n return;\n }\n\n vec2 sourceFracIndexCR = vec2(in_x,in_y);\n if(${methodId} == 1) {\n // Compute the four integer indices.\n ivec2 sourceFloorCR = ivec2(sourceFracIndexCR);\n ivec2 sourceCeilCR = ivec2(ceil(sourceFracIndexCR));\n\n float topLeft = getImage(b, sourceFloorCR.y, sourceFloorCR.x, d);\n float bottomLeft = getImage(b, sourceCeilCR.y, sourceFloorCR.x, d);\n float topRight = getImage(b, sourceFloorCR.y, sourceCeilCR.x, d);\n float bottomRight = getImage(b, sourceCeilCR.y, sourceCeilCR.x, d);\n\n vec2 fracCR = sourceFracIndexCR - vec2(sourceFloorCR);\n\n float top = topLeft + (topRight - topLeft) * fracCR.x;\n float bottom = bottomLeft + (bottomRight - bottomLeft) * fracCR.x;\n float newValue = top + (bottom - top) * fracCR.y;\n setOutput(newValue);\n } else {\n // Compute the coordinators of nearest neighbor point.\n ivec2 sourceNearestCR = ivec2(floor(\n sourceFracIndexCR + vec2(0.5,0.5)));\n float newValue = getImage(b, sourceNearestCR.y, sourceNearestCR.x, d);\n setOutput(newValue);\n }\n }\n `;\n}\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {CropAndResize, CropAndResizeAttrs, CropAndResizeInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {CropAndResizeProgram} from '../crop_and_resize_gpu';\n\nexport const cropAndResize = (args: {\n inputs: CropAndResizeInputs,\n backend: MathBackendWebGL,\n attrs: CropAndResizeAttrs\n}): TensorInfo => {\n const {inputs, backend, attrs} = args;\n const {image, boxes, boxInd} = inputs;\n const {cropSize, method, extrapolationValue} = attrs;\n\n const program = new CropAndResizeProgram(\n image.shape as [number, number, number, number],\n boxes.shape as [number, number], cropSize, method, extrapolationValue);\n return backend.runWebGLProgram(program, [image, boxes, boxInd], 'float32');\n};\n\nexport const cropAndResizeConfig: KernelConfig = {\n kernelName: CropAndResize,\n backendName: 'webgl',\n kernelFunc: cropAndResize as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\nimport {GPGPUContext} from './gpgpu_context';\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from

'./shader_compiler';\n\nexport class CumSumProgram implements GPGPUProgram {\n variableNames = ['x'];\n outputShape: number[];\n userCode: string;\n\n // Caching uniform location for speed.\n index: WebGLUniformLocation;\n\n constructor(shape: number[], exclusive: boolean, reverse: boolean) {\n this.outputShape = shape;\n const rank = shape.length;\n const val = exclusive ? '0.0' : `getX(${getCoords(rank, 'coords')})`;\n const length = shape[shape.length - 1];\n let condition = '';\n let idxString = '';\n // When exclusive is set, the cumsum op becomes roll op that copies the\n // value from the previous index based on the direction specified by the\n // reverse flag.\n if (exclusive) {\n condition = reverse ? `end != ${length - 1}` : 'end != 0';\n idxString = reverse ? 'end + 1' : 'end - 1';\n } else {\n condition = reverse ? `end + pow2 < ${length}` : 'end >= pow2';\n idxString = (reverse ? 'end + pow2' : 'end - pow2');\n }\n\n this.userCode = `\n uniform float index;\n void main() {\n ${getCoordsDataType(rank)} coords = getOutputCoords();\n int end = ${getFinalCoord(rank, 'coords')};\n float val = ${val};\n int pow2 = int(pow(2.0, index));\n if (${condition}) {\n int idx = ${idxString};\n ${getFinalCoord(rank, 'coords')} = idx;\n val += getX(${getCoords(rank, 'coords')});\n }\n setOutput(val);\n }\n `;\n }\n\n getCustomSetupFunc(index: number) {\n return (gpgpu: GPGPUContext, webGLProgram: WebGLProgram) => {\n if (this.index == null) {\n this.index = gpgpu.getUniformLocation(webGLProgram, 'index');\n }\n gpgpu.gl.uniform1f(this.index, index);\n };\n }\n}\n\nfunction getCoords(rank: number, name: string): string {\n if (rank === 1) {\n return `${name}`;\n } else if (rank === 2) {\n return `${name}.x, ${name}.y`;\n } else if (rank === 3) {\n return `${name}.x, ${name}.y, ${name}.z`;\n } else if (rank === 4) {\n return `${name}.x, ${name}.y, ${name}.z, ${name}.w`;\n } else {\n throw Error(`Cumulative sum for rank ${rank} is not yet supported`);\n }\n}\n\nfunction getFinalCoord(rank: number, name: string): string {\n if (rank === 1) {\n return `${name}`;\n } else if (rank === 2) {\n return `${name}.y`;\n } else if (rank === 3) {\n return `${name}.z`;\n } else if (rank === 4) {\n return `${name}.w`;\n } else {\n throw Error(`Cumulative sum for rank ${rank} is not yet supported`);\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {backend_util, Cumsum, CumsumAttrs, CumsumInputs, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {CumSumProgram} from '../cumsum_gpu';\n\nimport {identity} from './Identity';\nimport {transpose} from './Transpose';\n\nexport function cumsum(\n args:\n {inputs: CumsumInputs, backend: MathBackendWebGL, attrs: CumsumAttrs}):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {axis, exclusive, reverse} = attrs;\n\n const xRank = x.shape.length;\n const permutation = backend_util.getAxesPermutation([axis], xRank);\n let permutedX = x;\n if (permutation != null) {\n permutedX = transpose({inputs: {x}, backend, attrs: {perm: permutation}});\n }\n const permutedAxis = backend_util.getInnerMostAxes(1, xRank)[0];\n\n if (permutedAxis !== xRank - 1) {\n throw new Error(\n `WebGL cumsum shader expects an inner-most axis=${\n x.shape.length - 1} ` +\n `but got axis=${axis}`);\n }\n const size = permutedX.shape[permutedAxis];\n let result = identity({inputs: {x: permutedX}, backend});\n // Use cumsum parallel algorithm, ref:\n // https://developer.nvidia.com/gpugems/gpugems3/part-vi-gpu-computing/chapter-39-parallel-prefix-sum-scan-cuda\n\n for (let i = 0; i <= Math.ceil(Math.log2(size)) - 1; i++) {\n const program = new CumSumProgram(permutedX.shape, false, reverse);\n const customSetup = program.getCustomSetupFunc(i);\n const prevResult = result;\n result =\n backend.runWebGLProgram(program, [result], result.dtype, customSetup);\n backend.disposeIntermediateTensorInfo(prevResult);\n }\n // For

exclusive cumsum, shift the end result in the direction of sum\n // and add 0 to the front index.\n if (exclusive) {\n const program = new CumSumProgram(permutedX.shape, exclusive, reverse);\n   const prevResult = result;\n result = backend.runWebGLProgram(program, [result], result.dtype);\n backend.disposeIntermediateTensorInfo(prevResult);\n }\n\n if (permutation != null) {\n   const reversePermutation = backend_util.getUndoAxesPermutation(permutation);\n   const reverseTransposedResult = transpose(\n   {inputs: {x: result}, backend, attrs: {perm: reversePermutation}});\n\n backend.disposeIntermediateTensorInfo(result);\n   backend.disposeIntermediateTensorInfo(permutedX);\n\n return reverseTransposedResult;\n }\n\n return result;\n}\n\nexport const cumsumConfig: KernelConfig = {\n kernelName: Cumsum,\n backendName: 'webgl',\n kernelFunc: cumsum as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed
 under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {DenseBincount, DenseBincountAttrs, DenseBincountInputs, KernelConfig, KernelFunc, TensorInfo, TypedArray} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {bincountImplCPU, bincountReduceImplCPU} from '../kernel_utils/shared';\n\nexport function denseBincount(args: {\n inputs: DenseBincountInputs,\n
  backend: MathBackendWebGL,\n attrs: DenseBincountAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x, weights} = inputs;\n const {size, binaryOutput} = attrs;\n\n if (x.shape.length === 1) {\n   const xVals = backend.readSync(x.dataId) as TypedArray;\n   const weightsVals = backend.readSync(weights.dataId) as TypedArray;\n\n   const outVals =\n   bincountImplCPU(xVals, weightsVals, weights.dtype, weights.shape, size);\n\n   return backend.makeTensorInfo([size], weights.dtype, outVals);\n } else if (x.shape.length === 2) {\n const xBuf = backend.bufferSync(x);\n   const weightsBuf = backend.bufferSync(weights);\n\n   const outBuf = bincountReduceImplCPU(xBuf, weightsBuf, size, binaryOutput);\n\n   return backend.makeTensorInfo(outBuf.shape, weights.dtype, outBuf.values);\n }\n\n throw new Error(\n   `Error in denseBincount: input must be at most rank 2, but got rank` +\n   `${x.shape.length}.`);\n}\n\nexport const denseBincountConfig:
 KernelConfig = {\n kernelName: DenseBincount,\n backendName: 'webgl',\n kernelFunc: denseBincount as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class DepthToSpaceProgram implements GPGPUProgram {\n variableNames = ['x'];\n outputShape:
 number[] = [];\n userCode: string;\n blockSize: number;\n dataFormat: string;\n\n constructor(\n   outputShape: number[], blockSize: number, dataFormat: 'NHWC'|'NCHW') {\n   this.outputShape = outputShape;\n this.blockSize = blockSize;\n   this.dataFormat = dataFormat;\n   this.userCode = `\n   void main() {\n   ivec4 coords = getOutputCoords();\n   int b = coords[0];\n   int h = ${this.getHeightCoordString()};\n   int w = ${this.getWidthCoordString()};\n   int d = ${this.getDepthCoordString()};\n\n   int in_h = h / ${blockSize};\n int offset_h = imod(h, ${blockSize});\n   int in_w = w / ${blockSize};\n   int offset_w = imod(w,

${blockSize});\n int offset_d = (offset_h * ${blockSize} + offset_w) *\n ${this.getOutputDepthSize()};\n int in_d = d + offset_d;\n\n float result = ${this.getInputSamplingString()};\n setOutput(result);\n }\n `;\n }\n\n private getHeightCoordString(): string {\n if (this.dataFormat === 'NHWC') {\n return `coords[1]`;\n } else {\n return `coords[2]`;\n }\n }\n\n private getWidthCoordString(): string {\n if (this.dataFormat === 'NHWC') {\n return `coords[2]`;\n } else {\n return `coords[3]`;\n }\n }\n\n private getDepthCoordString(): string {\n if (this.dataFormat === 'NHWC') {\n return `coords[3]`;\n } else {\n return `coords[1]`;\n }\n }\n\n private getOutputDepthSize(): number {\n if (this.dataFormat === 'NHWC') {\n return this.outputShape[3];\n } else {\n return this.outputShape[1];\n }\n }\n\n private getInputSamplingString(): string {\n if (this.dataFormat === 'NHWC') {\n return `getX(b, in_h, in_w, in_d)`;\n } else {\n return `getX(b, in_d, in_h, in_w)`;\n }\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {DepthToSpace, DepthToSpaceAttrs, DepthToSpaceInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {DepthToSpaceProgram} from '../depth_to_space_gpu';\n\nexport function depthToSpace(args: {\n inputs: DepthToSpaceInputs,\n backend: MathBackendWebGL,\n attrs: DepthToSpaceAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {blockSize, dataFormat} = attrs;\n\n util.assert(\n blockSize > 1,\n () => `blockSize should be > 1 for depthToSpace, but was: ${blockSize}`);\n\n const batchSize = x.shape[0];\n const inputHeight = (dataFormat === 'NHWC') ? x.shape[1] : x.shape[2];\n const inputWidth = (dataFormat === 'NHWC') ? x.shape[2] : x.shape[3];\n const inputDepth = (dataFormat === 'NHWC') ? x.shape[3] : x.shape[1];\n\n const outputHeight = inputHeight * blockSize;\n const outputWidth = inputWidth * blockSize;\n const outputDepth = inputDepth / (blockSize * blockSize);\n\n const outputShape = (dataFormat === 'NHWC') ?\n [batchSize, outputHeight, outputWidth, outputDepth] :\n [batchSize, outputDepth, outputHeight, outputWidth];\n\n const program = new DepthToSpaceProgram(outputShape, blockSize, dataFormat);\n return backend.runWebGLProgram(program, [x], x.dtype);\n}\n\nexport const depthToSpaceConfig: KernelConfig = {\n kernelName: DepthToSpace,\n backendName: 'webgl',\n kernelFunc: depthToSpace as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class DepthwiseConv2DProgram implements GPGPUProgram {\n variableNames = ['x', 'W'];\n outputShape: number[];\n userCode: string;\n\n constructor(\n convInfo: backend_util.Conv2DInfo, addBias = false,\n activation: string = null, hasPreluActivation = false,\n hasLeakyReluAlpha = false) {\n this.outputShape = convInfo.outShape;\n\n const xNumRows = convInfo.inHeight;\n const xNumCols = convInfo.inWidth;\n const padTop = convInfo.padInfo.top;\n const padLeft = convInfo.padInfo.left;\n const strideHeight = convInfo.strideHeight;\n

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const strideWidth = convInfo.strideWidth;\n    const dilationHeight = convInfo.dilationHeight;\n    const dilationWidth = convInfo.dilationWidth;\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth = convInfo.filterWidth;\n    const channelMul = convInfo.outChannels / convInfo.inChannels;\n\n    let activationSnippet = '', applyActivationSnippet = '';\n    if (activation) {\n      if (hasPreluActivation) {\n activationSnippet = `float activation(float a) {\n          float b = getPreluActivationWeightsAtOutCoords();\n          ${activation}\n        }`;\n      } else if (hasLeakyReluAlpha) {\n        activationSnippet = `float activation(float a) {\n          float b = getLeakyreluAlphaAtOutCoords();\n          ${activation}\n        }`;\n      } else {\n activationSnippet = `\n          float activation(float x) {\n            ${activation}\n          }\n        `;\n      }\n\n applyActivationSnippet = `result = activation(result);`;\n    }\n\n    const addBiasSnippet = addBias ? 'result += getBiasAtOutCoords();' : '';\n    if (addBias) {\n      this.variableNames.push('bias');\n    }\n\n    if (hasPreluActivation) {\n      this.variableNames.push('preluActivationWeights');\n    }\n    if (hasLeakyReluAlpha) {\n      this.variableNames.push('leakyreluAlpha');\n    }\n\n    this.userCode = `\n      ${activationSnippet}\n\n      const ivec2 strides = ivec2(${strideHeight}, ${strideWidth});\n      const ivec2 pads = ivec2(${padTop}, ${padLeft});\n\n      void main() {\n        ivec4
 coords = getOutputCoords();\n        int batch = coords.x;\n        ivec2 xRCCorner = coords.yz * strides - pads;\n        int d2 = coords.w;\n        int d1 = d2 / ${channelMul};\n        int q = d2 - d1 * ${channelMul};\n\n        int xRCorner = xRCCorner.x;\n        int xCCorner = xRCCorner.y;\n\n        // Convolve x(?, ?, d1) with w(:, :, d1, q) to get y(yR, yC, d2).\n        // ? = to be determined. : = across all values in that axis.\n        float dotProd = 0.0;\n        // TODO(dsmilkov): Flatten the two for loops and vec4 the operations.\n        for (int wR = 0; wR < ${filterHeight}; wR++) {\n          int xR = xRCorner + wR * ${dilationHeight};\n\n          if (xR < 0 || xR >= ${xNumRows}) {\n            continue;\n          }\n\n          for (int wC = 0; wC < ${filterWidth}; wC++) {\n            int xC = xCCorner + wC * ${dilationWidth};\n\n            if (xC < 0 || xC >= ${xNumCols}) {\n              continue;\n            }\n\n            float xVal = getX(batch, xR,
 xC, d1);\n            float wVal = getW(wR, wC, d1, q);\n            dotProd += xVal * wVal;\n          }\n        }\n\n        float result = dotProd;\n        ${addBiasSnippet}\n        ${applyActivationSnippet}\n        setOutput(result);\n      }\n    `;\n  }\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n */\n\nimport
 {backend_util, util} from '@tensorflow/tfjs-core';\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class DepthwiseConvPacked2DProgram implements GPGPUProgram {\n  variableNames = ['x', 'W'];\n  packedInputs = true;\n  packedOutput = true;\n  outputShape: number[];\n  userCode: string;\n\n  constructor(\n      convInfo: backend_util.Conv2DInfo, addBias = false,\n      activation: string = null, hasPreluActivation = false,\n      hasLeakyReluAlpha = false) {\n    this.outputShape = convInfo.outShape;\n\n    const xNumRows = convInfo.inHeight;\n    const xNumCols = convInfo.inWidth;\n    const padTop = convInfo.padInfo.top;\n    const padLeft = convInfo.padInfo.left;\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const dilationHeight = convInfo.dilationHeight;\n    const dilationWidth = convInfo.dilationWidth;\n    const filterHeight = convInfo.filterHeight;\n    const filterWidth = convInfo.filterWidth;\n    const texelsAcross
 = filterWidth;\n\n    let mainLoop = `int xR; int xC; int xCOffset;`;\n\n    for (let r = 0; r < filterHeight; r++) {\n      for (let c = 0; c < filterWidth; c++) {\n        mainLoop += `\n          vec4 xTexelR${r}C${c * 2} = vec4(0.);\n          vec4 wR${r}C${c} = vec4(0.);\n          vec4 xR${r}C${c} = vec4(0.);`;\n      }\n    }\n\n    /**\n     * This vectorized implementation works by gathering the values needed for\n     * each output channel's dot product into vec4's and
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then multiplying them\n     * all together (this happens in the final double for-loop below). Most of\n     * the main loop consists of constructing these vec4's with the minimum\n     * number of texture2D calls, which means making use of all four returned\n     * values from a texture2D call at once.\n     */\n    for (let r = 0; r < filterHeight; r++) {\n      for (let texelC = 0; texelC < texelsAcross; texelC++) {\n        const c = texelC * 2;\n\n        mainLoop += `\n xR = xRCorner + ${r *
 dilationHeight};\n          xC = xCCorner + ${c * dilationWidth};\n        `;\n\n        if (strideWidth === 1) {\n          if (c < filterWidth) {\n            // If padding is odd, the outer texels have to be composed.\n            if (padLeft % 2 === 1) {\n              // TODO: Ensure vec4 previous does not result in redundant sample,\n              // and avoid setting xTexelRC's that exceed the boundary in the\n              // first place rather than resetting them to vec4(0)).\n\n              // To compute xCOffset:\n              // - If padding is odd, we must add 1 to ensure we ask for an\n              // even-numbered row.\n              // - We subtract 2 to access the previous texel.\n\n              mainLoop += `\n xCOffset = xC + 1;\n              if(xR >= 0 && xR < ${xNumRows} && xCOffset >= 0 && xCOffset < ${\n
    xNumCols}) {\n                xTexelR${r}C${c} = getX(batch, xR, xCOffset, d1);\n\n                // Need to manually
 clear unused channels in case\n                // we're reading from recycled texture.\n                if(xCOffset + 1 >= ${xNumCols}) {\n                  xTexelR${r}C${c}.zw = vec2(0.);\n                }\n              } else {\n xTexelR${r}C${c} = vec4(0.);\n              }\n\n              xCOffset = xC + 1 - 2;\n              if(xR >= 0 && xR < ${xNumRows} && xCOffset >= 0 && xCOffset < ${\n                xNumCols}) {\n                vec4 previous = getX(batch, xR, xCOffset, d1);\n\n                // Need to manually clear unused channels in case\n                // we're reading from recycled texture.\n                if(xCOffset + 1 >= ${xNumCols}) {\n                  previous.zw = vec2(0.);\n                }\n\n                xR${r}C${c} = vec4(previous.zw, xTexelR${r}C${c}.xy);\n              } else {\n                xR${r}C${c} = vec4(0, 0, xTexelR${r}C${c}.xy);\n              }\n            `;\n          } else
 {\n            // Padding is even, so xRC corresponds to a single texel.\n            mainLoop += `\n              if(xR >= 0 && xR < ${xNumRows} && xC >= 0 && xC < ${xNumCols}) {\n                xTexelR${r}C${c} = getX(batch, xR, xC, d1);\n              } else {\n                xTexelR${r}C${c} = vec4(0.);\n              }\n\n              xR${r}C${c} = xTexelR${r}C${c};\n            `;\n          }\n\n          if (c + 1 < filterWidth) {\n            // If dilation is even, the second entry should match the first\n            // (either both are composed or both are single samples). But if\n            // dilation is odd, then the second entry should be the opposite\n            // of the first (if the first is composed, the second is a single\n            // sample, and vice versa.)\n\n            const nextTexelOffset = padLeft % 2 === 0 ?\n                util.nearestLargerEven(dilationWidth) :\n                dilationWidth;\n\n            if ((dilationWidth % 2 === 0 && padLeft % 2 === 1) ||\n                (dilationWidth % 2 !== 0 && padLeft % 2 !== 1)) {\n              mainLoop += `\n                xCOffset = xC + ${padLeft % 2} + ${nextTexelOffset};\n\n                if(xR >= 0 && xR < ${xNumRows} &&\n                  xCOffset >= 0 && xCOffset < ${xNumCols}) {\n                  xTexelR${r}C${c + 2} = getX(batch, xR, xCOffset, d1);\n                }\n              `;\n\n              // If dilation > 1 then the xRC's will not be able to share any\n              // values, so each xRC will require two unique calls to getX.\n              if (dilationWidth > 1) {\n                mainLoop += `\n                  xCOffset -= 2;\n                  if(xR >= 0 && xR < ${xNumRows} &&\n                    xCOffset >= 0 && xCOffset < ${xNumCols}) {\n                    xTexelR${r}C${c} = getX(batch, xR, xCOffset, d1);\n                  } else {\n                    xTexelR${r}C${c}
 = vec4(0.);\n                  }\n                `;\n              }\n\n              mainLoop += `\n                xR${r}C${c + 1}
 = vec4(\n                  xTexelR${r}C${c}.zw, xTexelR${r}C${c + 2}.xy);\n                `;\n              } else {\n
 mainLoop += `\n                xCOffset = xC + ${nextTexelOffset};\n\n                if(xR >= 0 && xR <
 ${xNumRows} &&\n                  xCOffset >= 0 && xCOffset < ${xNumCols}) {\n                    xTexelR${r}C${c
 + 2} = getX(batch, xR, xCOffset, d1);\n                  }\n\n                  xR${r}C${c + 1} = xTexelR${r}C${c + 2};\n
          `;\n              }\n            }\n          }\n        } else {  // stride > 1\n          if (c < filterWidth) {\n            mainLoop
 += `\n              if(xR >= 0 && xR < ${xNumRows}) {\n              `;\n\n            // Depending on whether padLeft is
 even or odd, we want either the\n            // xy or zw channels from X texels for xR${r}C${c}.
 If padLeft is\n            // even, xR${r}C${c + 1} is simply the zw channels of texels we've\n            // already
 sampled. But if padLeft is odd, xR${r}C{$c + 1}.zw will\n            // need to come from the xy channels of a new
```

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texel, hence the `vec4\n          // final` initialized below.\n          if (padLeft % 2 === 1) {\n            mainLoop +=
`\n              xCOffset = xC + 1 - ${strideWidth};\n              if(xCOffset >= 0 && xCOffset < ${xNumCols}) {\n
          xTexelR${r}C${c} = getX(batch, xR, xCOffset, d1);\n            } else {\n              xTexelR${r}C${c} =
vec4(0.);\n            }\n\n            if(xC + 1 >= 0 && xC + 1 < ${xNumCols}) {\n              xTexelR${r}C${c +
2} = getX(batch, xR, xC + 1, d1);\n            } else {\n              xTexelR${r}C${c + 2} = vec4(0.);\n
}\n\n            xR${r}C${c} = vec4(\n              xTexelR${r}C${c}.zw, xTexelR${r}C${c + 2}.zw);\n
`;\n\n
          if (c + 1 < filterWidth) {\n            mainLoop += `\n              vec4 final = vec4(0.);\n
xCOffset = xC + 1 + ${strideWidth};\n              if(xCOffset >= 0 && xCOffset < ${xNumCols}) {\n
final = getX(batch, xR, xCOffset, d1);\n              }\n              xR${r}C${c + 1} = vec4(xTexelR${r}C${c +
2}.xy, final.xy);\n            `;\n          }\n        } else {\n          mainLoop += `\n            if(xC >= 0 && xC <
${xNumCols}) {\n              xTexelR${r}C${c} = getX(batch, xR, xC, d1);\n            } else {\n
xTexelR${r}C${c} = vec4(0.);\n            }\n\n            xCOffset = xC + ${strideWidth};\n            if(xCOffset
>= 0 && xCOffset < ${xNumCols}) {\n              xTexelR${r}C${c + 2} = getX(batch, xR, xCOffset, d1);\n
    } else {\n              xTexelR${r}C${c + 2} = vec4(0.);\n            }\n\n            xR${r}C${c}
 = vec4(\n              xTexelR${r}C${c}.xy, xTexelR${r}C${c + 2}.xy);\n            `;\n\n          if (c + 1 <
filterWidth) {\n            mainLoop += `\n              xR${r}C${c + 1} = vec4(\n
xTexelR${r}C${c}.zw, xTexelR${r}C${c + 2}.zw);\n            `;\n          }\n        }\n\n        mainLoop +=
`}`;\n      }\n    }\n\n    if (c < filterWidth) {\n      mainLoop += `\n        vec4 wTexelR${r}C${c} =
getW(${r}, ${c}, d1, q);\n        wR${r}C${c} = vec4(wTexelR${r}C${c}.xz, wTexelR${r}C${c}.xz);\n
`;\n\n      if (c + 1 < filterWidth) {\n        mainLoop += `\n          vec4 wTexelR${r}C${c + 1} = getW(${r},
${c + 1}, d1, q);\n          wR${r}C${c + 1} =\n            vec4(wTexelR${r}C${c + 1}.xz, wTexelR${r}C${c +
1}.xz);`;\n      }\n    }\n  }\n\n  for (let r = 0; r < filterHeight; r++) {\n    for (let c = 0; c < filterWidth;
c++) {\n      mainLoop +=
 `dotProd += xR${r}C${c} * wR${r}C${c};`;\n    }\n  }\n\n  let activationSnippet = '', applyActivationSnippet =
'';\n  if (activation) {\n    if (hasPreluActivation) {\n      activationSnippet = `vec4 activation(vec4 a) {\n
vec4 b = getPreluActivationWeightsAtOutCoords();\n        ${activation}\n      }`;\n    } else if
(hasLeakyReluAlpha) {\n      activationSnippet = `vec4 activation(vec4 a) {\n        vec4 b =
getLeakyreluAlphaAtOutCoords();\n        ${activation}\n      }`;\n    } else {\n      activationSnippet = `vec4
activation(vec4 x) {\n        ${activation}\n      }`;\n    }\n\n    applyActivationSnippet = `result =
activation(result);`;\n  }\n\n  const addBiasSnippet = addBias ? 'result += getBiasAtOutCoords();' : '';\n  if
(addBias) {\n    this.variableNames.push('bias');\n  }\n\n  if (hasPreluActivation) {\n
this.variableNames.push('preluActivationWeights');\n  }\n  if (hasLeakyReluAlpha) {\n
this.variableNames.push('leakyreluAlpha');\n
  }\n\n  this.userCode = `\n    ${activationSnippet}\n\n    const ivec2 strides = ivec2(${strideHeight},
${strideWidth});\n    const ivec2 pads = ivec2(${padTop}, ${padLeft});\n\n    void main() {\n\n      ivec4 coords
= getOutputCoords();\n      int batch = coords.x;\n      ivec2 xRCCorner = coords.yz * strides - pads;\n      int d2
= coords.w;\n      int d1 = d2;\n      int q = 0;\n      int xRCorner = xRCCorner.x;\n      int xCCorner =
xRCCorner.y;\n\n      vec4 dotProd = vec4(0.);\n\n      ${mainLoop}\n\n      vec4 result = dotProd;\n
${addBiasSnippet}\n      ${applyActivationSnippet}\n      setOutput(result);\n    }\n  `;\n}\n","/**\n *
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the License.\n *
==========================================================================\n
```

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*/\n\nimport {backend_util, DepthwiseConv2dNative, DepthwiseConv2dNativeAttrs,
DepthwiseConv2dNativeInputs, env, KernelConfig, KernelFunc, util} from '@tensorflow/tfjs-core';\n\nimport
{MathBackendWebGL} from '../backend_webgl';\nimport {DepthwiseConv2DProgram} from
'../conv_gpu_depthwise';\nimport {DepthwiseConvPacked2DProgram} from
'../conv_packed_gpu_depthwise';\n\nexport function depthwiseConv2dNative(args: {\n  inputs:
DepthwiseConv2dNativeInputs,\n  attrs: DepthwiseConv2dNativeAttrs,\n  backend: MathBackendWebGL\n}) {\n
const {inputs, backend,
 attrs} = args;\n  const {x, filter} = inputs;\n  const {strides, pad, dilations, dimRoundingMode} = attrs;\n\n  let
$dilations = dilations;\n  if ($dilations == null) {\n    $dilations = [1, 1];\n  }\n\n  util.assert(\n
backend_util.eitherStridesOrDilationsAreOne(strides, $dilations),\n      () => 'Error in depthwiseConv2d: Either
strides or dilations must be ' +\n          `1. Got strides ${strides} and dilations '${$dilations}'`);\n\n  const convInfo =
backend_util.computeConv2DInfo(\n      x.shape as [number, number, number, number],\n      filter.shape as
[number, number, number, number], strides, $dilations,\n      pad, dimRoundingMode, true /* depthwise */);\n\n  let
program: DepthwiseConv2DProgram|DepthwiseConvPacked2DProgram;\n  if
(env().getBool('WEBGL_PACK_DEPTHWISECONV') && convInfo.strideWidth <= 2 &&\n
convInfo.outChannels / convInfo.inChannels === 1) {\n    program = new
DepthwiseConvPacked2DProgram(convInfo);\n  } else {\n    program = new
DepthwiseConv2DProgram(convInfo);\n
  }\n\n  return backend.runWebGLProgram(program, [x, filter], 'float32');\n}\n\nexport const
depthwiseConv2dNativeConfig: KernelConfig = {\n  kernelName: DepthwiseConv2dNative,\n  backendName:
'webgl',\n  kernelFunc: depthwiseConv2dNative as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2018
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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==========================================================================\n
 */\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nexport class DepthwiseConv2DDerFilterProgram implements GPGPUProgram {\n
variableNames = ['x', 'dy'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(convInfo:
backend_util.Conv2DInfo) {\n    this.outputShape = convInfo.filterShape;\n\n    const strideHeight =
convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const padTop = convInfo.padInfo.top;\n
const padLeft = convInfo.padInfo.left;\n    const channelMul = convInfo.outChannels / convInfo.inChannels;\n\n
this.userCode = `\n      void main() {\n        ivec4 coords = getOutputCoords();\n        int wR = coords.x;\n        int
wC = coords.y;\n        int d1 = coords.z;\n        int dm = coords.w;\n        int d2 = d1 * ${channelMul} + dm;\n\n
float dotProd = 0.0;\n\n        // TO DO: Vec4 over the batch size\n        for (int b = 0; b < ${convInfo.batchSize};
b++) {\n
        for (int yR = 0; yR < ${convInfo.outHeight}; yR++) {\n          int xR = wR + yR * ${strideHeight} -
${padTop};\n\n          if (xR < 0 || xR >= ${convInfo.inHeight}) {\n            continue;\n          }\n\n          for (int
yC = 0; yC < ${convInfo.outWidth}; yC++) {\n            int xC = wC + yC * ${strideWidth} - ${padLeft};\n\n
  if (xC < 0 || xC >= ${convInfo.inWidth}) {\n              continue;\n            }\n\n            float dyValue = getDy(b,
yR, yC, d2);\n            float xValue = getX(b, xR, xC, d1);\n            dotProd += (xValue * dyValue);\n          }\n
    }\n        }\n        setOutput(dotProd);\n      }\n    `;\n  }\n}\n\nexport class DepthwiseConv2DDerInputProgram
implements GPGPUProgram {\n  variableNames = ['dy', 'W'];\n  outputShape: number[];\n  userCode: string;\n\n
constructor(convInfo: backend_util.Conv2DInfo) {\n    this.outputShape = convInfo.inShape;\n\n    const
filterHeight = convInfo.filterHeight;\n
```

const filterWidth = convInfo.filterWidth;\n const strideHeight = convInfo.strideHeight;\n const strideWidth = convInfo.strideWidth;\n\n const padTop = filterHeight - 1 - convInfo.padInfo.top;\n const padLeft = filterWidth - 1 - convInfo.padInfo.left;\n const channelMul = convInfo.outChannels / convInfo.inChannels;\n\n this.userCode = `\n const ivec2 pads = ivec2(${padTop}, ${padLeft});\n\n void main() {\n ivec4 coords = getOutputCoords();\n int batch = coords[0];\n int d1 = coords[3];\n ivec2 dyCorner = coords.yz - pads;\n int dyRCorner = dyCorner.x;\n int dyCCorner = dyCorner.y;\n\n float dotProd = 0.0;\n\n for (int wR = 0; wR < ${filterHeight}; wR++) {\n float dyR = float(dyRCorner + wR) / ${strideHeight}.0;\n\n if (dyR < 0.0 || dyR >= ${convInfo.outHeight}.0 || fract(dyR) > 0.0) {\n continue;\n }\n int idyR = int(dyR);\n\n int wRPerm = ${filterHeight} - 1 - wR;\n\n for (int wC = 0; wC < ${filterWidth}; wC++) {\n float dyC = float(dyCCorner + wC) / ${strideWidth}.0;\n\n if (dyC < 0.0 || dyC >= ${convInfo.outWidth}.0 ||\n fract(dyC) > 0.0) {\n continue;\n }\n int idyC = int(dyC);\n\n int wCPerm = ${filterWidth} - 1 - wC;\n\n // TO DO: Vec4 over the channelMul\n for (int dm = 0; dm < ${channelMul}; dm++) {\n int d2 = d1 * ${channelMul} + dm;\n float xValue = getDy(batch, idyR, idyC, d2);\n float wValue = getW(wRPerm, wCPerm, d1, dm);\n dotProd += xValue * wValue;\n }\n }\n }\n setOutput(dotProd);\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {backend_util, DepthwiseConv2dNativeBackpropFilter, DepthwiseConv2dNativeBackpropFilterAttrs, DepthwiseConv2dNativeBackpropFilterInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {DepthwiseConv2DDerFilterProgram} from '../conv_backprop_gpu_depthwise';\n\nexport function depthwiseConv2dNativeBackpropFilter(args: {\n inputs: DepthwiseConv2dNativeBackpropFilterInputs,\n attrs: DepthwiseConv2dNativeBackpropFilterAttrs,\n backend: MathBackendWebGL\n}) {\n const {inputs, backend, attrs} = args;\n const {x, dy} = inputs;\n const {strides, dilations, pad, dimRoundingMode, filterShape} = attrs;\n\n const convInfo = backend_util.computeConv2DInfo(\n x.shape as [number, number, number, number], filterShape, strides,\n dilations, pad, dimRoundingMode, true /* depthwise */);\n\n const program = new DepthwiseConv2DDerFilterProgram(convInfo);\n return backend.runWebGLProgram(program, [x, dy], 'float32');\n}\n\nexport const depthwiseConv2dNativeBackpropFilterConfig: KernelConfig = {\n kernelName: DepthwiseConv2dNativeBackpropFilter,\n backendName: 'webgl',\n kernelFunc: depthwiseConv2dNativeBackpropFilter as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {backend_util, DepthwiseConv2dNativeBackpropInput, DepthwiseConv2dNativeBackpropInputAttrs, DepthwiseConv2dNativeBackpropInputInputs, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {DepthwiseConv2DDerInputProgram} from '../conv_backprop_gpu_depthwise';\n\nexport function depthwiseConv2dNativeBackpropInput(args: {\n inputs: DepthwiseConv2dNativeBackpropInputInputs,\n attrs: DepthwiseConv2dNativeBackpropInputAttrs,\n backend:

MathBackendWebGL\n})
{\n const {inputs, backend, attrs} = args;\n const {dy, filter} = inputs;\n const {strides, dilations, pad, dimRoundingMode, inputShape} = attrs;\n\n const convInfo = backend_util.computeConv2DInfo(\n   inputShape, filter.shape as [number, number, number, number], strides,\n   dilations, pad, dimRoundingMode, true /* depthwise */);\n\n const program = new DepthwiseConv2DDerInputProgram(convInfo);\n return backend.runWebGLProgram(program, [dy, filter], 'float32');\n}\n\nexport const depthwiseConv2dNativeBackpropInputConfig: KernelConfig = {\n kernelName: DepthwiseConv2dNativeBackpropInput,\n backendName: 'webgl',\n kernelFunc: depthwiseConv2dNativeBackpropInput as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n
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==\n
*/\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class DiagProgram implements GPGPUProgram {\n variableNames = ['X'];\n outputShape: number[];\n userCode: string;\n\n constructor(size: number) {\n   this.outputShape = [size, size];\n   this.userCode = `\n      void main() {\n        ivec2 coords = getOutputCoords();\n        float val = coords[0] == coords[1] ? getX(coords[0]) : 0.0;\n        setOutput(val);\n      }\n    `;\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {Diag, DiagInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {DiagProgram} from '../diag_gpu';\nimport {reshape} from './Reshape';\n\nexport function diag(args: {inputs: DiagInputs, backend: MathBackendWebGL}):\n   TensorInfo {\n const {inputs, backend} = args;\n const {x} = inputs;\n\n const outShape = [...x.shape, ...x.shape];\n const xSize = util.sizeFromShape(x.shape);\n\n const flat = reshape({inputs: {x}, backend, attrs: {shape: [xSize]}});\n\n const program = new DiagProgram(xSize);\n const res = backend.runWebGLProgram(program, [flat], flat.dtype);\n\n const out = reshape({inputs: {x: res}, backend, attrs: {shape: outShape}});\n\n backend.disposeIntermediateTensorInfo(flat);\n backend.disposeIntermediateTensorInfo(res);\n\n return out;\n}\n\nexport const diagConfig: KernelConfig = {\n kernelName: Diag,\n backendName: 'webgl',\n kernelFunc: diag as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in
 writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class Dilation2DProgram implements GPGPUProgram {\n variableNames = ['x', 'W'];\n

outputShape: number[];\n userCode: string;\n\n constructor(convInfo: backend_util.Conv2DInfo) {\n this.outputShape = convInfo.outShape;\n\n   const {\n   inHeight,\n   inWidth,\n   padInfo,\n   strideHeight,\n   strideWidth,\n   filterHeight,\n   filterWidth,\n   dilationHeight,\n   dilationWidth\n   } = convInfo;\n\n const {top: padTop, left: padLeft} = padInfo;\n\n   this.userCode = `\n   const ivec2
 strides = ivec2(${strideHeight}, ${strideWidth});\n   const ivec2 pads = ivec2(${padTop}, ${padLeft});\n const float neg_infinity = -3.4e38;\n\n   void main() {\n   ivec4 coords = getOutputCoords();\n   int batch = coords.x;\n   int d1 = coords.w;\n   ivec2 outTopLeftCorner =\n   coords.yz * strides - pads;\n   int hBeg = outTopLeftCorner.x;\n   int wBeg = outTopLeftCorner.y;\n\n   float curVal = neg_infinity;\n   for (int h = 0; h < ${filterHeight}; h++) {\n   int hIn = hBeg + h * ${dilationHeight};\n\n   if (hIn >= 0 && hIn < ${inHeight}) {\n   for (int w = 0; w < ${filterWidth}; w++) {\n   int wIn = wBeg + w * ${dilationWidth};\n\n   if (wIn >= 0 && wIn < ${inWidth}) {\n   float xVal = getX(batch, hIn, wIn, d1);\n   float wVal = getW(h, w, d1);\n\n   float val = xVal + wVal;\n   if (val > curVal) {\n
curVal =
 val;\n   }\n   }\n   }\n   }\n   }\n\n   float result = curVal;\n   setOutput(result);\n   }\n   `;\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {backend_util, Dilation2D, Dilation2DAttrs, Dilation2DInputs, KernelConfig, KernelFunc, TensorInfo}
 from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {Dilation2DProgram} from '../dilation_gpu';\nimport {reshape} from './Reshape';\n\nexport function dilation2D(args: {\n inputs: Dilation2DInputs,\n attrs: Dilation2DAttrs,\n backend: MathBackendWebGL\n}) {\n const {inputs, backend, attrs} = args;\n const {x, filter} = inputs;\n const {strides, pad, dilations} = attrs;\n\n const convInfo = backend_util.computeDilation2DInfo(\n   x.shape as [number, number, number, number],\n filter.shape as [number, number, number], strides, pad,\n   'NHWC' /* dataFormat */, dilations);\n let out: TensorInfo;\n\n const program = new Dilation2DProgram(convInfo);\n out = backend.runWebGLProgram(program, [x, filter], 'float32');\n\n const outReshaped =\n   reshape({inputs: {x: out}, backend, attrs: {shape: convInfo.outShape}});\n backend.disposeIntermediateTensorInfo(out);\n\n return outReshaped;\n}\n\nexport const dilation2DConfig: KernelConfig
 = {\n kernelName: Dilation2D,\n backendName: 'webgl',\n kernelFunc: dilation2D as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {Elu, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst ELU = `return
 (x >= 0.0) ? x : (exp(x) - 1.0);`;\n\nconst ELU_PACKED = `\n vec4 result;\n\n result.r = (x.r >= 0.0) ? x.r : (exp(x.r) - 1.0);\n result.g = (x.g >= 0.0) ? x.g : (exp(x.g) - 1.0);\n result.b = (x.b >= 0.0) ? x.b : (exp(x.b) - 1.0);\n result.a = (x.a >= 0.0) ? x.a : (exp(x.a) - 1.0);\n\n return result;\n`;\n\nconst elu = unaryKernelFunc({opSnippet:

ELU, packedOpSnippet: ELU_PACKED});\n\nexport const eluConfig: KernelConfig = {\n kernelName: Elu,\n backendName: 'webgl',\n kernelFunc: elu as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {EluGrad, EluGradInputs, env, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {BinaryOpProgram} from '../binaryop_gpu';\nimport {BinaryOpPackedProgram} from '../binaryop_packed_gpu';\n\nconst ELU_DER = `return (b >= 1.0) ? a : a * (b + 1.0);`;\nconst ELU_DER_PACKED = `\n  vec4 bGTEZero = vec4(greaterThanEqual(b, vec4(0.)));\n  return (bGTEZero * a) + ((vec4(1.0) - bGTEZero) * (a * (b + vec4(1.0))));\n`;\n\nexport const eluGrad =\n   (args: {inputs: EluGradInputs, backend: MathBackendWebGL}): TensorInfo => {\n   const {inputs, backend} = args;\n   const {dy, y} = inputs;\n\n   const program = env().getBool('WEBGL_PACK_BINARY_OPERATIONS')\n   ?\n   new BinaryOpPackedProgram(ELU_DER_PACKED, dy.shape, y.shape) :\n   new BinaryOpProgram(ELU_DER, dy.shape, y.shape);\n   return backend.runWebGLProgram(program, [dy, y], dy.dtype);\n   };\n\nexport const eluGradConfig: KernelConfig = {\n kernelName: EluGrad,\n backendName: 'webgl',\n kernelFunc: eluGrad as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n * ===\n */\n\nimport {Equal, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\nimport {binaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst PACKED_EQUAL = `\n  return vec4(equal(a, b));\n`;\n\nconst EQUAL = `return float(a == b);`;\n\nexport const equal = binaryKernelFunc(\n   {opSnippet: EQUAL, packedOpSnippet: PACKED_EQUAL, dtype: 'bool'});\n\nexport const equalConfig: KernelConfig = {\n kernelName: Equal,\n backendName: 'webgl',\n kernelFunc: equal as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is\n distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {backend_util, Erf, KernelConfig} from '@tensorflow/tfjs-core';\n\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst ERF = `\n // Error function is calculated approximately with elementary function.\n // See \"Handbook of Mathematical Functions with Formulas,\n // Graphs, and Mathematical Tables\", Abramowitz and Stegun.\n float p = ${backend_util.ERF_P};\n float a1 = ${backend_util.ERF_A1};\n float a2 = ${backend_util.ERF_A2};\n float a3 = ${backend_util.ERF_A3};\n float a4 = ${backend_util.ERF_A4};\n float a5 = ${backend_util.ERF_A5};\n\n float sign = sign(x);\n x = abs(x);\n float t = 1.0 / (1.0 + p * x);\n return sign * (1.0 - (((((a5*t

+ a4)*t) + a3)*t + a2)*t + a1)*t*exp(-x*x));\n`;\n\nexport const erf = unaryKernelFunc({opSnippet: ERF});\n\nexport const erfConfig: KernelConfig = {\n kernelName: Erf,\n backendName: 'webgl',\n kernelFunc: erf,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the License);\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an AS IS BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {ExpandDims, ExpandDimsAttrs, ExpandDimsInputs,\n KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {reshape} from './Reshape';\n\nexport function expandDims(args: {\n inputs: ExpandDimsInputs,\n attrs: ExpandDimsAttrs,\n backend: MathBackendWebGL\n}): TensorInfo {\n const {inputs, attrs, backend} = args;\n const {dim} = attrs;\n const {input} = inputs;\n\n const inputRank = input.shape.length;\n const newShape = input.shape.slice();\n let $dim = dim;\n if (dim < 0) {\n // Negative value is counted from the tail of rank.\n util.assert(\n -(inputRank + 1) <= dim,\n () => `Axis must be in the interval [${- (inputRank + 1)}, ${\n inputRank}]`);\n $dim = inputRank + dim + 1;\n }\n newShape.splice($dim, 0, 1);\n\n return reshape({inputs: {x: input}, backend, attrs: {shape: newShape}});\n}\n\nexport const expandDimsConfig: KernelConfig = {\n kernelName: ExpandDims,\n backendName: 'webgl',\n kernelFunc: expandDims\n as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class FFTProgram implements GPGPUProgram {\n variableNames = ['real', 'imag'];\n outputShape: number[];\n userCode: string;\n\n constructor(\n component: 'real'|'imag', inputShape:\n [number, number],\n inverse: boolean) {\n const innerDim = inputShape[1];\n this.outputShape = inputShape;\n\n const exponentMultiplierSnippet =\n inverse ? `2.0 * ${Math.PI}` : `-2.0 * ${Math.PI}`;\n const resultDenominator = inverse ? `${innerDim}.0` : '1.0';\n\n let opString: string;\n if (component === 'real') {\n opString = 'return real * expR - imag * expI;';\n } else if (component === 'imag') {\n opString = 'return real * expI + imag * expR;';\n } else {\n throw new Error(\n `FFT component must be either \"real\" or \"imag\", got ${component}.`);\n }\n\n this.userCode = `\n const float exponentMultiplier = ${exponentMultiplierSnippet};\n\n float unaryOpComplex(float real, float expR, float imag, float expI) {\n ${opString}\n }\n\n float mulMatDFT(int batch, int index) {\n float indexRatio = float(index) / float(${innerDim});\n float exponentMultiplierTimesIndexRatio =\n exponentMultiplier * indexRatio;\n\n float result = 0.0;\n\n for (int i = 0; i < ${innerDim}; i++) {\n // x = (-2|2 * PI / N) * index * i;\n float x = exponentMultiplierTimesIndexRatio * float(i);\n float expR = cos(x);\n float expI = sin(x);\n float real = getReal(batch, i);\n float imag = getImag(batch, i);\n\n result +=\n unaryOpComplex(real, expR, imag, expI) / ${resultDenominator};\n }\n\n return result;\n }\n\n void main() {\n ivec2 coords = getOutputCoords();\n setOutput(mulMatDFT(coords[0], coords[1]));\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *

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==========\n
*/\n\nimport {TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from
'../backend_webgl';\nimport {FFTProgram} from '../fft_gpu';\n\nimport {complex} from './Complex';\nimport
{reshape} from './Reshape';\n\nexport function fftImpl(\n x: TensorInfo, inverse: boolean, backend:
MathBackendWebGL): TensorInfo {\n const xData = backend.texData.get(x.dataId);\n\n const inputSize =
util.sizeFromShape(x.shape);\n // Collapse all outer dimensions to a single batch dimension.\n const
innerDimensionSize = x.shape[x.shape.length - 1];\n const batch = inputSize / innerDimensionSize;\n\n
const input2D = reshape(\n {inputs: {x}, backend, attrs: {shape: [batch, innerDimensionSize]}});\n\n const
xShape = input2D.shape as [number, number];\n const realProgram = new FFTProgram('real', xShape, inverse);\n
const imagProgram = new FFTProgram('imag', xShape, inverse);\n\n const inputs = [\n {\n dataId:
xData.complexTensorInfos.real.dataId,\n dtype: xData.complexTensorInfos.real.dtype,\n shape: xShape\n
},\n {\n dataId: xData.complexTensorInfos.imag.dataId,\n dtype: xData.complexTensorInfos.imag.dtype,\n
shape: xShape\n }\n];\n\n const realPart = backend.runWebGLProgram(realProgram, inputs, 'float32');\n const
imagPart = backend.runWebGLProgram(imagProgram, inputs, 'float32');\n\n const complexOutput =\n
complex({inputs: {real: realPart, imag: imagPart}, backend});\n\n
backend.disposeIntermediateTensorInfo(realPart);\n backend.disposeIntermediateTensorInfo(imagPart);\n\n const
complexOutputReshaped
=\n reshape({inputs: {x: complexOutput}, backend, attrs: {shape: x.shape}});\n\n
backend.disposeIntermediateTensorInfo(input2D);\n backend.disposeIntermediateTensorInfo(complexOutput);\n
return complexOutputReshaped;\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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==========\n
*/\n\nimport {FFT, FFTInputs, KernelConfig,
TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\n\nimport
{fftImpl} from './FFT_impl';\n\nexport function fft(args: {inputs: FFTInputs, backend: MathBackendWebGL}):\n
TensorInfo {\n const {inputs, backend} = args;\n const {input} = inputs;\n\n return fftImpl(input, false /* inverse
*/, backend);\n}\n\nexport const fftConfig: KernelConfig = {\n kernelName: FFT,\n backendName: 'webgl',\n
kernelFunc: fft\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under
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==========\n
*/\n\nimport {GPGPUContext} from './gpgpu_context';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport
class FillProgram implements GPGPUProgram {\n variableNames: string[];\n outputShape: number[] = [];\n
userCode: string;\n\n valueLoc: WebGLUniformLocation;\n\n constructor(shape: number[], value: number) {\n
this.variableNames = ['x'];\n this.outputShape = shape;\n\n this.userCode = `\n uniform float value;\n void

main() {\n // Input can be obtained from uniform value.\n setOutput(value);\n }\n `;\n }\n\n getCustomSetupFunc(value: number) {\n return (gpgpu: GPGPUContext, webGLProgram: WebGLProgram) => {\n if (this.valueLoc == null) {\n this.valueLoc = gpgpu.getUniformLocationNoThrow(webGLProgram, 'value');\n }\n gpgpu.gl.uniform1f(this.valueLoc, value);\n };\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {Fill, FillAttrs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {FillProgram} from '../fill_gpu';\n\nexport function fill(args: {backend: MathBackendWebGL, attrs: FillAttrs}):\n TensorInfo {\n const {backend, attrs} = args;\n const {shape, value} = attrs;\n let {dtype} = attrs;\n\n dtype = dtype || util.inferDtype(value);\n\n if (dtype === 'string') {\n // String type should be handled in CPU memory.\n const values = util.getArrayFromDType(dtype, util.sizeFromShape(shape));\n values.fill(value as string);\n return backend.makeTensorInfo(shape, dtype, values);\n } else {\n const program = new FillProgram(shape, value as number);\n const customSetup = program.getCustomSetupFunc(value as number);\n return backend.runWebGLProgram(program, [], dtype, customSetup);\n }\n}\n\nexport const fillConfig: KernelConfig = {\n kernelName: Fill,\n backendName: 'webgl',\n kernelFunc: fill as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class FlipLeftRightProgram implements GPGPUProgram {\n variableNames = ['Image'];\n outputShape: number[] = [];\n userCode: string;\n\n constructor(imageShape: [number, number, number, number]) {\n const imageWidth = imageShape[2];\n this.outputShape = imageShape;\n\n this.userCode = `\n void main() {\n ivec4 coords = getOutputCoords();\n int x = coords[2];\n\n int coordX = ${imageWidth} - x;\n float outputValue;\n if(coordX >= 0 && coordX < ${imageWidth}) {\n outputValue = getImage(coords[0], coords[1], coordX, coords[3]);\n } else {\n outputValue = getImage(coords[0], coords[1], coords[2], coords[3]);\n }\n setOutput(outputValue);\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, Tensor4D} from '@tensorflow/tfjs-core';\nimport {FlipLeftRight, FlipLeftRightInputs}

from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {FlipLeftRightProgram} from '../flip_left_right_gpu';\n\nexport const flipLeftRightConfig: KernelConfig = {\n kernelName: FlipLeftRight,\n backendName: 'webgl',\n kernelFunc: ({inputs, backend}) => {\n const {image} = inputs as FlipLeftRightInputs;\n const webglBackend = backend as MathBackendWebGL;\n\n const program = new FlipLeftRightProgram((image as Tensor4D).shape);\n const output = webglBackend.runWebGLProgram(program, [image], image.dtype);\n return output;\n }\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {FloorDiv, KernelConfig, KernelFunc} from '@tensorflow/tfjs-core';\n\nimport {binaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\n// We use native integer division to deal with floating point imprecision. Since\n// we implement floor division and glsl implements truncated division, we\n// correct for this by subtracting 1 from result when the result is negative and\n// there is a remainder.\nconst INT_DIV = `\n float s = sign(a) * sign(b);\n int ia = round(a);\n int ib = round(b);\n if (ib != 0) {\n // Windows (D3D) wants guaranteed non-zero int division at compile-time.\n return float(idiv(ia, ib, s));\n } else {\n return NAN;\n }\n`;\n\nconst INT_DIV_PACKED = `\n ivec4 ia = round(a);\n ivec4 ib = round(b);\n bvec4 cond = notEqual(ib, ivec4(0));\n ivec4 result = ivec4(0);\n vec4 s = sign(a) * sign(b);\n\n // Windows (D3D) wants guaranteed non-zero int division at compile-time.\n if (cond[0]) {\n result[0] = idiv(ia[0], ib[0], s[0]);\n }\n if (cond[1]) {\n result[1] = idiv(ia[1], ib[1], s[1]);\n }\n if (cond[2]) {\n result[2] = idiv(ia[2], ib[2], s[2]);\n }\n if (cond[3]) {\n result[3] = idiv(ia[3], ib[3], s[3]);\n }\n return vec4(result);\n`;\n\nexport const floorDiv = binaryKernelFunc(\n {opSnippet: INT_DIV, packedOpSnippet: INT_DIV_PACKED, dtype: 'int32'});\n\nexport const floorDivConfig: KernelConfig = {\n kernelName: FloorDiv,\n backendName: 'webgl',\n kernelFunc: floorDiv as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {getGlslDifferences} from '../../glsl_version';\nimport {GPGPUProgram} from '../../gpgpu_math';\n\nexport class FromPixelsProgram implements GPGPUProgram {\n variableNames = ['A'];\n userCode: string;\n outputShape: number[];\n\n constructor(outputShape: number[]) {\n const glsl = getGlslDifferences();\n const [height, width,] = outputShape;\n this.outputShape = outputShape;\n this.userCode = `\n void main() {\n ivec3 coords = getOutputCoords();\n int texR = coords[0];\n int texC = coords[1];\n int depth = coords[2];\n vec2 uv = (vec2(texC, texR) + halfCR) / vec2(${width}.0, ${height}.0);\n\n vec4 values = ${glsl.texture2D}(A, uv);\n float value;\n if (depth == 0) {\n value = values.r;\n } else if (depth == 1) {\n value = values.g;\n } else if (depth == 2) {\n value = values.b;\n } else if (depth == 3) {\n value = values.a;\n }\n\n setOutput(floor(value * 255.0 + 0.5));\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in

compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {getGlslDifferences} from '../../glsl_version';\nimport {GPGPUProgram} from '../../gpgpu_math';\n\nexport class FromPixelsPackedProgram implements GPGPUProgram {\n variableNames = ['A'];\n userCode: string;\n outputShape: number[];\n packedInputs = false;\n packedOutput = true;\n\n constructor(outputShape: number[]) {\n const glsl = getGlslDifferences();\n const [height, width,] = outputShape;\n this.outputShape = outputShape;\n\n this.userCode = `\n void main() {\n ivec3 coords = getOutputCoords();\n int texR = coords[0];\n int texC = coords[1];\n int depth = coords[2];\n\n vec4 result = vec4(0.);\n\n for(int row=0; row<=1; row++) {\n for(int col=0; col<=1; col++) {\n texC = coords[1] + row;\n depth = coords[2] + col;\n\n vec2 uv = (vec2(texC, texR) + halfCR) /\n vec2(${width}.0, ${height}.0);\n vec4 values = ${glsl.texture2D}(A, uv);\n float value;\n if (depth == 0) {\n value = values.r;\n } else if (depth == 1) {\n value = values.g;\n } else if (depth == 2) {\n value = values.b;\n } else if (depth == 3) {\n value = values.a;\n }\n\n result[row * 2 + col] = floor(value * 255.0 + 0.5);\n }\n }\n\n ${glsl.output} = result;\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {env, KernelConfig, KernelFunc, TensorInfo} from '@tensorflow/tfjs-core';\nimport {FromPixels, FromPixelsAttrs, FromPixelsInputs} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {TextureUsage} from '../tex_util';\n\nimport {FromPixelsProgram} from './FromPixels_utils/from_pixels_gpu';\nimport {FromPixelsPackedProgram} from './FromPixels_utils/from_pixels_packed_gpu';\n\nexport const fromPixelsConfig: KernelConfig = {\n kernelName: FromPixels,\n backendName: 'webgl',\n kernelFunc: fromPixels as {} as KernelFunc,\n};\n\nlet fromPixels2DContext: CanvasRenderingContext2D;\n\nfunction fromPixels(args: {\n inputs: FromPixelsInputs,\n backend: MathBackendWebGL,\n attrs: FromPixelsAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n let {pixels} = inputs;\n const {numChannels} = attrs;\n\n const isVideo = typeof (HTMLVideoElement) !== 'undefined' &&\n pixels instanceof HTMLVideoElement;\n const isImage = typeof (HTMLImageElement) !== 'undefined' &&\n pixels instanceof HTMLImageElement;\n const isImageBitmap = typeof(ImageBitmap) !== 'undefined' &&\n pixels instanceof ImageBitmap;\n const [width, height] = isVideo ?\n [\n (pixels as HTMLVideoElement).videoWidth,\n (pixels as HTMLVideoElement).videoHeight\n] :\n [pixels.width, pixels.height];\n\n const texShape: [number, number] = [height, width];\n const outShape = [height, width, numChannels];\n\n if (isImage || isVideo || isImageBitmap) {\n if (fromPixels2DContext == null) {\n fromPixels2DContext = document.createElement('canvas').getContext('2d');\n }\n\n fromPixels2DContext.canvas.width = width;\n fromPixels2DContext.canvas.height = height;\n fromPixels2DContext.drawImage(\n pixels as HTMLVideoElement | HTMLImageElement | ImageBitmap,\n 0, 0, width, height);\n pixels = fromPixels2DContext.canvas;\n }\n\n const tempPixelHandle = backend.makeTensorInfo(texShape, 'int32');\n // This is a byte texture with pixels.\n backend.texData.get(tempPixelHandle.dataId).usage =

TextureUsage.PIXELS;\n backend.gpgpu.uploadPixelDataToTexture(\n backend.getTexture(tempPixelHandle.dataId), pixels as ImageData);\n const program = env().getBool('WEBGL_PACK') ?\n   new FromPixelsPackedProgram(outShape) :\n   new FromPixelsProgram(outShape);\n const res = backend.runWebGLProgram(program, [tempPixelHandle], 'int32');\n backend.disposeData(tempPixelHandle.dataId);\n return res;\n}\n\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {backend_util, env, FusedConv2D, FusedConv2DAttrs, FusedConv2DInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {Conv2DProgram} from '../conv_gpu';\nimport {mapActivationToShaderProgram} from '../kernel_utils/kernel_funcs_utils';\n\nimport {conv2dByMatMul, conv2dWithIm2Row} from './Conv2D_impl';\nimport {reshape} from './Reshape';\n\nexport function fusedConv2d(args: {\n inputs: FusedConv2DInputs,\n attrs: FusedConv2DAttrs,\n backend: MathBackendWebGL\n}) {\n const {inputs, backend, attrs} = args;\n const {x, filter, bias, preluActivationWeights} = inputs;\n const {\n   strides,\n   pad,\n   dataFormat,\n   dilations,\n   dimRoundingMode,\n   activation,\n   leakyreluAlpha\n } = attrs;\n\n const $dataFormat = backend_util.convertConv2DDataFormat(dataFormat);\n const convInfo = backend_util.computeConv2DInfo(\n   x.shape as [number, number, number, number],\n   filter.shape as [number, number, number, number], strides, dilations, pad,\n   dimRoundingMode, false /* depthwise */, $dataFormat);\n let out: TensorInfo;\n const intermediates: TensorInfo[] = [];\n\n if (convInfo.filterHeight === 1 && convInfo.filterWidth === 1 &&\n   convInfo.dilationHeight === 1 && convInfo.dilationWidth === 1 &&\n   convInfo.strideHeight === 1 && convInfo.strideWidth === 1 &&\n   (convInfo.padInfo.type === 'SAME' || convInfo.padInfo.type === 'VALID')) {\n   out = conv2dByMatMul({\n   x,\n   filter,\n   convInfo,\n   backend,\n   bias,\n   activation,\n   preluActivationWeights,\n   leakyreluAlpha\n   });\n } else if (env().getBool('WEBGL_CONV_IM2COL') && x.shape[0] === 1) {\n   out = conv2dWithIm2Row({\n   x,\n   filter,\n   convInfo,\n   backend,\n   bias,\n   activation,\n   preluActivationWeights,\n   leakyreluAlpha\n   });\n } else {\n   const hasBias = bias != null;\n   const hasPreluActivationWeights = preluActivationWeights != null;\n   const hasLeakyreluAlpha = activation === 'leakyrelu';\n   const fusedActivation =\n   activation ? mapActivationToShaderProgram(activation, false) : null;\n   const program = new Conv2DProgram(\n   convInfo, hasBias, fusedActivation, hasPreluActivationWeights,\n   hasLeakyreluAlpha);\n   const inputs: TensorInfo[] = [x, filter];\n   if (bias) {\n   inputs.push(bias);\n   }\n   if (preluActivationWeights) {\n   inputs.push(preluActivationWeights);\n   }\n   if (hasLeakyreluAlpha) {\n   const $leakyreluAlpha = backend.makeTensorInfo(\n   [], 'float32',\n   util.createScalarValue(leakyreluAlpha as {} as 'float32', 'float32'));\n   inputs.push($leakyreluAlpha);\n   intermediates.push($leakyreluAlpha);\n   }\n   out = backend.runWebGLProgram(program, inputs, 'float32');\n }\n\n const outReshaped =\n   reshape({inputs: {x: out}, backend, attrs: {shape: convInfo.outShape}});\n\n intermediates.push(out);\n intermediates.forEach(t => backend.disposeIntermediateTensorInfo(t));\n\n return outReshaped;\n}\n\nexport const fusedConv2DConfig: KernelConfig = {\n kernelName: FusedConv2D,\n backendName: 'webgl',\n kernelFunc: fusedConv2d as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,

software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport
{backend_util, env, FusedDepthwiseConv2D, FusedDepthwiseConv2DAttrs, FusedDepthwiseConv2DInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {DepthwiseConv2DProgram} from '../conv_gpu_depthwise';\nimport {DepthwiseConvPacked2DProgram} from '../conv_packed_gpu_depthwise';\nimport {mapActivationToShaderProgram} from '../kernel_utils/kernel_funcs_utils';\n\nexport function fusedDepthwiseConv2D(args: {\n inputs: FusedDepthwiseConv2DInputs,\n attrs: FusedDepthwiseConv2DAttrs,\n backend: MathBackendWebGL\n}) {\n const {inputs, backend, attrs} = args;\n const {x, filter, bias, preluActivationWeights} = inputs;\n const {strides, pad, dilations, dimRoundingMode, activation, leakyreluAlpha} =\n attrs;\n\n const intermediates: TensorInfo[] = [];\n\n let $dilations = dilations;\n if ($dilations == null) {\n $dilations = [1, 1];\n }\n\n util.assert(\n backend_util.eitherStridesOrDilationsAreOne(strides, $dilations),\n () => 'Error in depthwiseConv2d: Either strides or dilations must be ' +\n `1. Got strides ${strides} and dilations '${$dilations}'`);\n\n const convInfo = backend_util.computeConv2DInfo(\n x.shape as [number, number, number, number],\n filter.shape as [number, number, number, number], strides, $dilations,\n pad, dimRoundingMode, true /* depthwise */);\n\n const shouldPackDepthwiseConv =
env().getBool('WEBGL_PACK_DEPTHWISECONV') &&\n convInfo.strideWidth <= 2 &&\n convInfo.outChannels / convInfo.inChannels === 1;\n const fusedActivation = activation ?\n mapActivationToShaderProgram(activation, shouldPackDepthwiseConv) :\n null;\n const programInputs: TensorInfo[] = [x, filter];\n\n const hasBias = bias != null;\n const hasPreluActivationWeights = preluActivationWeights != null;\n const hasLeakyreluAlpha = activation === 'leakyrelu';\n\n if (hasBias) {\n programInputs.push(bias);\n }\n
if (hasPreluActivationWeights) {\n programInputs.push(preluActivationWeights);\n }\n if (hasLeakyreluAlpha) {\n const $leakyreluAlpha = backend.makeTensorInfo(\n [], 'float32',\n util.createScalarValue(leakyreluAlpha as {} as 'float32', 'float32'));\n programInputs.push($leakyreluAlpha);\n intermediates.push($leakyreluAlpha);\n }\n\n let program: DepthwiseConv2DProgram|DepthwiseConvPacked2DProgram;\n if (shouldPackDepthwiseConv) {\n program = new DepthwiseConvPacked2DProgram(\n convInfo, hasBias, fusedActivation, hasPreluActivationWeights,\n hasLeakyreluAlpha);\n } else {\n program = new DepthwiseConv2DProgram(\n convInfo, hasBias, fusedActivation, hasPreluActivationWeights,\n hasLeakyreluAlpha);\n }\n\n const result =
backend.runWebGLProgram(program, programInputs, 'float32');\n\n intermediates.forEach(t => backend.disposeIntermediateTensorInfo(t));\n\n return result;\n}\n\nexport const fusedDepthwiseConv2DConfig:
KernelConfig = {\n kernelName: FusedDepthwiseConv2D,\n backendName: 'webgl',\n kernelFunc: fusedDepthwiseConv2D as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
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==========\n */\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class GatherNDProgram implements
GPGPUProgram {\n variableNames = ['x', 'indices'];\n outputShape: number[];\n userCode: string;\n constructor(\n private sliceDim: number, private strides: number[], shape: number[]) {\n this.outputShape =

shape;\n const stridesType = getCoordsDataType(strides.length);\n const dtype = getCoordsDataType(shape.length);\n const strideString = this.sliceDim > 1 ? 'strides[j]' : 'strides';\n this.userCode = `\n ${stridesType} strides = ${stridesType}(${this.strides});\n void main() {\n ${dtype} coords = getOutputCoords();\n int flattenIndex = 0;\n for (int j = 0; j < ${this.sliceDim}; j++) {\n int index = round(getIndices(coords[0], j));\n flattenIndex += index * ${strideString};\n }\n setOutput(getX(flattenIndex, coords[1]));\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n*/\n\nimport {backend_util, GatherNd, GatherNdInputs, KernelConfig, KernelFunc, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {GatherNDProgram} from '../gather_nd_gpu';\nimport {reshape} from './Reshape';\n\nexport function gatherNd(\n args: {inputs: GatherNdInputs, backend: MathBackendWebGL}): TensorInfo {\n const {inputs, backend} = args;\n const {params, indices} = inputs;\n\n const indicesShape = indices.shape;\n const sliceRank = indicesShape[indicesShape.length - 1];\n\n const [resultShape, numSlices, sliceSize, strides] =\n backend_util.prepareAndValidate(params, indices);\n\n const flattenIndices = reshape(\n {inputs: {x: indices}, backend, attrs: {shape: [numSlices, sliceRank]}});\n const flattenX = reshape({\n inputs: {x: params},\n backend,\n attrs: {shape: [(util.sizeFromShape(params.shape) / sliceSize), sliceSize]}\n });\n\n const program =\n new GatherNDProgram(sliceRank, strides, [numSlices, sliceSize]);\n const res = backend.runWebGLProgram(\n program, [flattenX, flattenIndices], flattenX.dtype);\n\n const reshaped =\n reshape({inputs: {x: res}, backend, attrs: {shape: resultShape}});\n\n backend.disposeIntermediateTensorInfo(flattenIndices);\n backend.disposeIntermediateTensorInfo(flattenX);\n backend.disposeIntermediateTensorInfo(res);\n\n return reshaped;\n}\n\nexport const gatherNdConfig: KernelConfig = {\n kernelName: GatherNd,\n backendName: 'webgl',\n kernelFunc: gatherNd as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n*/\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class GatherProgram implements GPGPUProgram {\n variableNames = ['A', 'indices'];\n outputShape: number[];\n userCode: string;\n rank: number;\n\n constructor(aShape: number[], outputShape: number[]) {\n this.outputShape = outputShape;\n this.rank = outputShape.length;\n const dtype = getCoordsDataType(this.rank);\n const sourceCoords = getSourceCoords(aShape, 2);\n\n this.userCode = `\n void main() {\n  ${dtype} resRC = getOutputCoords();\n  setOutput(getA(${sourceCoords}));\n  }\n `;\n}\n\n// The input and output are always flattened into rank 4 tensors.\nfunction getSourceCoords(aShape: number[], axis: number): string {\n const currentCoords = ['resRC.x', 'resRC.y', 'resRC.z', 'resRC.w'];\n\n const sourceCoords = [];\n for (let i = 0; i < aShape.length; i++) {\n if (i === 2) {\n sourceCoords.push('int(getIndices(resRC.x, resRC.z))');\n } else {\n sourceCoords.push(`${currentCoords[i]}`);\n }\n }\n return sourceCoords.join();\n}\n","/**\n

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OR CONDITIONS OF ANY KIND, either express
or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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/\n\nimport {IFFT, IFFTInputs, KernelConfig, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\n\nimport {fftImpl} from './FFT_impl';\n\nexport function ifft(args: {inputs: IFFTInputs, backend: MathBackendWebGL}):\n TensorInfo {\n const {inputs, backend} = args;\n const {input} = inputs;\n\n return fftImpl(input, true / inverse */, backend);\n}\n\nexport const ifftConfig: KernelConfig = {\n kernelName: IFFT,\n backendName: 'webgl',\n kernelFunc: ifft\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n
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*/\n\nimport {IsFinite, KernelConfig} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst IS_FINITE = `return float(!isnan(x) && !isinf(x));`;\n\nexport const isFinite = unaryKernelFunc({opSnippet: IS_FINITE, dtype: 'bool'});\n\nexport const isFiniteConfig: KernelConfig = {\n kernelName: IsFinite,\n backendName: 'webgl',\n kernelFunc: isFinite,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n
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==========\n
*/\n\nimport {IsInf, KernelConfig} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst IS_INF = `return float(isinf(x));`;\n\nexport const isInf = unaryKernelFunc({opSnippet: IS_INF, dtype: 'bool'});\n\nexport const isInfConfig: KernelConfig = {\n kernelName: IsInf,\n backendName: 'webgl',\n kernelFunc: isInf,\n};\n","/**\n * @license\n * Copyright 2020 Google
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==========\n
*/\n\nimport {IsNan, KernelConfig} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst IS_NAN = `return float(isnan(x));`;\n\nexport const isNaN = unaryKernelFunc({opSnippet: IS_NAN, dtype: 'bool'});\n\nexport const isNaNConfig: KernelConfig = {\n kernelName: IsNan,\n
  backendName: 'webgl',\n kernelFunc: isNaN,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *

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==========\n */\n\nimport {KernelConfig, KernelFunc, LessEqual} from '@tensorflow/tfjs-core';\n\nimport {binaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nexport const LESS_EQUAL = `return float(a <= b);`;\nexport const LESS_EQUAL_PACKED
= `\n  return vec4(lessThanEqual(a, b));\n`;\n\nexport const lessEqual = binaryKernelFunc(\n   {opSnippet: LESS_EQUAL, packedOpSnippet: LESS_EQUAL_PACKED, dtype: 'bool'});\n\nexport const lessEqualConfig: KernelConfig = {\n kernelName: LessEqual,\n backendName: 'webgl',\n kernelFunc: lessEqual as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, LinSpace, LinSpaceAttrs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {linSpaceImplCPU} from '../kernel_utils/shared';\n\nexport function linSpace(\n   args: {backend: MathBackendWebGL, attrs: LinSpaceAttrs}): TensorInfo {\n const {backend, attrs} = args;\n const {start, stop, num} = attrs;\n\n // TODO: Use CPU implementation due to the precision problem in Safari.\n const outVals = linSpaceImplCPU(start, stop, num);\n return backend.makeTensorInfo([outVals.length], 'float32', outVals);\n}\n\nexport const linSpaceConfig: KernelConfig = {\n kernelName: LinSpace,\n backendName: 'webgl',\n kernelFunc: linSpace as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance
with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, Log1p} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst LOG1P = `return log(1.0 + x);`;\n\nexport const log1p = unaryKernelFunc({opSnippet: LOG1P});\n\nexport const log1pConfig: KernelConfig = {\n kernelName: Log1p,\n backendName: 'webgl',\n kernelFunc: log1p,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, LogicalAnd} from '@tensorflow/tfjs-core';\n\nimport {binaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst LOGICAL_AND = `return float(a >= 1.0 && b >= 1.0);`;\nconst LOGICAL_AND_PACKED = `\n return vec4(\n   vec4(greaterThanEqual(a, vec4(1.0))) *\n

vec4(greaterThanEqual(b, vec4(1.0))));\n`;\n\nexport const logicalAnd = binaryKernelFunc({\n opSnippet: LOGICAL_AND,\n packedOpSnippet: LOGICAL_AND_PACKED,\n dtype: 'bool'\n});\n\nexport const logicalAndConfig: KernelConfig = {\n kernelName: LogicalAnd,\n backendName: 'webgl',\n kernelFunc: logicalAnd as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig,\n LogicalNot} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst LOGICAL_NOT = `return float(!(x >= 1.0));`;\n\nexport const logicalNot = unaryKernelFunc({opSnippet: LOGICAL_NOT});\n\nexport const logicalNotConfig: KernelConfig = {\n kernelName: LogicalNot,\n backendName: 'webgl',\n kernelFunc: logicalNot,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under\n the License.\n *\n ==\n */\n\nimport {KernelConfig, KernelFunc, LogicalOr} from '@tensorflow/tfjs-core';\n\nimport {binaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst LOGICAL_OR = `return float(a >= 1.0 || b >= 1.0);`;\nconst LOGICAL_OR_PACKED = `\n return min(\n vec4(greaterThanEqual(a, vec4(1.0))) +\n vec4(greaterThanEqual(b, vec4(1.0))),\n vec4(1.0));\n`;\n\nexport const logicalOr = binaryKernelFunc(\n {opSnippet: LOGICAL_OR, packedOpSnippet: LOGICAL_OR_PACKED, dtype: 'bool'});\n\nexport const logicalOrConfig: KernelConfig = {\n kernelName: LogicalOr,\n backendName: 'webgl',\n kernelFunc: logicalOr as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class LRNProgram implements GPGPUProgram {\n variableNames = ['x'];\n outputShape: number[] = [];\n userCode: string;\n\n constructor(\n xShape: number[], radius: number, bias: number, alpha: number,\n beta: number) {\n const rad = radius;\n const maxD = xShape[3] - 1;\n this.outputShape = xShape;\n\n // optimize pow(bias + alpha * sum, -beta)\n // src: https://github.com/tensorflow/tensorflow/..\n // blob/26033a1644a9c4a5fbe3170ab2e864b6a4ccd4ca/..\n // tensorflow/core/kernels/mkl_lrn_op.cc#L320\n let powOperator;\n const basis = `float(${bias}) + float(${alpha}) * sum`;\n if (beta === 0.5) {\n powOperator = `inversesqrt(${basis})`;\n } else if (beta === 1.0) {\n powOperator = `1.0/(${basis})`;\n } else {\n powOperator = `exp(log(${basis}) * float(-${beta}));`;\n }\n\n this.userCode = `\n void main() {\n ivec4 coords = getOutputCoords();\n int b = coords[0];\n int r = coords[1];\n int c = coords[2];\n int d = coords[3];\n float x = getX(b, r, c, d);\n

```
    float sum = 0.0;\n       for (int j = -${rad}; j <= ${rad}; j++) {\n         int idx = d + j;\n         if (idx >= 0 && idx <=  ${maxD}) {\n           float z = getX(b, r, c, idx);\n           sum += z * z;\n         }\n       }\n       float val = x * ${powOperator};\n       setOutput(val);\n     }\n   `;\n }\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights
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 ==========================================================================\n
 */\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class LRNPackedProgram implements
 GPGPUProgram {\n  variableNames = ['x'];\n  outputShape: number[] = [];\n  userCode: string;\n  packedInputs = true;\n  packedOutput = true;\n\n  constructor(\n      xShape: number[], radius: number, bias: number, alpha: number,\n      beta:
 number) {\n    const rad = radius;\n    const maxD = xShape[3] - 1;\n    this.outputShape = xShape;\n\n    // optimize pow(bias + alpha * sum, -beta)\n    // src: https://github.com/tensorflow/tensorflow/..\n    //
 blob/26033a1644a9c4a5fbe3170ab2e864b6a4ccd4ca/..\n    // tensorflow/core/kernels/mkl_lrn_op.cc#L320\n    let powOperator;\n    const basis = `float(${bias}) + float(${alpha}) * sum`;\n    if (beta === 0.5) {\n      powOperator = `inversesqrt(${basis})`;\n    } else if (beta === 1.0) {\n      powOperator = `1.0/(${basis})`;\n    } else {\n      powOperator = `exp(log(${basis}) * float(-${beta}));`;\n    }\n\n    this.userCode = `\n      void main() {\n        ivec4 coords = getOutputCoords();\n        int b = coords.x;\n        int r = coords.y;\n        int c = coords.z;\n        int d = coords.w;\n\n        bool hasNextCol = d < ${this.outputShape[3]};\n        bool hasNextRow = c < ${this.outputShape[2]};\n\n        vec4 sum = vec4(0.);\n        vec4 xFragAtOutputCoords =
 getX(b, r, c, d);\n\n        vec4 xAtOutputCoords = vec4(\n          getChannel(xFragAtOutputCoords, vec2(c, d)),\n
    hasNextCol ?\n            getChannel(xFragAtOutputCoords, vec2(c, d + 1)) : 0.0,\n          hasNextRow ?\n            getChannel(xFragAtOutputCoords , vec2(c + 1, d)) : 0.0,\n          (hasNextRow && hasNextCol) ?\n            getChannel(xFragAtOutputCoords, vec2(c + 1, d + 1)) : 0.0\n        );\n\n        int firstChannel = d - ${rad};\n        vec2 cache = vec2(0.);\n        if(firstChannel >= 0){\n          vec4 firstChannelFrag = getX(b, r, c, firstChannel);\n
   cache.x = getChannel(firstChannelFrag, vec2(c, firstChannel));\n          if(hasNextRow){\n            cache.y = getChannel(firstChannelFrag, vec2(c + 1, firstChannel));\n          }\n        }\n\n        ivec2 depth = ivec2(d, d + 1);\n
    for (int j = - ${rad}; j <= ${rad}; j++) {\n          ivec2 idx = depth + j;\n          bvec2 aboveLowerBound = greaterThanEqual(idx, ivec2(0));\n
        bvec2 belowUpperBound = lessThanEqual(idx, ivec2(${maxD}));\n\n          bool depthInRange = aboveLowerBound.x && belowUpperBound.x;\n          bool depthPlusOneInRange = aboveLowerBound.y && belowUpperBound.y;\n\n          if(depthInRange || depthPlusOneInRange){\n            vec4 z = vec4(0.);\n            vec4 xFragAtCurrentDepth;\n            z.xz = cache.xy;\n            if(depthPlusOneInRange && hasNextCol){\n              xFragAtCurrentDepth = idx.y != d ?\n                getX(b, r, c, idx.y) : xFragAtOutputCoords;\n              z.y = getChannel(xFragAtCurrentDepth, vec2(c, idx.y));\n              if(hasNextRow){\n                z.w = getChannel(xFragAtCurrentDepth, vec2(c + 1, idx.y));\n              }\n            }\n            cache.xy = z.yw;\n            sum += z * z;\n          }\n        }\n        vec4 result = xAtOutputCoords * ${powOperator};\n        setOutput(result);\n
   }\n    `;\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights
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 http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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==========================================================================\n
*/\n\nimport {env, KernelConfig, KernelFunc, LRN, LRNAttrs, LRNInputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {LRNProgram} from '../lrn_gpu';\nimport {LRNPackedProgram} from '../lrn_packed_gpu';\n\nexport const lrn =\n    (args: {inputs: LRNInputs, backend: MathBackendWebGL,
 attrs: LRNAttrs}):\n        TensorInfo => {\n        const {inputs, backend, attrs} = args;\n        const {x} = inputs;\n
      const {depthRadius, bias, alpha, beta} = attrs;\n\n        const program =
env().getBool('WEBGL_PACK_NORMALIZATION') ?\n            new LRNPackedProgram(x.shape, depthRadius, bias, alpha, beta) :\n            new LRNProgram(x.shape, depthRadius, bias, alpha, beta);\n        return backend.runWebGLProgram(program, [x], x.dtype);\n    };\n\n// tslint:disable-next-line: variable-name\nexport const LRNConfig: KernelConfig = {\n  kernelName: LRN,\n  backendName: 'webgl',\n  kernelFunc: lrn as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable
 law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class LRNGradProgram implements GPGPUProgram {\n  variableNames = ['inputImage', 'outputImage', 'dy'];\n  outputShape: number[] = [];\n  userCode: string;\n  depthRadius: number;\n  bias: number;\n  alpha: number;\n  beta: number;\n  depth: number;\n\n  constructor(\n      inputShape: number[], depthRadius: number, bias: number, alpha: number,\n      beta: number) {\n    this.outputShape = inputShape;\n    this.depth = inputShape[3];\n    this.depthRadius = depthRadius;\n    this.bias = bias;\n    this.alpha = alpha;\n    this.beta = beta;\n    this.userCode
    = `\n      void main() {\n        ivec4 coords = getOutputCoords();\n        int b = coords[0];\n        int r = coords[1];\n
    int c = coords[2];\n\n        float result = 0.0;\n        for (int d = 0; d < ${this.depth}; ++d) {\n          int depthBegin = int(max(0.0, float(d - ${depthRadius})));\n          int depthEnd = int(min(float(${this.depth}),\n              float(d + ${depthRadius} + 1)));\n\n          const int MIN_DEPTH_BEGIN = 0;\n          const int MAX_DEPTH_END = ${this.depth};\n\n          float norm = 0.0;\n          for (int k = MIN_DEPTH_BEGIN; k < MAX_DEPTH_END; ++k) {\n            if (k < depthBegin){\n              continue;\n            }\n            else if (k >= depthBegin && k < depthEnd) {\n              norm += getInputImage(b, r, c, k) * getInputImage(b, r, c, k);\n            }\n            else {\n
      break;\n            }\n          }\n\n          norm = float(${alpha}) * norm + float(${bias});\n\n          for(int k = MIN_DEPTH_BEGIN;
 k < MAX_DEPTH_END; ++k){\n            if (k < depthBegin){\n              continue;\n            }\n            else if (k >= depthBegin && k < depthEnd){\n              float dyi = -2.0 * float(${alpha})\n                * float(${beta})\n                * getInputImage(b ,r ,c, k) * getOutputImage(b, r, c, d)\n                / norm;\n              if (k == d) {\n                dyi += pow(norm, -1.0 * ${beta});\n              }\n              if (k == coords[3]) {\n                dyi *= getDy(b, r, c, d);\n
 result += dyi;\n              }\n            }\n            else {\n              break;\n            }\n          }\n      }\n
setOutput(result);\n    }\n    `;\n  }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n
 *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
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*/\n\nimport {KernelConfig, KernelFunc, LRNGrad, LRNGradAttrs, LRNGradInputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {LRNGradProgram} from '../lrn_grad_gpu';\n\nexport const lrnGrad = (args: {\n inputs: LRNGradInputs,\n backend: MathBackendWebGL,\n attrs: LRNGradAttrs\n}): TensorInfo => {\n const {inputs, backend, attrs} = args;\n const {x, y, dy} = inputs;\n const {depthRadius, bias, alpha, beta} = attrs;\n\n const program = new LRNGradProgram(x.shape, depthRadius, bias, alpha, beta);\n return backend.runWebGLProgram(program, [x, y, dy], x.dtype);\n};\n\n// tslint:disable-next-line: variable-name\nexport const LRNGradConfig: KernelConfig = {\n kernelName: LRNGrad,\n backendName: 'webgl',\n kernelFunc: lrnGrad as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n*/\n\nimport {KernelFunc,
  Max, MaxAttrs, MaxInputs, TensorInfo} from '@tensorflow/tfjs-core';\nimport {backend_util, KernelConfig, TypedArray, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {maxImplCPU} from '../kernel_utils/shared';\n\nimport {maxImpl} from './Max_impl';\nimport {transposeImpl, transposeImplCPU} from './Transpose_impl';\n\nexport function max(\n args: {inputs: MaxInputs, backend: MathBackendWebGL, attrs: MaxAttrs}):\n   TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {reductionIndices, keepDims} = attrs;\n\n const xRank = x.shape.length;\n\n const origAxes = util.parseAxisParam(reductionIndices, x.shape);\n let axes = origAxes;\n const permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n const maxInputIsTransposed = permutedAxes != null;\n const shouldExecuteOnCPU = backend.shouldExecuteOnCPU([x]);\n\n let maxInput = x;\n if (maxInputIsTransposed) {\n   if (shouldExecuteOnCPU)
  {\n   const xTexData = backend.texData.get(maxInput.dataId);\n   const values = xTexData.values as TypedArray;\n\n   const newShape: number[] = new Array(xRank);\n   for (let i = 0; i < newShape.length; i++)
  {\n   newShape[i] = x.shape[permutedAxes[i]];\n   }\n   const maxInputValues =\n   transposeImplCPU(values, x.shape, x.dtype, permutedAxes, newShape);\n\n   maxInput = backend.makeTensorInfo(newShape, x.dtype);\n   const maxInputData = backend.texData.get(maxInput.dataId);\n   maxInputData.values = maxInputValues;\n   } else {\n   maxInput = transposeImpl(x, permutedAxes, backend);\n   }\n\n   axes = backend_util.getInnerMostAxes(axes.length, xRank);\n }\n\n backend_util.assertAxesAreInnerMostDims('max', axes, xRank);\n const [maxOutShape, reduceShape] =\n   backend_util.computeOutAndReduceShapes(maxInput.shape, axes);\n\n let outShape = maxOutShape;\n if (keepDims) {\n   // rather than reshape at the end, set the target
  shape here.\n   outShape = backend_util.expandShapeToKeepDim(maxOutShape, origAxes);\n }\n\n let out;\n if (shouldExecuteOnCPU) {\n   const xTexData = backend.texData.get(maxInput.dataId);\n   const values = xTexData.values as TypedArray;\n\n   const outValues =\n   maxImplCPU(values, util.sizeFromShape(reduceShape), outShape, x.dtype);\n\n   out = backend.makeTensorInfo(outShape, x.dtype);\n   const outData = backend.texData.get(out.dataId);\n   outData.values = outValues;\n } else {\n   out = maxImpl(maxInput, reduceShape, outShape, backend);\n }\n\n if (maxInputIsTransposed) {\n   backend.disposeIntermediateTensorInfo(maxInput);\n }\n\n return out;\n}\n\nexport const maxConfig: KernelConfig = {\n kernelName: Max,\n backendName: 'webgl',\n kernelFunc: max as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in

compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\nimport {backend_util, KernelConfig, KernelFunc, MaxPool, MaxPoolAttrs, MaxPoolInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {Pool2DProgram} from '../pool_gpu';\nimport {assertNotComplex} from '../webgl_util';\nimport {identity} from './Identity';\n\nexport function maxPool(args: {\n inputs: MaxPoolInputs,\n backend: MathBackendWebGL,\n attrs: MaxPoolAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n assertNotComplex(x, 'maxPool');\n const {filterSize, strides, pad, dimRoundingMode} = attrs;\n const dilations = 1;\n\n util.assert(\n   backend_util.eitherStridesOrDilationsAreOne(strides, dilations),\n   () => 'Error in maxPool: Either strides or dilations must be 1. ' +\n   `Got strides ${strides} and dilations '${dilations}'`);\n\n const convInfo = backend_util.computePool2DInfo(\n   x.shape as [number, number, number, number], filterSize, strides,\n   dilations, pad, dimRoundingMode);\n if (convInfo.filterWidth === 1 && convInfo.filterHeight === 1 &&\n   util.arraysEqual(convInfo.inShape, convInfo.outShape)) {\n   return identity({inputs: {x}, backend});\n }\n const maxPoolProgram = new Pool2DProgram(convInfo, 'max', false);\n return backend.runWebGLProgram(maxPoolProgram, [x], x.dtype);\n}\n\nexport const maxPoolConfig: KernelConfig = {\n kernelName: MaxPool,\n backendName: 'webgl',\n kernelFunc: maxPool as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\nimport {backend_util, KernelConfig, KernelFunc, MaxPool3D, MaxPool3DAttrs, MaxPool3DInputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {Pool3DProgram} from '../pool_gpu';\n\nexport function maxPool3d(args: {\n inputs: MaxPool3DInputs,\n backend: MathBackendWebGL,\n attrs: MaxPool3DAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {filterSize, strides, pad, dataFormat, dimRoundingMode} = attrs;\n const dilations: [number, number, number] = [1, 1, 1];\n\n const convInfo = backend_util.computePool3DInfo(\n   x.shape as [number, number, number, number, number], filterSize, strides,\n   dilations, pad, dimRoundingMode, dataFormat);\n const maxPoolProgram = new Pool3DProgram(convInfo, 'max', false);\n return backend.runWebGLProgram(maxPoolProgram, [x], x.dtype);\n}\n\nexport const maxPool3DConfig: KernelConfig = {\n kernelName: MaxPool3D,\n backendName: 'webgl',\n kernelFunc: maxPool3d as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance
with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n

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*/\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from
'./gpgpu_math';\n\nexport class MaxPool2DBackpropProgram implements GPGPUProgram {\n  variableNames =
['dy', 'maxPos'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(convInfo:
backend_util.Conv2DInfo) {\n    this.outputShape = convInfo.inShape;\n    const strideHeight =
convInfo.strideHeight;\n    const strideWidth = convInfo.strideWidth;\n    const dilationHeight
 = convInfo.dilationHeight;\n    const effectiveFilterHeight = convInfo.effectiveFilterHeight;\n    const
effectiveFilterWidth = convInfo.effectiveFilterWidth;\n\n    const padTop = effectiveFilterHeight - 1 -
convInfo.padInfo.top;\n    const padLeft = effectiveFilterWidth - 1 - convInfo.padInfo.left;\n\n    const lastIndex =
effectiveFilterHeight * effectiveFilterWidth - 1;\n    this.userCode = `\n      const ivec2 pads = ivec2(${padTop},
${padLeft});\n\n      void main() {\n        ivec4 coords = getOutputCoords();\n        int b = coords[0];\n        int d =
coords[3];\n\n        ivec2 dyRCCorner = coords.yz - pads;\n        int dyRCorner = dyRCCorner.x;\n        int
dyCCorner = dyRCCorner.y;\n\n        // Convolve dy(?, ?, d) with pos mask(:, :, d) to get dx(xR, xC, d).\n        // ? =
to be determined. : = across all values in that axis.\n        float dotProd = 0.0;\n        for (int wR = 0; wR <
${effectiveFilterHeight};\n          wR += ${dilationHeight}) {\n          float
 dyR = float(dyRCorner + wR) / ${strideHeight}.0;\n\n          if (dyR < 0.0 || dyR >= ${convInfo.outHeight}.0 ||
fract(dyR) > 0.0) {\n            continue;\n          }\n          int idyR = int(dyR);\n\n          for (int wC = 0; wC <
${effectiveFilterWidth}; wC++) {\n            float dyC = float(dyCCorner + wC) / ${strideWidth}.0;\n\n            if
(dyC < 0.0 || dyC >= ${convInfo.outWidth}.0 ||\n                fract(dyC) > 0.0) {\n              continue;\n            }\n
 int idyC = int(dyC);\n\n            float dyValue = getDy(b, idyR, idyC, d);\n            int maxPosValue = ${lastIndex} -
int(getMaxPos(b, idyR, idyC, d));\n\n            // Get the current value, check it against the value from the\n            //
position matrix.\n            int curPosValue = wR * ${effectiveFilterWidth} + wC;\n            float mask =
float(maxPosValue == curPosValue ? 1.0 : 0.0);\n\n            dotProd += dyValue * mask;\n          }\n        }\n
setOutput(dotProd);\n
    }\n    `;\n  }\n}\n\nexport class MaxPool3DBackpropProgram implements GPGPUProgram {\n  variableNames =
['dy', 'maxPos'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(convInfo:
backend_util.Conv3DInfo) {\n    this.outputShape = convInfo.inShape;\n    const strideDepth =
convInfo.strideDepth;\n    const strideHeight = convInfo.strideHeight;\n    const strideWidth =
convInfo.strideWidth;\n    const dilationDepth = convInfo.dilationDepth;\n    const dilationHeight =
convInfo.dilationHeight;\n    const dilationWidth = convInfo.dilationWidth;\n    const effectiveFilterDepth =
convInfo.effectiveFilterDepth;\n    const effectiveFilterHeight = convInfo.effectiveFilterHeight;\n    const
effectiveFilterWidth = convInfo.effectiveFilterWidth;\n\n    const padFront = effectiveFilterDepth - 1 -
convInfo.padInfo.front;\n    const padTop = effectiveFilterHeight - 1 - convInfo.padInfo.top;\n    const padLeft =
effectiveFilterWidth - 1 - convInfo.padInfo.left;\n\n    const lastIndex
 =\n        effectiveFilterDepth * effectiveFilterHeight * effectiveFilterWidth - 1;\n    this.userCode = `\n      const
ivec3 pads = ivec3(${padFront}, ${padTop}, ${padLeft});\n\n      void main() {\n        ivec5 coords =
getOutputCoords();\n        int batch = coords.x;\n        int ch = coords.u;\n\n        ivec3 dyCorner = ivec3(coords.y,
coords.z, coords.w) - pads;\n        int dyDCorner = dyCorner.x;\n        int dyRCorner = dyCorner.y;\n        int
dyCCorner = dyCorner.z;\n\n        // Convolve dy(?, ?, ?, ch) with pos mask(:, :, :, d) to get\n        // dx(xD, xR, xC,
ch).\n        // ? = to be determined. : = across all values in that axis.\n        float dotProd = 0.0;\n\n        for (int wD =
0; wD < ${effectiveFilterDepth};\n          wD += ${dilationDepth}) {\n          float dyD = float(dyDCorner + wD) /
${strideDepth}.0;\n\n          if (dyD < 0.0 || dyD >= ${convInfo.outDepth}.0 || fract(dyD) > 0.0) {\n
continue;\n          }\n          int idyD = int(dyD);\n\n
          for (int wR = 0; wR < ${effectiveFilterHeight};\n            wR += ${dilationHeight}) {\n            float dyR =
float(dyRCorner + wR) / ${strideHeight}.0;\n\n            if (dyR < 0.0 || dyR >= ${convInfo.outHeight}.0 ||\n
fract(dyR) > 0.0) {\n              continue;\n            }\n            int idyR = int(dyR);\n\n            for (int wC = 0; wC <
${effectiveFilterWidth};\n              wC += ${dilationWidth}) {\n              float dyC = float(dyCCorner + wC) /
${strideWidth}.0;\n\n              if (dyC < 0.0 || dyC >= ${convInfo.outWidth}.0 ||\n                  fract(dyC) > 0.0) {\n
          continue;\n              }\n              int idyC = int(dyC);\n\n              float dyValue = getDy(batch, idyD, idyR,
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idyC, ch);\n int maxPosValue = ${lastIndex} -\n int(getMaxPos(batch, idyD, idyR, idyC, ch));\n\n // Get the current value, check it against the value from the\n // position matrix.\n int curPosValue =\n wD * ${effectiveFilterHeight} * ${effectiveFilterWidth} +\n wR * ${effectiveFilterWidth} + wC;\n float mask = float(maxPosValue == curPosValue ? 1.0 : 0.0);\n\n dotProd += dyValue * mask;\n }\n }\n }\n setOutput(dotProd);\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations
under the License.\n *
==========\n*/\nimport {backend_util, KernelConfig, KernelFunc, MaxPool3DGrad, MaxPool3DGradAttrs, MaxPool3DGradInputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {MaxPool3DBackpropProgram} from '../max_pool_backprop_gpu';\nimport {Pool3DProgram} from '../pool_gpu';\n\nexport function maxPool3DGrad(args: {\n inputs: MaxPool3DGradInputs,\n backend: MathBackendWebGL,\n attrs: MaxPool3DGradAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {dy, input} = inputs;\n const x = input;\n const {filterSize, strides, pad, dimRoundingMode} = attrs;\n const dilations: [number, number, number] = [1, 1, 1];\n\n const convInfo = backend_util.computePool3DInfo(\n x.shape as [number, number, number, number, number], filterSize, strides,\n dilations, pad, dimRoundingMode);\n\n const maxPool3dPositionsProgram =\n new Pool3DProgram(convInfo, 'max', true /* get positions */);\n const maxPool3dPositions =\n backend.runWebGLProgram(maxPool3dPositionsProgram, [x], x.dtype);\n const maxPoolBackpropProgram = new MaxPool3DBackpropProgram(convInfo);\n const result = backend.runWebGLProgram(\n maxPoolBackpropProgram, [dy, maxPool3dPositions], x.dtype);\n backend.disposeIntermediateTensorInfo(maxPool3dPositions);\n return result;\n}\n\nexport const maxPoolGrad3DConfig: KernelConfig = {\n kernelName: MaxPool3DGrad,\n backendName: 'webgl',\n kernelFunc: maxPool3DGrad as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under
the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n*/\nimport {backend_util, KernelConfig, KernelFunc, MaxPoolGrad, MaxPoolGradAttrs, MaxPoolGradInputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {MaxPool2DBackpropProgram} from '../max_pool_backprop_gpu';\nimport {Pool2DProgram} from '../pool_gpu';\nimport {assertNotComplex} from '../webgl_util';\n\nexport function maxPoolGrad(args: {\n inputs: MaxPoolGradInputs,\n backend: MathBackendWebGL,\n attrs: MaxPoolGradAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {dy, input, output} = inputs;\n const x = input;\n assertNotComplex([input, output], 'maxPoolGrad');\n const {filterSize,
strides, pad, dimRoundingMode} = attrs;\n\n const convInfo = backend_util.computePool2DInfo(\n x.shape as [number, number, number, number], filterSize, strides,\n 1 /* dilations */, pad, dimRoundingMode);\n const getPositions = true;\n const maxPoolPositionsProgram =\n new Pool2DProgram(convInfo, 'max', getPositions);\n const maxPoolPositions: TensorInfo =\n

backend.runWebGLProgram(maxPoolPositionsProgram, [x], x.dtype);\n\n const maxPoolBackPropProgram = new MaxPool2DBackpropProgram(convInfo);\n const result = backend.runWebGLProgram(\n maxPoolBackPropProgram, [dy, maxPoolPositions], x.dtype);\n backend.disposeIntermediateTensorInfo(maxPoolPositions);\n return result;\n}\n\nexport const maxPoolGradConfig: KernelConfig = {\n kernelName: MaxPoolGrad,\n backendName: 'webgl',\n kernelFunc: maxPoolGrad as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {backend_util, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {Pool2DProgram} from '../pool_gpu';\n\nexport function maxPoolWithArgmaxImpl(\n x: TensorInfo, includeBatchInIndex: boolean,\n   convInfo: backend_util.Conv2DInfo,\n   backend: MathBackendWebGL): TensorInfo[] {\n let program = new Pool2DProgram(convInfo, 'max', false);\n const poolOutput = backend.runWebGLProgram(program, [x], 'float32');\n\n program = new Pool2DProgram(convInfo, 'max', true, true, includeBatchInIndex);\n const indexOutput = backend.runWebGLProgram(program, [x], 'float32');\n return [poolOutput, indexOutput];\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport\n {MaxPoolWithArgmax, MaxPoolWithArgmaxAttrs, MaxPoolWithArgmaxInputs} from '@tensorflow/tfjs-core';\nimport {backend_util, KernelConfig, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\n\nimport {maxPoolWithArgmaxImpl} from './MaxPoolWithArgmax_impl';\n\nexport const maxPoolWithArgmaxConfig: KernelConfig = {\n kernelName: MaxPoolWithArgmax,\n backendName: 'webgl',\n kernelFunc: ({inputs, attrs, backend}) => {\n   const {x} = inputs as MaxPoolWithArgmaxInputs;\n const {filterSize, strides, pad, includeBatchInIndex} =\n   attrs as {} as MaxPoolWithArgmaxAttrs;\n   const webglBackend = backend as MathBackendWebGL;\n\n   util.assert(\n   x.shape.length === 4,\n   () => `Error in maxPool: input must be rank 4 but got rank ${\n            x.shape.length}.`);\n   const dilations: [number, number] = [1, 1];\n   util.assert(\n   backend_util.eitherStridesOrDilationsAreOne(strides, dilations),\n   () => 'Error in maxPool: Either strides or dilations must be 1. ' +\n   `Got strides ${strides} and dilations '${dilations}'`);\n\n const convInfo = backend_util.computePool2DInfo(\n   x.shape as [number, number, number, number], filterSize, strides,\n   dilations, pad);\n\n   const [result, indexes] =\n   maxPoolWithArgmaxImpl(x, includeBatchInIndex, convInfo, webglBackend);\n   return [result, indexes];\n }\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific

language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from
'../backend_webgl';\nimport {reduce} from '../kernel_utils/reduce';\nimport {reshape} from
'../kernels/Reshape';\n\nexport function meanImpl(\n x: TensorInfo, reduceShape: number[], outShape:
number[],\n backend: MathBackendWebGL): TensorInfo {\n const inSize = util.sizeFromShape(reduceShape);\n
const xSize = util.sizeFromShape(x.shape);\n const batchSize = xSize / inSize;\n const reshapedInput =\n
reshape({inputs: {x}, attrs: {shape: [batchSize, inSize]}, backend});\n\n const reduced = reduce(reshapedInput,
'float32', 'mean', backend);\n const reshapedOutput =\n reshape({inputs: {x: reduced}, attrs: {shape: outShape},
backend});\n\n backend.disposeIntermediateTensorInfo(reshapedInput);\n
backend.disposeIntermediateTensorInfo(reduced);\n\n
return reshapedOutput;\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n *
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*/\n\nimport {backend_util, KernelConfig, Mean, MeanAttrs, MeanInputs, TensorInfo, TypedArray, util} from
'@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\n\nimport {meanImpl} from
'./Mean_impl';\nimport
{transposeImpl, transposeImplCPU} from './Transpose_impl';\n\nexport const meanConfig: KernelConfig = {\n
kernelName: Mean,\n backendName: 'webgl',\n kernelFunc: ({inputs, attrs, backend}) => {\n const {x} = inputs
as MeanInputs;\n const {keepDims, axis} = attrs as {} as MeanAttrs;\n const webglBackend = backend as
MathBackendWebGL;\n\n const xRank = x.shape.length;\n const origAxes = util.parseAxisParam(axis,
x.shape);\n\n let axes = origAxes;\n const permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n
const meanInputIsTransposed = permutedAxes != null;\n const shouldExecuteOnCPU =
webglBackend.shouldExecuteOnCPU([x]);\n\n const intermediates: TensorInfo[] = [];\n\n let meanInput = x;\n
if (meanInputIsTransposed) {\n if (shouldExecuteOnCPU) {\n const xTexData =
webglBackend.texData.get(meanInput.dataId);\n const values = xTexData.values as TypedArray;\n\n const
newShape: number[] = new Array(xRank);\n
for (let i = 0; i < newShape.length; i++) {\n newShape[i] = x.shape[permutedAxes[i]];\n }\n
const meanInputValues =\n transposeImplCPU(values, x.shape, x.dtype, permutedAxes, newShape);\n\n
meanInput = webglBackend.makeTensorInfo(newShape, x.dtype);\n const meanInputData =
webglBackend.texData.get(meanInput.dataId);\n meanInputData.values = meanInputValues;\n } else {\n
meanInput = transposeImpl(x, permutedAxes, webglBackend);\n }\n\n intermediates.push(meanInput);\n
axes = backend_util.getInnerMostAxes(axes.length, xRank);\n }\n\n
backend_util.assertAxesAreInnerMostDims('sum', axes, xRank);\n const [meanOutShape, reduceShape] =\n
backend_util.computeOutAndReduceShapes(meanInput.shape, axes);\n\n let outShape = meanOutShape;\n if
(keepDims) {\n // rather than reshape at the end, set the target shape here.\n outShape =
backend_util.expandShapeToKeepDim(meanOutShape,
origAxes);\n }\n\n const out = meanImpl(meanInput, reduceShape, outShape, webglBackend);\n for (const i
of intermediates) {\n webglBackend.disposeIntermediateTensorInfo(i);\n }\n\n return out;\n }\n};\n","/**\n *
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {backend_util, KernelConfig, KernelFunc, Min, MinAttrs, MinInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {reduce} from '../kernel_utils/reduce';\n\nimport {reshape} from './Reshape';\nimport {transpose} from './Transpose';\n\nexport function min(\n args: {inputs: MinInputs, backend: MathBackendWebGL, attrs: MinAttrs}):\n TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {axis, keepDims} = attrs;\n\n const xRank = x.shape.length;\n\n const origAxes = util.parseAxisParam(axis, x.shape);\n let axes = origAxes;\n const permutedAxes = backend_util.getAxesPermutation(axes, xRank);\n let permutedX = x;\n if (permutedAxes != null) {\n permutedX = transpose({inputs: {x}, backend, attrs: {perm: permutedAxes}});\n axes = backend_util.getInnerMostAxes(axes.length, x.shape.length);\n }\n\n backend_util.assertAxesAreInnerMostDims('min', axes, xRank);\n const [outShape, reduceShape] =\n backend_util.computeOutAndReduceShapes(permutedX.shape, axes);\n const inSize = util.sizeFromShape(reduceShape);\n const a2D =\n reshape({inputs: {x: permutedX}, backend, attrs: {shape: [-1, inSize]}});\n const reduced = reduce(a2D, a2D.dtype, 'min', backend);\n\n let res;\n if (keepDims) {\n const newShape = backend_util.expandShapeToKeepDim(outShape, origAxes);\n res = reshape({inputs: {x: reduced}, backend, attrs: {shape: newShape}});\n } else {\n res = reshape({inputs: {x: reduced}, backend, attrs: {shape: outShape}});\n }\n\n backend.disposeIntermediateTensorInfo(a2D);\n backend.disposeIntermediateTensorInfo(reduced);\n\n if (permutedAxes != null) {\n backend.disposeIntermediateTensorInfo(permutedX);\n }\n\n return res;\n}\n\nexport const minConfig: KernelConfig = {\n kernelName: Min,\n backendName: 'webgl',\n kernelFunc: min as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class MirrorPadProgram implements GPGPUProgram {\n variableNames = ['x'];\n outputShape: number[];\n userCode: string;\n\n constructor(\n xShape: number[], paddings: Array<[number, number]>,\n mode: 'reflect'|'symmetric') {\n this.outputShape = paddings.map(\n (p, i) => p[0] /* beforePad */ + xShape[i] + p[1] /* afterPad */);\n const rank = xShape.length;\n const dtype = getCoordsDataType(rank);\n\n const start = paddings.map(p => p[0]).join(',');\n const end = paddings.map((p, i) => p[0] + xShape[i]).join(',');\n const unpackedCoords =\n ['coords[0]', 'coords[1]', 'coords[2]', 'coords[3]'].slice(0, rank);\n const offset = mode === 'reflect' ? 0 : 1;\n\n if (rank === 1) {\n this.userCode = `\n int start = ${start};\n int end = ${end};\n\n void main() {\n int outC = getOutputCoords();\n if (outC < start) {\n outC = start * 2 - outC - ${offset};\n } else if(outC >= end) {\n outC = (end - 1) * 2 - outC + ${offset};\n }\n setOutput(getX(outC - start));\n }\n `;\n return;\n }\n this.userCode = `\n ${dtype} start = ${dtype}(${start});\n ${dtype} end = ${dtype}(${end});\n\n void main() {\n ${dtype} outC = getOutputCoords();\n for (int i = 0; i < ${rank}; i++) {\n if (outC[i] < start[i]) {\n outC[i] = start[i] * 2 - outC[i] - ${offset};\n } else if(outC[i] >= end[i]) {\n outC[i] = (end[i] - 1) * 2 - outC[i] + ${offset};\n }\n }\n ${dtype} coords = outC - start;\n setOutput(getX(${unpackedCoords}));\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC.

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==========================================================================\n
*/\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getChannels} from './packing_util';\nimport {getCoordsDataType} from './shader_compiler';\n\n/**\n * Example shader code for\n * `mirrorPad(tf.tensor1d([1, 2, 3], 'int32'), [[2, 2]], 'reflect')`\n * ```\n *    const int start = int(2);\n *    const int end = int(5);\n *\n *    void main() {\n *      int outputLoc = getOutputCoords();\n *      vec4 result = vec4(0.);\n *\n *      int rc = outputLoc;\n *\n *
 int source = rc;\n *      if (source < start) {\n *        source = start * 2 - source - 0;\n *      } else if (source >= end) {\n *        source = (end - 1) * 2 - source + 0;\n *      }\n *      source -= start;\n *\n *      result[0] = getChannel(getX(source), source);\n *      rc += 1;\n *      if(rc < 6) {\n *        int source = rc;\n *        if (source < start)
 {\n *          source = start * 2 - source - 0;\n *        } else if (source >= end) {\n *          source = (end - 1) * 2 - source + 0;\n *        }\n *        source -= start;\n *\n *        result[1] = getChannel(getX(source), source);\n *      }\n *\n *      setOutput(result);\n *    }\n * ```\n */\nexport class MirrorPadPackedProgram implements GPGPUProgram {\n  variableNames = ['x'];\n  packedInputs = true;\n  packedOutput = true;\n  outputShape: number[];\n  userCode: string;\n\n  constructor(\n      xShape: number[], paddings: Array<[number, number]>,\n      mode: 'reflect'|'symmetric') {\n    this.outputShape = paddings.map(\n        (p, i) => p[0] /* beforePad */ + xShape[i] + p[1] /* afterPad */);\n    const rank = xShape.length;\n    const dtype = getCoordsDataType(rank);\n\n    const start = paddings.map(p => p[0]).join(',');\n    const end = paddings.map((p, i) => p[0] + xShape[i]).join(',');\n    const coords = getChannels('rc', rank);\n    const source
 = getChannels('source', rank);\n    const cLimit = `${coords[rank - 1]} < ${this.outputShape[rank - 1]}`;\n    const innerDims =\n        rank === 1 ? 'source' : `vec2(${source.slice(-2).join()})`;\n    const offset = mode === 'reflect' ? 0 : 1;\n\n    let mainLoop = '';\n    if (rank === 1) {\n      const padSetup = `\n        ${dtype} source = rc;\n        if (source < start) {\n          source = start * 2 - source - ${offset};\n        } else if (source >= end) {\n          source = (end - 1) * 2 - source + ${offset};\n        }\n        source -= start;\n      `;\n      mainLoop = `\n        ${dtype} rc = outputLoc;\n        ${padSetup}\n        result[0] = getChannel(getX(${source.join()}), ${innerDims});\n        ${coords[rank - 1]} += 1;\n        if(${cLimit}) {\n          ${padSetup}\n          result[1] = getChannel(getX(${source.join()}), ${innerDims});\n        }\n      `;\n    } else {\n      const padSetup = `\n        ${dtype} source = rc;\n        ${dtype} lt = ${dtype}(lessThan(source,
 start));\n        ${dtype} gte = ${dtype}(greaterThanEqual(source, end));\n        ${dtype} orig = 1 - (lt + gte);\n        source = orig * source +\n                 lt * (start * 2 - source - ${offset}) +\n                 gte * ((end - 1) * 2 - source + ${offset});\n        source -= start;\n      `;\n\n      mainLoop = `\n        ${dtype} rc = outputLoc;\n        ${padSetup}\n        result[0] = getChannel(getX(${source.join()}), ${innerDims});\n        ${coords[rank - 1]} += 1;\n        if(${cLimit}) {\n          ${padSetup}\n          result[1] = getChannel(getX(${source.join()}), ${innerDims});\n        }\n        rc = outputLoc;\n        ${coords[rank - 2]} += 1;\n        if(${coords[rank - 2]} < ${this.outputShape[rank - 2]}) {\n          ${padSetup}\n          result[2] = getChannel(getX(${source.join()}), ${innerDims});\n          ${coords[rank - 1]} += 1;\n          if(${cLimit}) {\n            ${padSetup}\n            result[3] = getChannel(getX(${source.join()}),
 ${innerDims});\n          }\n        }\n      `;\n    }\n\n    this.userCode = `\n      const ${dtype} start = ${dtype}(${start});\n      const ${dtype} end = ${dtype}(${end});\n\n      void main() {\n        ${dtype} outputLoc = getOutputCoords();\n        vec4 result = vec4(0.);\n        ${mainLoop}\n        setOutput(result);\n      }\n    `;\n  }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You
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 * ==\n
*/\n\nimport {env, KernelConfig, KernelFunc, MirrorPad, MirrorPadAttrs, MirrorPadInputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {MirrorPadProgram} from '../mirror_pad_gpu';\nimport {MirrorPadPackedProgram} from '../mirror_pad_packed_gpu';\n\nexport const mirrorPadKernelFunc: (params: {\n inputs: MirrorPadInputs,\n backend: MathBackendWebGL,\n attrs: MirrorPadAttrs\n}) => TensorInfo = ({inputs, backend, attrs}) => {\n const {x} = inputs;\n const {paddings, mode} = attrs;\n\n const program = env().getBool('WEBGL_PACK_ARRAY_OPERATIONS') ?\n   new MirrorPadPackedProgram(x.shape, paddings, mode) :\n   new MirrorPadProgram(x.shape, paddings, mode);\n\n const output = backend.runWebGLProgram(program, [x], x.dtype);\n\n return output;\n};\n\nexport const mirrorPadConfig: KernelConfig = {\n kernelName: MirrorPad,\n backendName: 'webgl',\n kernelFunc: mirrorPadKernelFunc as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
 * ==\n
*/\n\nimport {KernelConfig, KernelFunc, Mod} from '@tensorflow/tfjs-core';\n\nimport {CHECK_NAN_SNIPPET} from '../binaryop_packed_gpu';\nimport {binaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst
 MOD = `if (b == 0.0) return NAN;\n  return mod(a, b);`;\n\nconst MOD_PACKED = `\n  vec4 result = mod(a, b);\n  vec4 isNaN = vec4(equal(b, vec4(0.0)));\n  ` +\n   CHECK_NAN_SNIPPET + `\n  return result;\n`;\n\nexport const mod = binaryKernelFunc({\n opSnippet: MOD,\n packedOpSnippet: MOD_PACKED,\n});\n\nexport const modConfig: KernelConfig = {\n kernelName: Mod,\n backendName: 'webgl',\n kernelFunc: mod as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the
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 * ==\n
*/\n\nimport {GPGPUContext} from './gpgpu_context';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class MultinomialProgram implements GPGPUProgram {\n variableNames = ['probs'];\n outputShape: number[];\n userCode: string;\n\n // Caching uniform location for speed.\n seedLoc: WebGLUniformLocation;\n\n constructor(batchSize: number, numOutcomes: number, numSamples: number) {\n   this.outputShape = [batchSize, numSamples];\n\n   this.userCode = `\n   uniform float seed;\n\n   void main() {\n   ivec2 coords = getOutputCoords();\n   int batch = coords[0];\n\n   float r = random(seed);\n   float cdf = 0.0;\n\n   for (int i = 0; i < ${numOutcomes - 1}; i++) {\n   cdf += getProbs(batch, i);\n\n   if (r < cdf) {\n   setOutput(float(i));\n   return;\n
        }\n   }\n\n   // If no other event happened, last event happened.\n   setOutput(float(${numOutcomes - 1}));\n   }\n   `;\n }\n\n getCustomSetupFunc(seed: number) {\n   return (gpgpu: GPGPUContext, webGLProgram: WebGLProgram) => {\n   if (this.seedLoc == null) {\n   this.seedLoc =

gpgpu.getUniformLocation(webGLProgram, 'seed');\n }\n gpgpu.gl.uniform1f(this.seedLoc, seed);\n };\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {RealDiv} from '@tensorflow/tfjs-core';\nimport {KernelConfig} from '@tensorflow/tfjs-core';\nimport {binaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\n// Without the equality check div produces 0.9999 for a = b, which when\n// floored can cause errors.\nconst DIV = `\nif (a == b) {\n return 1.0;\n};\nreturn a / b;`;\n\n// We do the same as in ./binaryop_gpu, with vec4 and ivec4.\n// On Linux, the vectorized implementation produces NaNs when a and b are 0.\nconst DIV_PACKED = `\n // vec4 one = vec4(equal(a, b));\n // return one + (vec4(1.0) - one) * a / b;\n vec4 result = a / b;\n if(a.x == b.x) {\n result.x = 1.;\n }\n if(a.y == b.y) {\n result.y = 1.;\n }\n if(a.z == b.z) {\n result.z = 1.;\n }\n if(a.w == b.w) {\n result.w = 1.;\n }\n\n return result;\n`;\n\nexport const realDiv
= binaryKernelFunc(\n {opSnippet: DIV, packedOpSnippet: DIV_PACKED, checkOutOfBounds: true});\n\nexport const realDivConfig: KernelConfig = {\n kernelName: RealDiv,\n backendName: 'webgl',\n kernelFunc: realDiv,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {backend_util, KernelConfig, KernelFunc,
Softmax, SoftmaxAttrs, SoftmaxInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\n\nimport {exp} from './Exp';\nimport {max} from './Max';\nimport {realDiv} from './RealDiv';\nimport {reshape} from './Reshape';\nimport {sub} from './Sub';\nimport {sum} from './Sum';\n\nexport function softmax(args: {\n inputs: SoftmaxInputs,\n backend: MathBackendWebGL,\n attrs: SoftmaxAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {logits} = inputs;\n const {dim} = attrs;\n\n const axes = util.parseAxisParam([dim], logits.shape);\n\n const maxLogit = max({\n inputs: {x: logits},\n backend,\n attrs: {reductionIndices: axes, keepDims: false}\n });\n\n const expandedShape = backend_util.expandShapeToKeepDim(maxLogit.shape, axes);\n\n const maxLogitsReshaped =\n reshape({inputs: {x: maxLogit}, backend, attrs: {shape: expandedShape}});\n const a =\n sub({inputs: {a: logits, b: maxLogitsReshaped},
backend}) as TensorInfo;\n const b = exp({inputs: {x: a}, backend}) as TensorInfo;\n const sumExp =\n sum({inputs: {x: b}, backend, attrs: {axis: axes, keepDims: false}});\n const sumExpReshaped =\n reshape({inputs: {x: sumExp}, backend, attrs: {shape: expandedShape}});\n\n const res =\n realDiv({inputs: {a: b, b: sumExpReshaped}, backend}) as TensorInfo;\n\n backend.disposeIntermediateTensorInfo(maxLogit);\n backend.disposeIntermediateTensorInfo(maxLogitsReshaped);\n backend.disposeIntermediateTensorInfo(a);\n backend.disposeIntermediateTensorInfo(b);\n backend.disposeIntermediateTensorInfo(sumExp);\n backend.disposeIntermediateTensorInfo(sumExpReshaped);\n\n return res;\n}\n\nexport const softmaxConfig: KernelConfig = {\n kernelName: Softmax,\n backendName: 'webgl',\n kernelFunc: softmax as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n

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{\n const {inputs, backend, attrs} = args;\n const {logits} = inputs;\n const {numSamples, seed, normalized} = attrs;\n\n const probs = normalized ?\n logits :\n softmax(\n {inputs: {logits}, backend, attrs: {dim: logits.shape.length - 1}});\n const batchSize = probs.shape[0];\n const numOutcomes = probs.shape[1];\n const program = new MultinomialProgram(batchSize, numOutcomes, numSamples);\n const customSetup = program.getCustomSetupFunc(seed);\n\n const res = backend.runWebGLProgram(program, [probs], 'int32', customSetup);\n if (!normalized) {\n backend.disposeIntermediateTensorInfo(probs);\n }\n return res;\n}\n\nexport const multinomialConfig: KernelConfig = {\n kernelName: Multinomial,\n backendName: 'webgl',\n kernelFunc: multinomial as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except
in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n===\n*/\n\nimport {backend_util, kernel_impls, KernelConfig, KernelFunc, NonMaxSuppressionV3, NonMaxSuppressionV3Attrs, NonMaxSuppressionV3Inputs, TypedArray} from '@tensorflow/tfjs-core';\n\nconst nonMaxSuppressionV3Impl = kernel_impls.nonMaxSuppressionV3Impl;\nimport {MathBackendWebGL} from '../backend_webgl';\n\nexport function nonMaxSuppressionV3(args: {\n inputs: NonMaxSuppressionV3Inputs,\n backend: MathBackendWebGL,\n attrs: NonMaxSuppressionV3Attrs\n})
{\n backend_util.warn(\n 'tf.nonMaxSuppression() in webgl locks the UI thread. ' +\n 'Call tf.nonMaxSuppressionAsync() instead');\n\n const {inputs, backend, attrs} = args;\n const {boxes, scores} = inputs;\n const {maxOutputSize, iouThreshold, scoreThreshold} = attrs;\n\n const boxesVals = backend.readSync(boxes.dataId) as TypedArray;\n const scoresVals = backend.readSync(scores.dataId) as TypedArray;\n\n const {selectedIndices} = nonMaxSuppressionV3Impl(\n boxesVals, scoresVals, maxOutputSize, iouThreshold, scoreThreshold);\n\n return backend.makeTensorInfo(\n [selectedIndices.length], 'int32', new Int32Array(selectedIndices));\n}\n\nexport const nonMaxSuppressionV3Config: KernelConfig = {\n kernelName: NonMaxSuppressionV3,\n backendName: 'webgl',\n kernelFunc: nonMaxSuppressionV3 as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n
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*/\n\nimport {backend_util, kernel_impls, KernelConfig, KernelFunc, NonMaxSuppressionV4, NonMaxSuppressionV4Attrs, NonMaxSuppressionV4Inputs, TensorInfo, TypedArray} from '@tensorflow/tfjs-core';\nconst nonMaxSuppressionV4Impl = kernel_impls.nonMaxSuppressionV4Impl;\n\nimport {MathBackendWebGL} from '../backend_webgl';\n\nexport function nonMaxSuppressionV4(args: {\n inputs: NonMaxSuppressionV4Inputs,\n backend: MathBackendWebGL,\n attrs: NonMaxSuppressionV4Attrs\n}): [TensorInfo, TensorInfo] {\n backend_util.warn(\n 'tf.nonMaxSuppression() in webgl locks the UI thread. ' +\n   'Call tf.nonMaxSuppressionAsync() instead');\n\n const {inputs, backend, attrs} = args;\n const {boxes, scores} = inputs;\n const {maxOutputSize, iouThreshold, scoreThreshold, padToMaxOutputSize} =\n   attrs;\n\n const boxesVals = backend.readSync(boxes.dataId) as TypedArray;\n const scoresVals = backend.readSync(scores.dataId) as TypedArray;\n\n const {selectedIndices, validOutputs} = nonMaxSuppressionV4Impl(\n   boxesVals, scoresVals, maxOutputSize, iouThreshold, scoreThreshold,\n   padToMaxOutputSize);\n\n return [\n   backend.makeTensorInfo(\n [selectedIndices.length], 'int32', new Int32Array(selectedIndices)),\n   backend.makeTensorInfo([], 'int32', new Int32Array([validOutputs]))\n];\n}\n\nexport const nonMaxSuppressionV4Config: KernelConfig = {\n kernelName: NonMaxSuppressionV4,\n backendName: 'webgl',\n kernelFunc: nonMaxSuppressionV4 as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {backend_util, kernel_impls, KernelConfig, KernelFunc, NonMaxSuppressionV5, NonMaxSuppressionV5Attrs, NonMaxSuppressionV5Inputs, TensorInfo, TypedArray} from '@tensorflow/tfjs-core';\n\nconst
 nonMaxSuppressionV5Impl = kernel_impls.nonMaxSuppressionV5Impl;\nimport {MathBackendWebGL} from '../backend_webgl';\n\nexport function nonMaxSuppressionV5(args: {\n inputs: NonMaxSuppressionV5Inputs,\n backend: MathBackendWebGL,\n attrs: NonMaxSuppressionV5Attrs\n}): [TensorInfo, TensorInfo] {\n backend_util.warn(\n   'tf.nonMaxSuppression() in webgl locks the UI thread. ' +\n   'Call tf.nonMaxSuppressionAsync() instead');\n\n const {inputs, backend, attrs} = args;\n const {boxes, scores} = inputs;\n const {maxOutputSize, iouThreshold, scoreThreshold, softNmsSigma} = attrs;\n\n const boxesVals = backend.readSync(boxes.dataId) as TypedArray;\n const scoresVals = backend.readSync(scores.dataId) as TypedArray;\n\n const maxOutputSizeVal = maxOutputSize;\n const iouThresholdVal = iouThreshold;\n const scoreThresholdVal = scoreThreshold;\n const softNmsSigmaVal = softNmsSigma;\n\n const {selectedIndices, selectedScores} = nonMaxSuppressionV5Impl(\n   boxesVals,
 scoresVals, maxOutputSizeVal, iouThresholdVal,\n   scoreThresholdVal, softNmsSigmaVal);\n\n return [\n   backend.makeTensorInfo(\n   [selectedIndices.length], 'int32', new Int32Array(selectedIndices)),\n   backend.makeTensorInfo(\n   [selectedScores.length], 'float32', new Float32Array(selectedScores))\n];\n}\n\nexport const nonMaxSuppressionV5Config: KernelConfig = {\n kernelName: NonMaxSuppressionV5,\n backendName: 'webgl',\n kernelFunc: nonMaxSuppressionV5 as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS
 OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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==========\n*/\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class OneHotProgram implements GPGPUProgram {\n  variableNames = ['indices'];\n  outputShape: number[];\n  userCode: string;\n\n  // Caching uniform location for speed.\n  seedLoc: WebGLUniformLocation;\n\n  constructor(\n      numIndices: number, depth: number, onValue: number, offValue: number) {\n    this.outputShape = [numIndices, depth];\n\n    this.userCode = `\n      void main() {\n        ivec2 coords = getOutputCoords();\n        int index = round(getIndices(coords.x));\n        setOutput(mix(float(${offValue}), float(${onValue}),\n                      float(index == coords.y)));\n      }\n    `;\n  }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\n\nimport {KernelConfig, KernelFunc, OneHot, OneHotAttrs, OneHotInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {OneHotProgram} from '../onehot_gpu';\nimport {reshape} from './Reshape';\n\nexport const oneHot = (args: {\n  inputs: OneHotInputs,\n  backend: MathBackendWebGL,\n  attrs: OneHotAttrs\n}): TensorInfo => {\n  const {inputs, backend, attrs} = args;\n  const {indices} = inputs;\n  const {depth, onValue, offValue} = attrs;\n\n  const indicesSize = util.sizeFromShape(indices.shape);\n  const program = new OneHotProgram(indicesSize, depth, onValue, offValue);\n  const reshaped =\n      reshape({inputs: {x: indices}, backend, attrs: {shape: [indicesSize]}});\n  const result = backend.runWebGLProgram(program, [reshaped], indices.dtype);\n  backend.disposeIntermediateTensorInfo(reshaped);\n\n  const outShape = [...indices.shape, depth];\n  const out = reshape({inputs: {x: result}, backend, attrs: {shape: outShape}});\n  backend.disposeIntermediateTensorInfo(result);\n  return out;\n};\n\nexport const oneHotConfig: KernelConfig = {\n  kernelName: OneHot,\n  backendName: 'webgl',\n  kernelFunc: oneHot as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\n\nimport {KernelConfig, KernelFunc, TensorInfo, ZerosLike, ZerosLikeInputs} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\n\nimport {complex} from './Complex';\nimport {fill} from './Fill';\nimport {imag} from './Imag';\nimport {real} from './Real';\n\nexport function zerosLike(\n    args: {inputs: ZerosLikeInputs, backend: MathBackendWebGL}): TensorInfo {\n  const {inputs, backend} = args;\n  const {x} = inputs;\n\n  if (x.dtype === 'complex64') {\n    const realPart = real({inputs: {input: x}, backend});\n    const r = zerosLike({inputs: {x: realPart}, backend});\n    const imagPart = imag({inputs: {input: x}, backend});\n    const i = zerosLike({inputs: {x: imagPart}, backend});\n\n    const result = complex({inputs: {real: r, imag: i}, backend});\n\n    backend.disposeIntermediateTensorInfo(realPart);\n    backend.disposeIntermediateTensorInfo(r);\n    backend.disposeIntermediateTensorInfo(imagPart);\n    backend.disposeIntermediateTensorInfo(i);\n\n    return result;\n  } else {\n    return fill({\n      attrs: {\n        shape: x.shape,\n        dtype: x.dtype,\n        value: x.dtype === 'string' ? '' : 0\n      },\n      backend\n    });\n  }\n}\n\nexport const zerosLikeConfig: KernelConfig = {\n  kernelName: ZerosLike,\n  backendName: 'webgl',\n  kernelFunc: zerosLike as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All
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==========\n
*/\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from
'./shader_compiler';\n\nexport class PadProgram implements GPGPUProgram {\n variableNames = ['x'];\n
outputShape: number[];\n userCode: string;\n\n constructor(\n   xShape: number[], paddings: Array<[number,
number]>,\n   constantValue: number) {\n   this.outputShape = paddings.map(\n   (p, i) => p[0] /* beforePad */
+ xShape[i] + p[1] /* afterPad */);\n   const rank = xShape.length;\n   const type = getCoordsDataType(rank);\n\n
const start = paddings.map(p => p[0]).join(',');\n   const end = paddings.map((p, i) => p[0] + xShape[i]).join(',');\n
const unpackedCoords =\n   ['coords[0]', 'coords[1]', 'coords[2]', 'coords[3]'].slice(0, rank);\n\n   if (rank === 1)
{\n   this.userCode = `\n   int start = ${start};\n
        int end = ${end};\n\n   void main() {\n   int outC = getOutputCoords();\n   if (outC < start || outC
>= end) {\n   setOutput(float(${constantValue}));\n   } else {\n   setOutput(getX(outC - start));\n
        }\n   }\n   `;\n      return;\n    }\n    this.userCode = `\n ${type} start = ${type}(${start});\n ${type} end =
${type}(${end});\n\n   void main() {\n ${type} outC = getOutputCoords();\n   if (any(lessThan(outC,
start)) || any(greaterThanEqual(outC, end))) {\n   setOutput(float(${constantValue}));\n   } else {\n
${type} coords = outC - start;\n   setOutput(getX(${unpackedCoords}));\n   }\n   }\n   `;\n }\n}\n","/**\n
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WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getChannels} from './packing_util';\nimport
{getCoordsDataType} from './shader_compiler';\n\nexport class PadPackedProgram implements GPGPUProgram
{\n variableNames = ['x'];\n packedInputs = true;\n packedOutput = true;\n outputShape: number[];\n userCode:
string;\n\n constructor(\n   xShape: number[], paddings: Array<[number, number]>,\n   constantValue: number)
{\n   this.outputShape = paddings.map(\n   (p, i) => p[0] /* beforePad */ + xShape[i] +
 p[1] /* afterPad */);\n   const rank = xShape.length;\n   const dtype = getCoordsDataType(rank);\n\n   const start =
paddings.map(p => p[0]).join(',');\n   const end = paddings.map((p, i) => p[0] + xShape[i]).join(',');\n   const coords
= getChannels('rc', rank);\n   const source = getChannels('source', rank);\n   const cLimit = `${coords[rank - 1]} <
${this.outputShape[rank - 1]}`;\n    const innerDims =\n        rank === 1 ? 'source' : `vec2(${source.slice(-
2).join()})`;\n\n    const componentSetup = [\n      `${dtype} rc = outputLoc;`, `${coords[rank - 1]} += 1;\n
if(${cLimit}) {\n   `,\n      rank === 1 ? '' : `}\n   rc = outputLoc;\n ${coords[rank - 2]} += 1;\n
if(${coords[rank - 2]} < ${this.outputShape[rank - 2]}) {`,\n      rank === 1 ? '' : ` ${coords[rank - 1]} += 1;\n
if(${cLimit}) {`\n   ];\n\n   const paddingArea = rank === 1 ?\n   'rc < start || rc >= end' :\n   'any(lessThan(rc,
start)) || any(greaterThanEqual(rc, end))';\n
   let mainLoop = '';\n   for (let i = 0, j = rank === 1 ? 2 : 4; i < j; i++) {\n   mainLoop += `\n
${componentSetup[i]}\n   if (${paddingArea}) {\n   result[${i}] = float(${constantValue});\n   } else {\n
    ${dtype} source = rc - start;\n   result[${i}] = getChannel(getX(${source.join()}), ${innerDims});\n   }\n
   `;\n    }\n    mainLoop += (rank === 1 ? `} ` : `}}`);\n\n    this.userCode = `\n   const ${dtype} start =
${dtype}(${start});\n   const ${dtype} end = ${dtype}(${end});\n\n   void main() {\n ${dtype} outputLoc =
getOutputCoords();\n   vec4 result = vec4(0.);\n ${mainLoop}\n   setOutput(result);\n   }\n   `;\n
}\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache
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==========\n */\n\nimport {env, KernelConfig, KernelFunc, PadV2, PadV2Attrs, PadV2Inputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {PadProgram} from '../pad_gpu';\nimport {PadPackedProgram} from '../pad_packed_gpu';\n\nexport const padV2 =\n (args: {inputs: PadV2Inputs, backend: MathBackendWebGL, attrs: PadV2Attrs}):\n TensorInfo => {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {paddings, constantValue} = attrs;\n\n const program = env().getBool('WEBGL_PACK_ARRAY_OPERATIONS') ?\n new PadPackedProgram(x.shape, paddings, constantValue) :\n new PadProgram(x.shape, paddings, constantValue);\n return backend.runWebGLProgram(program, [x], x.dtype);\n };\n\nexport const padV2Config: KernelConfig = {\n kernelName: PadV2,\n backendName: 'webgl',\n kernelFunc: padV2 as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, Pow} from '@tensorflow/tfjs-core';\n\nimport {CHECK_NAN_SNIPPET} from '../binaryop_packed_gpu';\nimport {binaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst POW = `\n if(a < 0.0 && floor(b) < b){\n return NAN;\n }\n if (b == 0.0) {\n return 1.0;\n }\n return (round(mod(b, 2.0)) != 1) ?\n pow(abs(a), b) : sign(a) * pow(abs(a), b);\n`;\n\nconst POW_PACKED = `\n // isModRound1 has 1 for components with round(mod(b, 2.0)) == 1, 0 otherwise.\n vec4 isModRound1 = vec4(equal(round(mod(b, 2.0)), ivec4(1)));\n vec4 multiplier = sign(a) * isModRound1 + (vec4(1.0) - isModRound1);\n vec4 result = multiplier * pow(abs(a), b);\n\n // Ensure that a^0 = 1, including 0^0 = 1 as this correspond to TF and JS\n bvec4 isExpZero = equal(b, vec4(0.0));\n result.r = isExpZero.r ? 1.0 : result.r;\n
result.g = isExpZero.g ? 1.0 : result.g;\n result.b = isExpZero.b ? 1.0 : result.b;\n result.a = isExpZero.a ? 1.0 : result.a;\n\n vec4 isNaN = vec4(lessThan(a, vec4(0.0))) * vec4(lessThan(floor(b), b));\n ` +\n CHECK_NAN_SNIPPET + `\n return result;\n`;\n\nexport const pow =\n binaryKernelFunc({opSnippet: POW, packedOpSnippet: POW_PACKED});\n\nexport const powConfig: KernelConfig = {\n kernelName: Pow,\n backendName: 'webgl',\n kernelFunc: pow as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either
express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, Range, RangeAttrs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {rangeImplCPU} from '../kernel_utils/shared';\n\nexport const range =\n (args: {backend: MathBackendWebGL, attrs: RangeAttrs}): TensorInfo => {\n const {backend, attrs} = args;\n const {start, stop, step, dtype} = attrs;\n const values = rangeImplCPU(start, stop, step,

dtype);\n return backend.makeTensorInfo([values.length], dtype, values);\n };\n\nexport const rangeConfig: KernelConfig = {\n kernelName: Range,\n backendName: 'webgl',\n kernelFunc: range as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
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==========\n
*/\n\nimport {KernelConfig, Reciprocal} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst RECIPROCAL = `return 1.0 / x;`;\n\nexport const reciprocal = unaryKernelFunc({opSnippet: RECIPROCAL});\n\nexport const reciprocalConfig: KernelConfig = {\n kernelName: Reciprocal,\n backendName: 'webgl',\n kernelFunc: reciprocal,\n};\n","/**\n
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==========\n
*/\n\nimport {KernelConfig, KernelFunc, Relu} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\nimport {CHECK_NAN_SNIPPET} from '../unaryop_gpu';\n\nconst RELU = CHECK_NAN_SNIPPET + `\n  return (x < 0.0) ? 0.0 : x;\n`;\n\nconst RELU_PACKED
 = `\n  vec4 result = x * vec4(greaterThanEqual(x, vec4(0.0)));\n  bvec4 isNaN = isnan(x);\n\n  result.r = isNaN.r ? x.r : result.r;\n  result.g = isNaN.g ? x.g : result.g;\n  result.b = isNaN.b ? x.b : result.b;\n  result.a = isNaN.a ? x.a : result.a;\n\n  return result;\n`;\n\nexport const relu =\n   unaryKernelFunc({opSnippet: RELU, packedOpSnippet: RELU_PACKED});\n\nexport const reluConfig: KernelConfig = {\n kernelName: Relu,\n backendName: 'webgl',\n kernelFunc: relu as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS
 OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {KernelConfig, KernelFunc, Relu6} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\nimport {CHECK_NAN_SNIPPET} from '../unaryop_gpu';\n\nconst RELU6 = CHECK_NAN_SNIPPET + `\n  return (x < 0.0) ? 0.0 : min(6.0, x);\n`;\n\nconst RELU6_PACKED = `\n  vec4 result = min(x, vec4(6.)) * vec4(greaterThanEqual(x, vec4(0.0)));\n  bvec4 isNaN = isnan(x);\n\n  result.r = isNaN.r ? x.r : result.r;\n  result.g = isNaN.g ? x.g : result.g;\n  result.b = isNaN.b ? x.b : result.b;\n  result.a = isNaN.a ? x.a : result.a;\n\n  return result;\n`;\n\nexport const relu6 =\n   unaryKernelFunc({opSnippet: RELU6, packedOpSnippet: RELU6_PACKED});\n\nexport const relu6Config: KernelConfig = {\n kernelName: Relu6,\n backendName:
 'webgl',\n kernelFunc: relu6 as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,

software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class ResizeBilinearProgram implements GPGPUProgram {\n variableNames = ['A'];\n outputShape: number[] = [];\n userCode: string;\n\n constructor(\n inputShape: [number, number, number, number], newHeight: number,\n newWidth: number, alignCorners: boolean, halfPixelCenters: boolean) {\n const [batch, oldHeight, oldWidth, depth] = inputShape;\n this.outputShape = [batch, newHeight, newWidth, depth];\n\n const effectiveInSize: [number, number] = [\n (alignCorners && newHeight > 1) ? oldHeight - 1 : oldHeight,\n (alignCorners && newWidth > 1) ? oldWidth - 1 : oldWidth\n];\n\n const effectiveOutSize: [number, number] = [\n (alignCorners && newHeight > 1) ? newHeight - 1 : newHeight,\n (alignCorners && newWidth > 1) ? newWidth - 1 : newWidth\n];\n\n let sourceFracIndexRC: string;\n if (halfPixelCenters) {\n sourceFracIndexRC =\n `(vec2(yRC) + vec2(0.5)) * effectiveInputOverOutputRatioRC` +\n ` - vec2(0.5)`;\n } else {\n sourceFracIndexRC = `vec2(yRC) * effectiveInputOverOutputRatioRC`;\n }\n\n this.userCode = `\n const vec2 effectiveInputOverOutputRatioRC
= vec2(\n ${effectiveInSize[0] / effectiveOutSize[0]},\n ${effectiveInSize[1] / effectiveOutSize[1]});\n const vec2 inputShapeRC = vec2(${oldHeight}.0, ${oldWidth}.0);\n\n void main() {\n ivec4 coords = getOutputCoords();\n int b = coords[0];\n int d = coords[3];\n ivec2 yRC = coords.yz;\n\n // Fractional source index.\n vec2 sourceFracIndexRC = ${sourceFracIndexRC};\n\n // Compute the four integer indices.\n ivec2 sourceFloorRC = ivec2(max(sourceFracIndexRC, vec2(0.0)));\n ivec2 sourceCeilRC = ivec2(\n min(inputShapeRC - 1.0, ceil(sourceFracIndexRC)));\n\n float topLeft = getA(b, sourceFloorRC.x, sourceFloorRC.y, d);\n float bottomLeft = getA(b, sourceCeilRC.x, sourceFloorRC.y, d);\n float topRight = getA(b, sourceFloorRC.x, sourceCeilRC.y, d);\n float bottomRight = getA(b, sourceCeilRC.x, sourceCeilRC.y, d);\n\n vec2 fracRC = sourceFracIndexRC
- vec2(sourceFloorRC);\n\n float top = topLeft + (topRight - topLeft) * fracRC.y;\n float bottom = bottomLeft + (bottomRight - bottomLeft) * fracRC.y;\n float newValue = top + (bottom - top) * fracRC.x;\n\n setOutput(newValue);\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class ResizeBilinearPackedProgram implements GPGPUProgram {\n variableNames = ['A'];\n packedInputs = true;\n packedOutput = true;\n outputShape: number[] = [];\n userCode: string;\n\n constructor(\n inputShape: [number, number, number, number], newHeight: number,\n newWidth: number, alignCorners: boolean, halfPixelCenters: boolean) {\n const [batch, oldHeight, oldWidth, depth] = inputShape;\n this.outputShape = [batch, newHeight, newWidth, depth];\n\n const effectiveInSize: [number, number] = [\n (alignCorners && newHeight > 1) ? oldHeight - 1 : oldHeight,\n (alignCorners && newWidth > 1) ? oldWidth - 1 : oldWidth\n];\n\n const effectiveOutSize: [number, number] = [\n (alignCorners && newHeight > 1) ? newHeight - 1 : newHeight,\n (alignCorners && newWidth > 1) ? newWidth - 1 : newWidth\n];\n\n let sourceFracIndexRC: string;\n if (halfPixelCenters) {\n sourceFracIndexRC = `(vec3(yRC) + vec3(0.5)) * ` +\n `effectiveInputOverOutputRatioRC - vec3(0.5)`;\n } else {\n sourceFracIndexRC = `vec3(yRC) * effectiveInputOverOutputRatioRC`;\n }\n\n this.userCode = `\n const vec3 effectiveInputOverOutputRatioRC = vec3(\n ${effectiveInSize[0] / effectiveOutSize[0]},\n ${effectiveInSize[1] / effectiveOutSize[1]},\n ${effectiveInSize[1] / effectiveOutSize[1]});\n const vec3

inputShapeRC = vec3(${oldHeight}.0, ${oldWidth}.0,\n ${oldWidth}.0);\n\n float getAValue(int b, int r, int c, int d) {\n return getChannel(getA(b, r, c, d), vec2(c, d));\n }\n\n void main() {\n ivec4 coords = getOutputCoords();\n int b = coords[0];\n int d = coords[3];\n // Calculate values for next column in yRC.z.\n ivec3 yRC = coords.yzz + ivec3(0, 0, 1);\n\n // Fractional source index.\n vec3 sourceFracIndexRC
= ${sourceFracIndexRC};\n\n // Compute the four integer indices.\n ivec3 sourceFloorRC = ivec3(max(sourceFracIndexRC, vec3(0.0)));\n ivec3 sourceCeilRC = ivec3(\n min(inputShapeRC - 1.0, ceil(sourceFracIndexRC)));\n\n // Should we calculate next column and row elements in 2x2 packed cell.\n bool hasNextCol = d < ${depth - 1};\n bool hasNextRow = coords.z < ${newWidth - 1};\n\n // In parallel, construct four corners for all four components in\n // packed 2x2 cell.\n vec4 topLeft = vec4(\n getAValue(b, sourceFloorRC.x, sourceFloorRC.y, d),\n hasNextCol ? getAValue(b, sourceFloorRC.x, sourceFloorRC.y, d + 1)\n : 0.0,\n hasNextRow ? getAValue(b, sourceFloorRC.x, sourceFloorRC.z, d)\n : 0.0,\n (hasNextRow && hasNextCol) ?\n getAValue(b, sourceFloorRC.x, sourceFloorRC.z, d + 1) : 0.0);\n\n vec4 bottomLeft = vec4(\n getAValue(b, sourceCeilRC.x, sourceFloorRC.y, d),\n hasNextCol ? getAValue(b, sourceCeilRC.x, sourceFloorRC.y, d + 1)\n : 0.0,\n hasNextRow ? getAValue(b, sourceCeilRC.x, sourceFloorRC.z, d)\n : 0.0,\n (hasNextRow && hasNextCol) ?\n getAValue(b, sourceCeilRC.x, sourceFloorRC.z, d + 1) : 0.0);\n\n vec4 topRight = vec4(\n getAValue(b, sourceFloorRC.x, sourceCeilRC.y, d),\n hasNextCol ? getAValue(b, sourceFloorRC.x, sourceCeilRC.y, d + 1)\n : 0.0,\n hasNextRow ? getAValue(b, sourceFloorRC.x, sourceCeilRC.z, d)\n : 0.0,\n (hasNextRow && hasNextCol) ?\n getAValue(b, sourceFloorRC.x, sourceCeilRC.z, d + 1) : 0.0);\n\n vec4 bottomRight = vec4(\n getAValue(b, sourceCeilRC.x, sourceCeilRC.y, d),\n hasNextCol ? getAValue(b, sourceCeilRC.x, sourceCeilRC.y, d + 1)\n : 0.0,\n hasNextRow
? getAValue(b, sourceCeilRC.x, sourceCeilRC.z, d)\n : 0.0,\n (hasNextRow && hasNextCol) ?\n getAValue(b, sourceCeilRC.x, sourceCeilRC.z, d + 1) : 0.0);\n\n vec3 fracRC = sourceFracIndexRC - vec3(sourceFloorRC);\n\n vec4 top = mix(topLeft, topRight, fracRC.yyzz);\n vec4 bottom = mix(bottomLeft, bottomRight, fracRC.yyzz);\n vec4 newValue = mix(top, bottom, fracRC.x);\n\n setOutput(newValue);\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY
KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {env, KernelConfig, KernelFunc, ResizeBilinear, ResizeBilinearAttrs, ResizeBilinearInputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {ResizeBilinearProgram} from '../resize_bilinear_gpu';\nimport {ResizeBilinearPackedProgram} from '../resize_bilinear_packed_gpu';\n\nexport function resizeBilinear(args: {\n inputs: ResizeBilinearInputs,\n backend: MathBackendWebGL,\n attrs: ResizeBilinearAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {images} = inputs;\n const {alignCorners, halfPixelCenters, size} = attrs;\n\n const [newHeight, newWidth] = size;\n\n const program = env().getBool('WEBGL_PACK_IMAGE_OPERATIONS') ?\n new ResizeBilinearPackedProgram(\n images.shape as [number, number, number, number], newHeight, newWidth,\n alignCorners, halfPixelCenters) :\n new ResizeBilinearProgram(\n images.shape as [number, number, number, number], newHeight, newWidth,\n alignCorners, halfPixelCenters);\n return backend.runWebGLProgram(program, [images], 'float32');\n}\n\nexport const resizeBilinearConfig: KernelConfig = {\n kernelName: ResizeBilinear,\n

backendName: 'webgl',\n kernelFunc: resizeBilinear as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS
 OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class ResizeBilinearBackpropProgram implements GPGPUProgram {\n variableNames = ['dy'];\n outputShape: number[] = [];\n userCode: string;\n\n constructor(\n   dyShape: [number, number, number, number],\n   inputShape: [number, number, number, number],
alignCorners: boolean) {\n   this.outputShape = inputShape;\n   const [, xHeight, xWidth,] = inputShape;\n   const [, yHeight, yWidth] = dyShape;\n\n   // In the backwards pass, we want to find the pixels that were generated for\n   // each pixel in the input image the forward pass and add the corresponding\n   // coefficient from dy to the gradient (with some interpolation).\n\n   const effectiveXSize: [number, number] = [\n   (alignCorners
 && yHeight > 1) ? xHeight - 1 : xHeight,\n   (alignCorners && yWidth > 1) ? xWidth - 1 : xWidth\n   ];\n\n   const effectiveYSize: [number, number] = [\n   (alignCorners && yHeight > 1) ? yHeight - 1 : yHeight,\n   (alignCorners && yWidth > 1) ? yWidth - 1 : yWidth\n   ];\n\n   const heightScale = effectiveXSize[0] / effectiveYSize[0];\n   const widthScale = effectiveXSize[1] / effectiveYSize[1];\n\n   const invHeightScale = 1 / heightScale;\n   const invWidthScale = 1 / widthScale;\n\n   // This defines the size of the window of values around a particular\n   // index in dy that we want to search for contributions to dx.\n   const winHeight = (Math.ceil(invHeightScale) * 2) + 2;\n   const winWidth = (Math.ceil(invWidthScale) * 2) + 2;\n\n   this.userCode = `\n   void main() {\n   ivec4 coords = getOutputCoords();\n   int b = coords[0];\n   int d = coords[3];\n   int r = coords[1];\n   int c = coords[2];\n\n   float accumulator
 = 0.0;\n\n   const float heightScale = float(${heightScale});\n   const float widthScale = float(${widthScale});\n\n   const float invHeightScale = float(${invHeightScale});\n   const float invWidthScale = float(${invWidthScale});\n\n   const int winHeight = int(${winHeight});\n   const int winWidth = int(${winWidth});\n\n   // Compute bounds for where in dy we will look\n   float startRLerp = floor(float(r) * invHeightScale);\n   int startDyR = int(startRLerp - float(winHeight / 2));\n\n   float startCLerp = floor(float(c) * invWidthScale);\n   int startDyC = int(startCLerp - float(winWidth / 2));\n\n   // Loop over dy\n   for (int dyROffset = 0; dyROffset < winHeight; dyROffset++) {\n   int dyR = dyROffset + startDyR;\n\n   // Guard against the window exceeding the bounds of dy\n   if (dyR < 0 || dyR >= ${yHeight}) {\n   continue;\n   }\n\n   for (int dyCOffset = 0; dyCOffset
 < winWidth; dyCOffset++) {\n   int dyC = dyCOffset + startDyC;\n\n   // Guard against the window exceeding the bounds of dy\n   if (dyC < 0 || dyC >= ${yWidth}) {\n   continue;\n   }\n\n   float dxR = float(dyR) * heightScale;\n   int topDxRIndex = int(floor(dxR));\n   int bottomDxRIndex = int(min(ceil(dxR), ${xHeight - 1}.0));\n   float dxRLerp = dxR - float(topDxRIndex);\n   float inverseDxRLerp = 1.0 - dxRLerp;\n\n   float dxC = float(dyC) * widthScale;\n   int leftDxCIndex = int(floor(dxC));\n   int rightDxCIndex = int(min(ceil(dxC), ${xWidth - 1}.0));\n   float dxCLerp = dxC - float(leftDxCIndex);\n   float inverseDxCLerp = 1.0 - dxCLerp;\n\n   if (r == topDxRIndex && c == leftDxCIndex) {\n   // topLeft\n   accumulator +=\n   getDy(b, dyR, dyC, d) * inverseDxRLerp * inverseDxCLerp;\n
            }\n\n   if (r == topDxRIndex && c == rightDxCIndex) {\n   // topRight\n   accumulator += getDy(b, dyR, dyC, d) * inverseDxRLerp * dxCLerp;\n   }\n\n   if (r == bottomDxRIndex && c == leftDxCIndex) {\n   // bottomLeft\n   accumulator += getDy(b, dyR, dyC, d) * dxRLerp * inverseDxCLerp;\n   }\n\n   if (r == bottomDxRIndex && c == rightDxCIndex) {\n   // bottomRight\n   accumulator += getDy(b, dyR, dyC, d) * dxRLerp * dxCLerp;\n   }\n   }\n   }\n

// End loop over dy\n\n setOutput(accumulator);\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {KernelConfig, KernelFunc, ResizeBilinearGrad, ResizeBilinearGradAttrs, ResizeBilinearGradInputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {ResizeBilinearBackpropProgram} from '../resize_bilinear_backprop_gpu';\n\nexport function resizeBilinearGrad(args: {\n inputs: ResizeBilinearGradInputs,\n backend: MathBackendWebGL,\n attrs: ResizeBilinearGradAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {images, dy} = inputs;\n const {alignCorners} = attrs;\n\n const program = new ResizeBilinearBackpropProgram(\n dy.shape as [number, number, number, number],\n images.shape as [number, number, number, number], alignCorners);\n\n return backend.runWebGLProgram(program, [dy], dy.dtype);\n}\n\nexport const resizeBilinearGradConfig: KernelConfig = {\n kernelName: ResizeBilinearGrad,\n backendName: 'webgl',\n kernelFunc: resizeBilinearGrad as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class ResizeNearestNeighborProgram implements GPGPUProgram {\n variableNames = ['A'];\n outputShape: number[] = [];\n userCode: string;\n\n constructor(\n inputShape: [number, number, number, number], newHeight: number,\n newWidth: number, alignCorners: boolean, halfPixelCenters: boolean) {\n const [batch, oldHeight, oldWidth, depth] = inputShape;\n this.outputShape = [batch, newHeight, newWidth, depth];\n\n const effectiveInSize: [number, number] = [\n (alignCorners && newHeight > 1) ? oldHeight - 1 : oldHeight,\n (alignCorners && newWidth > 1) ? oldWidth - 1 : oldWidth\n];\n\n const effectiveOutSize: [number, number] = [\n (alignCorners && newHeight > 1) ? newHeight - 1 : newHeight,\n (alignCorners && newWidth > 1) ? newWidth - 1 : newWidth\n];\n\n // When align corners is false,\n we rounds the value with floor.\n const roundBase = alignCorners ? '0.5' : '0.0';\n\n let sourceFracIndexRC: string;\n if (halfPixelCenters) {\n sourceFracIndexRC =\n `max((vec2(yRC) + vec2(0.5)) * effectiveInputOverOutputRatioRC` +\n `, vec2(0.0))`;\n } else {\n sourceFracIndexRC = `vec2(yRC) * effectiveInputOverOutputRatioRC`;\n }\n this.userCode = `\n const vec2 effectiveInputOverOutputRatioRC = vec2(\n ${effectiveInSize[0] / effectiveOutSize[0]},\n ${effectiveInSize[1] / effectiveOutSize[1]});\n const vec2 inputShapeRC = vec2(${oldHeight}.0, ${oldWidth}.0);\n\n void main() {\n ivec4 coords = getOutputCoords();\n int b = coords[0];\n int d = coords[3];\n ivec2 yRC = coords.yz;\n\n // Fractional source index.\n vec2 sourceFracIndexRC = ${sourceFracIndexRC};\n\n // Compute the coordinators of nearest neighbor point.\n ivec2 sourceNearestRC = ivec2(\n min(inputShapeRC - 1.0, floor(sourceFracIndexRC + ${roundBase})));\n float newValue = getA(b, sourceNearestRC.x, sourceNearestRC.y, d);\n\n setOutput(newValue);\n }\n `;\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a

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==========================================================================\n
*/\n\nimport {KernelConfig, KernelFunc, ResizeNearestNeighbor, ResizeNearestNeighborAttrs,
 ResizeNearestNeighborInputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from
'../backend_webgl';\nimport {ResizeNearestNeighborProgram} from '../resize_nearest_neighbor_gpu';\n\nexport
function resizeNearestNeighbor(args: {\n  inputs: ResizeNearestNeighborInputs,\n  backend:
MathBackendWebGL,\n  attrs: ResizeNearestNeighborAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} =
args;\n  const {images} = inputs;\n  const {alignCorners, halfPixelCenters, size} = attrs;\n\n  const [newHeight,
newWidth] = size;\n\n  const program = new ResizeNearestNeighborProgram(\n      images.shape as [number,
number, number, number], newHeight, newWidth,\n      alignCorners, halfPixelCenters);\n  return
backend.runWebGLProgram(program, [images], images.dtype);\n}\n\nexport const resizeNearestNeighborConfig:
KernelConfig = {\n  kernelName: ResizeNearestNeighbor,\n  backendName: 'webgl',\n  kernelFunc:
resizeNearestNeighbor as {} as KernelFunc\n};\n","/**\n
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WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class ResizeNearestNeigborBackpropProgram
implements GPGPUProgram {\n  variableNames = ['dy'];\n  outputShape: number[] = [];\n  userCode: string;\n\n
constructor(\n      dyShape: [number, number, number, number],\n
    inputShape: [number, number, number, number], alignCorners: boolean) {\n    this.outputShape = inputShape;\n
 const [, xHeight, xWidth, ] = inputShape;\n    const [, yHeight, yWidth] = dyShape;\n\n    // In the backwards pass,
we want to find the pixels that were generated for\n    // each pixel in the input image the forward pass and add the
corresponding\n    // coefficient from dy to the gradient (with some interpolation).\n\n    const effectiveXSize:
[number, number] = [\n      (alignCorners && yHeight > 1) ? xHeight - 1 : xHeight,\n      (alignCorners && yWidth
> 1) ? xWidth - 1 : xWidth\n    ];\n\n    const effectiveYSize: [number, number] = [\n      (alignCorners && yHeight
> 1) ? yHeight - 1 : yHeight,\n      (alignCorners && yWidth > 1) ? yWidth - 1 : yWidth\n    ];\n\n    const
heightScale = effectiveXSize[0] / effectiveYSize[0];\n    const widthScale = effectiveXSize[1] /
effectiveYSize[1];\n\n    const invHeightScale = 1 / heightScale;\n    const invWidthScale = 1 /
 widthScale;\n\n    // This defines the size of the window of values around a particular\n    // index in dy that we want
to search for contributions to dx.\n    const winHeight = (Math.ceil(invHeightScale) * 2) + 2;\n    const winWidth =
(Math.ceil(invWidthScale) * 2) + 2;\n\n    this.userCode = `\n      void main() {\n        ivec4 coords =
getOutputCoords();\n        int b = coords[0];\n        int d = coords[3];\n        int r = coords[1];\n        int c =
coords[2];\n\n        float accumulator = 0.0;\n\n        const float heightScale = float(${heightScale});\n        const
float widthScale = float(${widthScale});\n\n        const float invHeightScale = float(${invHeightScale});\n        const
float invWidthScale = float(${invWidthScale});\n\n        const int winHeight = int(${winHeight});\n        const int
winWidth = int(${winWidth});\n\n        // Compute bounds for where in dy we will look\n        float startRLerp =
floor(float(r) * invHeightScale);\n        int startDyR =
 int(floor(startRLerp - float(winHeight / 2)));\n\n        float startCLerp = floor(float(c) * invWidthScale);\n        int
startDyC = int(floor(startCLerp - float(winWidth / 2)));\n\n        // Loop over dy\n        for (int dyROffset = 0;
dyROffset < winHeight; dyROffset++) {\n          int dyR = dyROffset + startDyR;\n\n          // Guard against the
window exceeding the bounds of dy\n          if (dyR < 0 || dyR >= ${yHeight}) {\n            continue;\n          }\n\n
```

```
 for (int dyCOffset = 0; dyCOffset < winWidth; dyCOffset++) {\n          int dyC = dyCOffset + startDyC;\n\n
// Guard against the window exceeding the bounds of dy\n          if (dyC < 0 || dyC >= ${yWidth}) {\n
continue;\n          }\n\n          float sourceFracRow =\n              float(${effectiveXSize[0]}) *\n
(float(dyR) / float(${effectiveYSize[0]}));\n\n          float sourceFracCol =\n              float(${effectiveXSize[1]})
*\n              (float(dyC)
 / float(${effectiveYSize[1]}));\n\n          int sourceNearestRow = int(min(\n              float(int(${xHeight}) - 1),\n
          ${alignCorners} ? float(round(sourceFracRow)) :\n                                float(floor(sourceFracRow))));\n\n
      int sourceNearestCol = int(min(\n              float(int(${xWidth}) - 1),\n              ${alignCorners} ?
float(round(sourceFracCol)) :\n                                float(floor(sourceFracCol))));\n\n          if (r ==
sourceNearestRow && c == sourceNearestCol) {\n              accumulator += getDy(b, dyR, dyC, d);\n          }\n
 }\n      }\n      // End loop over dy\n\n      setOutput(accumulator);\n    }\n    `;\n  }\n}\n","/**\n * @license\n *
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the License.\n *
==========================================================================\n
*/\n\nimport {KernelConfig, KernelFunc, ResizeNearestNeighborGrad, ResizeNearestNeighborGradAttrs,
ResizeNearestNeighborGradInputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL}
from '../backend_webgl';\nimport {ResizeNearestNeigborBackpropProgram} from
'../resize_nearest_neighbor_backprop_gpu';\n\nexport function resizeNearestNeighborGrad(args: {\n  inputs:
ResizeNearestNeighborGradInputs,\n  backend: MathBackendWebGL,\n  attrs:
ResizeNearestNeighborGradAttrs\n}): TensorInfo {\n  const {inputs, backend, attrs} =
 args;\n  const {images, dy} = inputs;\n  const {alignCorners} = attrs;\n\n  const program = new
ResizeNearestNeigborBackpropProgram(\n      dy.shape as [number, number, number, number],\n      images.shape
as [number, number, number, number], alignCorners);\n  return backend.runWebGLProgram(program, [dy],
dy.dtype);\n}\n\nexport const resizeNearestNeighborGradConfig: KernelConfig = {\n  kernelName:
ResizeNearestNeighborGrad,\n  backendName: 'webgl',\n  kernelFunc: resizeNearestNeighborGrad as {} as
KernelFunc\n};\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the
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permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from
'./shader_compiler';\n\nexport class ReverseProgram implements GPGPUProgram {\n  variableNames = ['x'];\n
outputShape: number[];\n  userCode: string;\n\n  constructor(xShape: number[], axis: number[]) {\n    const rank =
xShape.length;\n    if (rank > 4) {\n      throw new Error(\n          `WebGL backend: Reverse of rank-${rank} tensor
is not yet supported`);\n    }\n    this.outputShape = xShape;\n\n    if (rank === 1) {\n      this.userCode = `\n
void main() {\n          int coord = getOutputCoords();\n          setOutput(getX(${xShape[0]} - coord - 1));\n        }\n
 `;\n      return;\n    }\n    const getInCoord = (i: number) => {\n      if (axis.indexOf(i)
 !== -1 && xShape[i] !== 1) {\n        return `${xShape[i]} - coords[${i}] - 1`;\n      }\n      return `coords[${i}]`;\n
};\n    const inCoords = xShape.map((_, i) => getInCoord(i)).join(',');\n    const type =
getCoordsDataType(rank);\n\n    this.userCode = `\n      void main() {\n        ${type} coords = getOutputCoords();\n
```

```
    setOutput(getX(${inCoords}));\n      }\n    `;\n  }\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions
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 ==========================================================================\n
 */\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getChannels} from './packing_util';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class ReversePackedProgram implements GPGPUProgram {\n  variableNames = ['x'];\n  outputShape: number[];\n  userCode: string;\n  packedInputs = true;\n  packedOutput = true;\n\n  constructor(xShape: number[], axis: number[]) {\n    const rank = xShape.length;\n    if (rank > 4) {\n      throw new Error(\n          `WebGL backend: Reverse of rank-${rank} tensor is not yet supported`);\n    }\n    this.outputShape = xShape;\n    const channels = getChannels('rc', rank);\n    const nextColumn =\n        `${channels[rank - 1]} + 1 < ${this.outputShape[rank - 1]}`;\n    const nextRow =
 `${channels[rank - 2]} + 1 < ${this.outputShape[rank - 2]}`;\n    const type = getCoordsDataType(rank);\n    if (rank === 1) {\n
      this.userCode = `\n        void main(){\n          int rc = getOutputCoords();\n          vec4 result = vec4(0.);\n result.r = getChannel(getX(${xShape[0]} - rc - 1),\n            ${xShape[0]} - rc - 1);\n          if(${nextColumn}){\n
      result.g = getChannel(getX(${xShape[0]} - (rc  + 1) - 1),\n              ${xShape[0]} - (rc  + 1) - 1);\n          }\n
   setOutput(result);\n        }\n      `;\n    } else {\n      this.userCode = `\n        void main() {\n          ${type} rc =
 getOutputCoords();\n          vec4 result = vec4(0.);\n          result.r = ${getR(channels.slice())};\n
 if(${nextColumn}){\n            result.g = ${getG(channels.slice())};\n          }\n          if(${nextRow}) {\n
 result.b = ${getB(channels.slice())};\n            if(${nextColumn}) {\n              result.a = ${getA(channels.slice())};\n
        }\n          }\n          setOutput(result);\n        }\n      `;\n    }\n\n    function getR(channels: string[]):
  string {\n      return getChannel(channels);\n    }\n\n    function getG(channels: string[]): string {\n      channels[rank
 - 1] = '(' + channels[rank - 1] + ` + 1)`;\n      return getChannel(channels);\n    }\n\n    function getB(channels:
 string[]): string {\n      channels[rank - 2] = '(' + channels[rank - 2] + ` + 1)`;\n      return getChannel(channels);\n
 }\n\n    function getA(channels: string[]): string {\n      channels[rank - 1] = '(' + channels[rank - 1] + ` + 1)`;\n
 channels[rank - 2] = '(' + channels[rank - 2] + ` + 1)`;\n      return getChannel(channels);\n    }\n\n    function
 getChannel(channels: string[]): string {\n      const inCoordsArray = xShape.map((_, i) => getInCoord(i,
 channels));\n      const inCoords = inCoordsArray.join(',');\n      const innerDims = inCoordsArray.slice(-
 2).join(',');\n      return `getChannel(getX(${inCoords}), vec2(${innerDims}))`;\n    }\n\n    function getInCoord(i:
 number, channels1: string[]): string {\n      if (axis.indexOf(i)
  !== -1 && xShape[i] !== 1) {\n        return `${xShape[i]} - ${channels1[i]} - 1`;\n      } else {\n        return
 `${channels1[i]}`;\n      }\n    }\n  }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights
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 OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
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 ==========================================================================\n
 */\n\nimport {env, KernelConfig, KernelFunc, Reverse, ReverseAttrs, ReverseInputs, TensorInfo, util} from
 '@tensorflow/tfjs-core';\n\nimport
  {MathBackendWebGL} from '../backend_webgl';\nimport {ReverseProgram} from '../reverse_gpu';\nimport
 {ReversePackedProgram} from '../reverse_packed_gpu';\n\nimport {identity} from './Identity';\n\nexport function
```

reverse(args: {\n inputs: ReverseInputs,\n backend: MathBackendWebGL,\n attrs: ReverseAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {dims} = attrs;\n\n const xRank = x.shape.length;\n\n const $dims = util.parseAxisParam(dims, x.shape);\n if (xRank === 0) {\n   return identity({inputs: {x}, backend});\n }\n\n const program = env().getBool('WEBGL_PACK_ARRAY_OPERATIONS') ?\n   new ReversePackedProgram(x.shape, $dims) :\n   new ReverseProgram(x.shape, $dims);\n\n return backend.runWebGLProgram(program, [x], x.dtype);\n}\n\nexport const reverseConfig: KernelConfig = {\n kernelName: Reverse,\n backendName: 'webgl',\n kernelFunc: reverse as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {backend_util} from '@tensorflow/tfjs-core';\n\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class RotateProgram implements GPGPUProgram {\n variableNames = ['Image'];\n outputShape: number[] = [];\n userCode: string;\n\n constructor(\n   imageShape: [number, number, number, number], radians: number,\n   fillValue: number|[number, number, number],\n   center: number|[number, number]) {\n   const imageHeight = imageShape[1];\n   const imageWidth = imageShape[2];\n   const sinFactor = Math.sin(radians).toFixed(3);\n   const cosFactor = Math.cos(radians).toFixed(3);\n   this.outputShape = imageShape;\n\n   const [centerX, centerY] =\n   backend_util.getImageCenter(center, imageHeight, imageWidth);\n   const centerXString = centerX.toFixed(3);\n   const centerYString = centerY.toFixed(3);\n\n   let fillSnippet = '';\n   if (typeof fillValue === 'number') {\n   fillSnippet = `float outputValue = ${fillValue.toFixed(2)};`;\n   } else {\n   fillSnippet = `\n        vec3 fill = vec3(${fillValue.join(',')});\n        float outputValue = fill[coords[3]];`;\n   }\n\n   this.userCode = `\n   void main() {\n   ivec4 coords = getOutputCoords();\n   int x = coords[2];\n   int y = coords[1];\n   float coordXFloat = (float(x) - ${centerXString}) * ${\n   cosFactor} - (float(y) - ${centerYString}) * ${sinFactor};\n   float coordYFloat = (float(x) - ${centerXString}) * ${\n   sinFactor} + (float(y) - ${centerYString}) * ${cosFactor};\n   int coordX = int(round(coordXFloat + ${centerXString}));\n   int coordY = int(round(coordYFloat + ${centerYString}));\n ${fillSnippet}\n   if(coordX >= 0 && coordX < ${imageWidth} && coordY >= 0 && coordY < ${\n   imageHeight}) {\n   outputValue = getImage(coords[0], coordY, coordX, coords[3]);\n   }\n   setOutput(outputValue);\n   }\n   `;\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\n\nimport {KernelConfig, Tensor4D} from '@tensorflow/tfjs-core';\nimport {RotateWithOffset, RotateWithOffsetAttrs, RotateWithOffsetInputs} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {RotateProgram} from '../rotate_gpu';\n\nexport const rotateWithOffsetConfig: KernelConfig = {\n kernelName: RotateWithOffset,\n backendName: 'webgl',\n kernelFunc: ({inputs, attrs, backend}) => {\n   const {image} = inputs as RotateWithOffsetInputs;\n   const {radians, fillValue, center} = attrs as {} as RotateWithOffsetAttrs;\n   const webglBackend = backend as MathBackendWebGL;\n\n   const program = new RotateProgram(\n   (image as Tensor4D).shape, radians, fillValue, center);\n   const output = webglBackend.runWebGLProgram(program, [image], image.dtype);\n   return output;\n }\n};\n","/**\n *

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ScatterNdInputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {ScatterProgram} from '../scatter_gpu';\nimport {reshape} from './Reshape';\n\nexport function scatterNd(args: {\n inputs: ScatterNdInputs,\n backend: MathBackendWebGL,\n attrs: ScatterNdAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {indices, updates} = inputs;\n const {shape} = attrs;\n\n const {sliceRank, numUpdates, sliceSize, strides, outputSize} =\n backend_util.calculateShapes(updates, indices, shape);\n\n const flattenShape = [outputSize / sliceSize, sliceSize];\n\n if (outputSize === 0) {\n   return backend.makeTensorInfo(shape, indices.dtype);\n }\n\n const flattenIndices = reshape(\n   {inputs: {x: indices}, backend, attrs: {shape: [numUpdates, sliceRank]}});\n const flattenX = reshape(\n   {inputs: {x: updates}, backend, attrs: {shape: [numUpdates, sliceSize]}});\n\n const defaultValue = backend.makeTensorInfo(\n   [], 'float32', new Float32Array([0])); // scalar(0)\n const program = new ScatterProgram(\n   numUpdates, sliceRank, flattenIndices.shape.length, flattenX.shape.length,\n   strides, flattenShape);\n const res =\n backend.runWebGLProgram(\n   program, [flattenX, flattenIndices, defaultValue], flattenX.dtype);\n\n const reshaped = reshape({inputs: {x: res}, backend, attrs: {shape}});\n\n backend.disposeIntermediateTensorInfo(flattenIndices);\n backend.disposeIntermediateTensorInfo(flattenX);\n backend.disposeIntermediateTensorInfo(res);\n backend.disposeIntermediateTensorInfo(defaultValue);\n\n return reshaped;\n}\n\nexport const scatterNdConfig: KernelConfig = {\n kernelName: ScatterNd,\n backendName: 'webgl',\n kernelFunc: scatterNd as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with
the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==\n*/\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class SelectProgram implements GPGPUProgram {\n variableNames = ['c', 'a', 'b'];\n outputShape: number[];\n userCode: string;\n\n constructor(cRank: number, shape: number[], rank: number) {\n   this.outputShape = shape;\n\n   let cCoords;\n   let abCoords;\n   if (rank > 4) {\n   throw Error(`Where for rank ${rank} is not yet supported`);\n   }\n\n   if (rank === 1) {\n   abCoords = `resRC`;\n   cCoords = `resRC`;\n   } else {\n   const currentCoords = ['resRC.x', 'resRC.y', 'resRC.z', 'resRC.w'];\n   const cCoordVars = [];\n   const abCoordVars = [];\n   for (let i = 0; i < shape.length; i++) {\n   abCoordVars.push(`${currentCoords[i]}`);\n   if (i < cRank) {\n   cCoordVars.push(`${currentCoords[i]}`);\n   }\n   }\n   cCoords = cCoordVars.join();\n   abCoords = abCoordVars.join();\n   }\n\n   const dtype = getCoordsDataType(rank);\n\n   this.userCode = `\n      void main() {\n        ${dtype} resRC = getOutputCoords();\n        float cVal = getC(${cCoords});\n        if (cVal >= 1.0) {\n          setOutput(getA(${abCoords}));\n        } else {\n          setOutput(getB(${abCoords}));\n        }\n      }\n    `;\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may
not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==\n*/\n\nimport {KernelConfig, KernelFunc, Select, SelectInputs, TensorInfo, upcastType} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {SelectProgram} from

'../select_gpu';\n\nexport function select(args: {inputs: SelectInputs, backend: MathBackendWebGL}):\n TensorInfo {\n const {inputs, backend} = args;\n const {condition, t, e} = inputs;\n\n const program =\n   new SelectProgram(condition.shape.length,
 t.shape, t.shape.length);\n return backend.runWebGLProgram(\n   program, [condition, t, e], upcastType(t.dtype, e.dtype));\n}\n\nexport const selectConfig: KernelConfig = {\n kernelName: Select,\n backendName: 'webgl',\n kernelFunc: select as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
 */\n\nimport {backend_util, KernelConfig, Selu} from '@tensorflow/tfjs-core';\n\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst SELU = `\n  // Stable and Attracting Fixed Point (0, 1) for Normalized Weights.\n  // see: https://arxiv.org/abs/1706.02515\n  float scaleAlpha = ${backend_util.SELU_SCALEALPHA};\n  float scale = ${backend_util.SELU_SCALE};\n  return (x >= 0.0) ? scale * x : scaleAlpha * (exp(x) - 1.0);\n`;\n\nexport const selu = unaryKernelFunc({opSnippet: SELU});\n\nexport const seluConfig: KernelConfig = {\n kernelName: Selu,\n backendName: 'webgl',\n kernelFunc: selu,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed
 to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {KernelConfig, Sigmoid} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst SIGMOID = `return 1.0 / (1.0 + exp(-1.0 * x));`;\n\nexport const sigmoid = unaryKernelFunc({opSnippet: SIGMOID});\n\nexport const sigmoidConfig: KernelConfig = {\n kernelName: Sigmoid,\n backendName: 'webgl',\n kernelFunc: sigmoid,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License
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==\n
*/\n\nimport {KernelConfig, Sign} from '@tensorflow/tfjs-core';\n\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\n// Sign does not propagate NANs.\nconst SIGN = `\n  if (isnan(x)) { return 0.0; }\n  return sign(x);\n`;\n\nexport const sign = unaryKernelFunc({opSnippet: SIGN});\n\nexport const signConfig: KernelConfig = {\n kernelName: Sign,\n backendName: 'webgl',\n kernelFunc: sign,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License,
 Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

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==========\n*/\n\nimport {KernelConfig, Sin} from '@tensorflow/tfjs-core';\n\nimport {CHECK_NAN_SNIPPET_UNARY, unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst SIN = CHECK_NAN_SNIPPET_UNARY + `\n  return sin(x);\n`;\n\nexport const sin = unaryKernelFunc({opSnippet: SIN});\n\nexport const sinConfig: KernelConfig = {\n  kernelName: Sin,\n  backendName: 'webgl',\n  kernelFunc: sin,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\n\nimport {KernelConfig, Sinh} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst SINH = `\n  float e2x = exp(x);\n  return (e2x - 1.0 / e2x) / 2.0;\n`;\n\nexport const sinh = unaryKernelFunc({opSnippet: SINH});\n\nexport const sinhConfig: KernelConfig = {\n  kernelName: Sinh,\n  backendName: 'webgl',\n  kernelFunc: sinh,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\n\nimport {KernelConfig, Softplus} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst SOFTPLUS = `\n  float epsilon = 1.1920928955078125e-7;\n  float threshold = log(epsilon) + 2.0;\n\n  bool too_large = x > -threshold;\n  bool too_small = x < threshold;\n\n  float result;\n  float exp_x = exp(x);\n\n  if (too_large){\n    result = x;\n  }\n  else if (too_small){\n    result = exp_x;\n  }\n  else{\n    result = log(exp_x + 1.0);\n  }\n  return result;\n`;\n\nexport const softplus = unaryKernelFunc({opSnippet: SOFTPLUS});\n\nexport const softplusConfig: KernelConfig = {\n  kernelName: Softplus,\n  backendName: 'webgl',\n  kernelFunc: softplus,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n==========\n*/\n\nimport {backend_util, KernelConfig, KernelFunc, SpaceToBatchND, SpaceToBatchNDAttrs, SpaceToBatchNDInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\n\nimport {padV2} from './PadV2';\nimport {reshape} from './Reshape';\nimport {transpose} from './Transpose';\n\nexport const spaceToBatchND = (args: {\n  inputs: SpaceToBatchNDInputs,\n  backend: MathBackendWebGL,\n  attrs: SpaceToBatchNDAttrs\n}): TensorInfo => {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {blockShape, paddings} = attrs;\n\n  util.assert(\n      x.shape.length <= 4,\n      () => 'spaceToBatchND for rank > 4 with a WebGL backend not ' +\n          'implemented yet');\n\n  const prod = blockShape.reduce((a, b) => a * b);\n\n  const completePaddings: Array<[number, number]> = [[0, 0]];\n  completePaddings.push(...paddings as Array<[number, number]>);\n  for (let i = 1 + blockShape.length; i < x.shape.length; ++i) {\n    completePaddings.push([0, 0]);\n  }\n\n  const toDispose = [];\n\n
```

const paddedX = padV2({\n inputs: {x},\n backend,\n attrs: {paddings: completePaddings, constantValue: 0}\n });\n\n const reshapedPaddedShape =\n backend_util.getReshaped(paddedX.shape, blockShape, prod, false);\n\n const permutedReshapedPaddedPermutation = backend_util.getPermuted(\n reshapedPaddedShape.length, blockShape.length, false);\n\n const flattenShape =\n backend_util.getReshapedPermuted(paddedX.shape, blockShape, prod, false);\n\n const reshapedPaddedX = reshape(\n {inputs: {x: paddedX}, backend, attrs: {shape: reshapedPaddedShape}});\n\n const paddedXT = transpose({\n inputs: {x: reshapedPaddedX},\n backend,\n attrs: {perm: permutedReshapedPaddedPermutation}\n });\n\n const result =\n reshape({inputs: {x: paddedXT}, backend, attrs: {shape: flattenShape}});\n\n toDispose.push(paddedX);\n toDispose.push(reshapedPaddedX);\n toDispose.push(paddedXT);\n\n toDispose.forEach(t => backend.disposeIntermediateTensorInfo(t));\n\n return result;\n};\n\nexport const spaceToBatchNDConfig: KernelConfig = {\n kernelName: SpaceToBatchND,\n backendName: 'webgl',\n kernelFunc: spaceToBatchND as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES
OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {backend_util, KernelConfig, KernelFunc, SparseToDense, SparseToDenseAttrs, SparseToDenseInputs, TensorInfo} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {ScatterProgram} from '../scatter_gpu';\nimport {reshape} from './Reshape';\n\nexport function sparseToDense(args: {\n inputs: SparseToDenseInputs,\n backend: MathBackendWebGL,\n attrs: SparseToDenseAttrs\n}): TensorInfo {\n const {inputs, backend, attrs} = args;\n const {sparseIndices, sparseValues, defaultValue} = inputs;\n const {outputShape} = attrs;\n\n const {sliceRank, numUpdates, strides, outputSize} =\n backend_util.calculateShapes(sparseValues, sparseIndices, outputShape);\n\n const sumDupeIndices = false;\n
const program = new ScatterProgram(\n numUpdates, sliceRank, sparseIndices.shape.length,\n sparseValues.shape.length, strides, [outputSize, 1], sumDupeIndices);\n\n const res = backend.runWebGLProgram(\n program, [sparseValues, sparseIndices, defaultValue], sparseValues.dtype);\n\n const reshaped =\n reshape({inputs: {x: res}, backend, attrs: {shape: outputShape}});\n\n backend.disposeIntermediateTensorInfo(res);\n return reshaped;\n}\n\nexport const sparseToDenseConfig: KernelConfig = {\n kernelName: SparseToDense,\n backendName: 'webgl',\n kernelFunc: sparseToDense as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing,
software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {backend_util, KernelConfig, KernelFunc, SplitV, SplitVAttrs, SplitVInputs, TensorInfo, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {slice} from './Slice';\n\nexport function splitV(\n args:\n {inputs: SplitVInputs, backend: MathBackendWebGL, attrs: SplitVAttrs}):\n TensorInfo[] {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {numOrSizeSplits, axis} = attrs;\n\n const $axis = util.parseAxisParam(axis, x.shape)[0];\n const splitSizes = backend_util.prepareSplitSize(x, numOrSizeSplits, $axis);\n\n const xRank = x.shape.length;\n const

begin = new Array(xRank).fill(0);\n const size = x.shape.slice();\n\n return splitSizes.map(s => {\n   const sliceSize = [...size];\n   sliceSize[$axis] = s;\n   const sliceT =\n   slice({inputs: {x}, backend, attrs: {begin, size: sliceSize}});\n   begin[$axis] += s;\n   return sliceT;\n });\n}\n\nexport const splitVConfig: KernelConfig = {\n kernelName: SplitV,\n backendName: 'webgl',\n kernelFunc: splitV as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, KernelFunc, Sqrt} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst SQRT = `return sqrt(x);`;\n\nexport const sqrt = unaryKernelFunc({opSnippet: SQRT});\n\nexport const sqrtConfig: KernelConfig = {\n kernelName: Sqrt,\n backendName: 'webgl',\n kernelFunc: sqrt as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, Square} from '@tensorflow/tfjs-core';\n\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst SQUARE = `return x * x;`;\n\nexport const square = unaryKernelFunc({opSnippet: SQUARE});\n\nexport const squareConfig: KernelConfig = {\n kernelName: Square,\n backendName: 'webgl',\n kernelFunc: square,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {KernelConfig, KernelFunc, Step, StepAttrs, TensorInfo, UnaryInputs} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {CHECK_NAN_SNIPPET, UnaryOpProgram} from '../unaryop_gpu';\n\nexport function step(\n   {inputs, attrs, backend}:\n   {inputs: UnaryInputs, attrs: StepAttrs, backend: MathBackendWebGL}):\n   TensorInfo {\n const {x} = inputs;\n const opSnippet = CHECK_NAN_SNIPPET + `\n    return x > 0.0 ? 1.0 : float(${attrs.alpha});\n  `;\n\n const program = new UnaryOpProgram(x.shape, opSnippet);\n\n return backend.runWebGLProgram(program, [x], x.dtype);\n}\n\nexport const
 stepConfig: KernelConfig = {\n kernelName: Step,\n backendName: 'webgl',\n kernelFunc: step as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *

```
==========================================================================\n
*/\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from
'./shader_compiler';\n\nexport class StridedSliceProgram implements GPGPUProgram
 {\n  variableNames = ['x'];\n  outputShape: number[];\n  userCode: string;\n\n  constructor(begin: number[], strides:
number[], size: number[]) {\n    this.outputShape = size;\n    const rank = size.length;\n    const inputDtype =
getCoordsDataType(size.length);\n    const dtype = getCoordsDataType(size.length);\n\n    let newCoords = '';\n    if
(rank === 1) {\n      newCoords = 'coords * strides + begin';\n    } else {\n      let outputAxis = 0;\n      newCoords
=\n          size.map((_, i) => {\n            outputAxis++;\n            return size.length === 1 ?\n                `coords
* strides[${i}] + begin[${i}]` :\n                `coords[${outputAxis - 1}] * strides[${i}] + begin[${i}]`;\n
})\n            .join(',');\n    }\n\n    this.userCode = `\n      ${inputDtype} begin = ${inputDtype}(${begin});\n
${inputDtype} strides = ${inputDtype}(${strides});\n\n      void main() {\n        ${dtype} coords =
getOutputCoords();\n        setOutput(getX(${newCoords}));\n
    }\n    `;\n  }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under
the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
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Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or
implied.\n * See the License for the specific language governing permissions and\n * limitations under the
License.\n *
==========================================================================\n
*/\n\nimport {buffer, KernelConfig, KernelFunc, Rank, slice_util, StridedSlice, StridedSliceAttrs,
StridedSliceInputs, TensorBuffer, TensorInfo, TypedArray} from '@tensorflow/tfjs-core';\n\nimport
{MathBackendWebGL} from '../backend_webgl';\nimport
 {stridedSliceImplCPU} from '../kernel_utils/shared';\nimport {StridedSliceProgram} from
'../strided_slice_gpu';\n\nimport {reshape} from './Reshape';\nimport {slice} from './Slice';\n\nexport function
stridedSlice(args: {\n  inputs: StridedSliceInputs,\n  backend: MathBackendWebGL,\n  attrs: StridedSliceAttrs\n}):
TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {x} = inputs;\n  const {\n    begin,\n    end,\n
strides,\n    beginMask,\n    endMask,\n    ellipsisMask,\n    newAxisMask,\n    shrinkAxisMask\n  } = attrs;\n\n
const {nonStrided, $begin, $strides, size, newShape, outShape} =\n      slice_util.sliceInfo(\n          x.shape, begin,
end, strides, beginMask, endMask, ellipsisMask,\n          newAxisMask, shrinkAxisMask);\n\n  const $x =
reshape({inputs: {x}, backend, attrs: {shape: newShape}});\n\n  let result;\n  if (nonStrided) {\n    const sliced =\n
  slice({inputs: {x: $x}, backend, attrs: {begin: $begin, size}});\n    result = reshape({inputs:
 {x: sliced}, backend, attrs: {shape: outShape}});\n\n    backend.disposeIntermediateTensorInfo(sliced);\n  } else if
(outShape.some(axis => axis === 0)) {\n    result = backend.makeTensorInfo(outShape, x.dtype, []);\n  } else {\n
const shouldExecuteOnCPU = backend.shouldExecuteOnCPU([$x]);\n    if (shouldExecuteOnCPU) {\n      const
xTexData = backend.texData.get($x.dataId);\n      const values = xTexData.values as TypedArray;\n      const xBuf
= buffer($x.shape, $x.dtype, values) as TensorBuffer<Rank>;\n      const resultValues =\n
stridedSliceImplCPU(outShape, xBuf, $strides, $begin);\n      result = backend.makeTensorInfo(outShape, $x.dtype,
resultValues.values);\n    } else {\n      const program = new StridedSliceProgram($begin, $strides, outShape);\n
result = backend.runWebGLProgram(program, [$x], $x.dtype);\n    }\n  }\n\n  const resultReshaped =\n
reshape({inputs: {x: result}, backend, attrs: {shape: outShape}});\n\n
backend.disposeIntermediateTensorInfo($x);\n
  backend.disposeIntermediateTensorInfo(result);\n\n  return resultReshaped;\n}\n\nexport const stridedSliceConfig:
KernelConfig = {\n  kernelName: StridedSlice,\n  backendName: 'webgl',\n  kernelFunc: stridedSlice as {} as
KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the
Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the
License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n *
Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed
```

on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig,
Tan} from '@tensorflow/tfjs-core';\n\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst TAN = `return tan(x);`;\n\nexport const tan = unaryKernelFunc({opSnippet: TAN});\n\nexport const tanConfig: KernelConfig = {\n kernelName: Tan,\n backendName: 'webgl',\n kernelFunc: tan,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, Tanh} from '@tensorflow/tfjs-core';\nimport {unaryKernelFunc} from '../kernel_utils/kernel_funcs_utils';\n\nconst TANH = `\n float e2x = exp(-2.0 * abs(x));\n return sign(x) * (1.0 - e2x) / (1.0 + e2x);\n`;\n\nexport const tanh = unaryKernelFunc({opSnippet: TANH});\n\nexport const tanhConfig: KernelConfig = {\n kernelName: Tanh,\n backendName: 'webgl',\n kernelFunc: tanh,\n};\n","/**\n * @license\n * Copyright 2017 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the
License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {GPGPUProgram} from './gpgpu_math';\nimport {getCoordsDataType} from './shader_compiler';\n\nexport class TileProgram implements GPGPUProgram {\n variableNames = ['A'];\n outputShape: number[];\n userCode: string;\n rank: number;\n\n constructor(aShape: number[], reps: number[]) {\n const outputShape: number[] = new Array(aShape.length);\n for (let i = 0; i < outputShape.length; i++) {\n outputShape[i] = aShape[i] * reps[i];\n }\n this.outputShape = outputShape;\n this.rank = outputShape.length;\n const dtype = getCoordsDataType(this.rank);\n const sourceCoords = getSourceCoords(aShape);\n\n this.userCode = `\n void main() {\n ${dtype} resRC = getOutputCoords();\n setOutput(getA(${sourceCoords}));\n }\n `;\n }\n}\n\nfunction getSourceCoords(aShape:
number[]): string {\n const rank = aShape.length;\n if (rank > 5) {\n throw Error(`Tile for rank ${rank} is not yet supported`);\n }\n if (rank === 1) {\n return `imod(resRC, ${aShape[0]})`;\n }\n\n const currentCoords = ['resRC.x', 'resRC.y', 'resRC.z', 'resRC.w', 'resRC.u'];\n\n const sourceCoords = [];\n for (let i = 0; i < aShape.length; i++) {\n sourceCoords.push(`imod(${currentCoords[i]}, ${aShape[i]})`);\n }\n return sourceCoords.join();\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express
or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {buffer, KernelConfig, KernelFunc, TensorInfo, Tile, TileAttrs, TileInputs, util} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {tileImplCPU} from

'../kernel_utils/shared';\nimport {TileProgram} from '../tile_gpu';\n\nexport function tile(\n params: {inputs: TileInputs, backend: MathBackendWebGL, attrs: TileAttrs}):\n TensorInfo {\n const {inputs, backend, attrs} = params;\n const {x} = inputs;\n const {reps} = attrs;\n\n if (x.dtype === 'string') {\n // Even thought string tensor is always on CPU, just to be consistent on how\n // to access tensor data.\n const data = backend.readSync(x.dataId) as Uint8Array[];\n const decodedData = data.map(d => util.decodeString(d));\n const buf = buffer(x.shape,
x.dtype, decodedData);\n const outBuf = tileImplCPU(buf, reps);\n return backend.makeTensorInfo(outBuf.shape, outBuf.dtype, outBuf.values);\n }\n\n const program = new TileProgram(x.shape, reps);\n const output = backend.runWebGLProgram(program, [x], x.dtype);\n\n return output;\n}\n\nexport const tileConfig: KernelConfig = {\n kernelName: Tile,\n backendName: 'webgl',\n kernelFunc: tile as {} as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, NumericDataType, TensorInfo, TopK, TopKAttrs, TopKInputs, TypedArray} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {topKImplCPU} from '../kernel_utils/shared';\n\nexport function topK(\n args: {inputs: TopKInputs, backend: MathBackendWebGL, attrs: TopKAttrs}):\n TensorInfo[] {\n const {inputs, backend, attrs} = args;\n const {x} = inputs;\n const {k, sorted} = attrs;\n\n const xVals = backend.readSync(x.dataId) as TypedArray;\n const [allTopKVals, allTopKIndices] =\n topKImplCPU(xVals, x.shape, x.dtype as NumericDataType, k, sorted);\n\n return [\n backend.makeTensorInfo(\n allTopKVals.shape, allTopKVals.dtype, allTopKVals.values),\n backend.makeTensorInfo(\n allTopKIndices.shape, allTopKIndices.dtype, allTopKIndices.values)\n];\n}\n\nexport const topKConfig: KernelConfig = {\n kernelName: TopK,\n backendName: 'webgl',\n kernelFunc: topK as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the License);\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an AS IS BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {KernelConfig, KernelFunc, TensorInfo, Unique, UniqueAttrs, UniqueInputs} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL}
from '../backend_webgl';\nimport {uniqueImplCPU} from '../kernel_utils/shared';\nimport {assertNotComplex} from '../webgl_util';\n\nexport function unique(\n args:\n {inputs: UniqueInputs, attrs: UniqueAttrs, backend: MathBackendWebGL}):\n TensorInfo[] {\n const {inputs, attrs, backend} = args;\n const {axis} = attrs;\n const {x} = inputs;\n assertNotComplex(x, 'unique');\n\n // For now, always forward calculation to the CPU backend.\n console.warn(\n 'WARNING: ',\n 'UI might be locked temporarily as data is being downloaded');\n const values = backend.readSync(x.dataId);\n const {outputValues, outputShape, indices} =\n uniqueImplCPU(values, axis, x.shape, x.dtype);\n return [\n backend.makeTensorInfo(outputShape, x.dtype, outputValues),\n backend.makeTensorInfo([indices.length], 'int32', indices),\n];\n}\n\nexport const uniqueConfig: KernelConfig = {\n kernelName: Unique,\n backendName: 'webgl',\n kernelFunc: unique as {}
as KernelFunc,\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the

License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {KernelConfig, KernelFunc, TensorInfo, Unpack, UnpackAttrs, UnpackInputs} from '@tensorflow/tfjs-core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\n\nimport {reshape} from './Reshape';\nimport {slice} from './Slice';\n\nexport function unpack(\n args:\n {inputs: UnpackInputs, backend: MathBackendWebGL, attrs: UnpackAttrs}):\n TensorInfo[] {\n const {inputs, backend, attrs} = args;\n const {value} = inputs;\n let {axis} = attrs;\n\n if (axis < 0) {\n axis += value.shape.length;\n }\n\n const x = value;\n const xRank = x.shape.length;\n\n const num = value.shape[axis];\n const outShape: number[] = new Array(xRank - 1);\n let outIndex = 0;\n for (let i = 0; i < xRank; i++) {\n if (i !== axis) {\n outShape[outIndex++] = x.shape[i];\n }\n }\n\n const toDispose = [];\n\n const begin = new Array(xRank).fill(0);\n const size = x.shape.slice();\n size[axis] = 1;\n const res: TensorInfo[] = new Array(num);\n for (let i = 0; i < res.length; i++) {\n begin[axis] = i;\n const sliced = slice({inputs: {x}, backend, attrs: {begin, size}});\n const reshaped =\n reshape({inputs: {x: sliced}, backend, attrs: {shape: outShape}});\n res[i] = reshaped;\n\n toDispose.push(sliced);\n }\n\n toDispose.forEach(t => backend.disposeIntermediateTensorInfo(t));\n return res;\n}\n\nexport const unpackConfig: KernelConfig = {\n kernelName: Unpack,\n backendName: 'webgl',\n kernelFunc: unpack as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==========\n */\n\nimport {backend_util} from '@tensorflow/tfjs-core';\nimport {GPGPUProgram} from './gpgpu_math';\n\nexport class SegmentOpProgram implements GPGPUProgram {\n variableNames = ['x', 'segmentIds'];\n outputShape: number[];\n userCode: string;\n\n constructor(\n segOpInfo: backend_util.segment_util.SegOpInfo,\n segOpType: 'unsortedSegmentSum') {\n const windowSize = segOpInfo.windowSize;\n const batchSize = segOpInfo.batchSize;\n const inSize = segOpInfo.inSize;\n const numSegments = segOpInfo.numSegments;\n const outSize = numSegments * Math.ceil(inSize / windowSize);\n this.outputShape = [batchSize, outSize];\n\n const initializationValue = '0.0';\n const returnValue = `sumValue`;\n\n const windowSizeNearestVec4 = Math.floor(windowSize / 4) * 4;\n const windowSizeVec4Remainder = windowSize % 4;\n\n const updateSnippet = `\n sumValue += dot(values, segFilter);\n `;\n\n let checkValueOutOfBounds = '';\n if (inSize % windowSize > 0) {\n checkValueOutOfBounds\n = `\n if (inIdx < 0 || inIdx >= ${inSize}) {\n return initializationValue;\n }\n `;\n }\n\n let checkSegmentIdOutOfBounds = '';\n if (inSize % windowSize > 0) {\n checkSegmentIdOutOfBounds = `\n if (inIdx < 0 || inIdx >= ${inSize}) {\n return -1.0;\n }\n `;\n }\n\n this.userCode = `\n const float initializationValue = ${initializationValue};\n\n float getValue(int batch, int inIdx) {\n ${checkValueOutOfBounds}\n return getX(batch, inIdx);\n }\n\n float getSegmentIdAtIndex(int inIdx) {\n ${checkSegmentIdOutOfBounds}\n return getSegmentIds(inIdx);\n }\n\n void main() {\n ivec2 coords = getOutputCoords();\n int batch = coords[0];\n int outIdx = coords[1];\n int inOffset = int(floor(float(outIdx) / float(\n ${numSegments})) * float(${windowSize}));\n int currentSeg = int(mod(float(outIdx), float(${numSegments})));\n\n

```
      float sumValue = 0.0;\n\n      for (int i = 0; i < ${windowSizeNearestVec4}; i += 4) {\n        int inIdx = inOffset + i;\n        vec4 values = vec4(\n          getValue(batch, inIdx),\n          getValue(batch, inIdx + 1),\n          getValue(batch, inIdx + 2),\n          getValue(batch, inIdx + 3)\n        );\n\n        vec4 segFilter = vec4(\n          int(getSegmentIdAtIndex(inIdx)) == currentSeg ? 1 : 0,\n          int(getSegmentIdAtIndex(inIdx + 1)) == currentSeg ? 1 : 0,\n          int(getSegmentIdAtIndex(inIdx + 2)) == currentSeg ? 1 : 0,\n          int(getSegmentIdAtIndex(inIdx + 3)) == currentSeg ? 1 : 0\n        );\n\n        ${updateSnippet}\n      }\n\n      int inIdx = inOffset + ${windowSizeNearestVec4};\n      if (${windowSizeVec4Remainder === 1}) {\n        vec4 values = vec4(\n          getValue(batch, inIdx),\n          initializationValue,\n          initializationValue,\n          initializationValue\n        );\n\n        int inIdxSeg = int(getSegmentIdAtIndex(inIdx));\n\n        vec4 segFilter = vec4(\n          int(getSegmentIdAtIndex(inIdx)) == currentSeg ? 1 : 0,\n          0,\n          0,\n          0\n        );\n\n        ${updateSnippet}\n      } else if (${windowSizeVec4Remainder === 2}) {\n        vec4 values = vec4(\n          getValue(batch, inIdx),\n          getValue(batch, inIdx + 1),\n          initializationValue,\n          initializationValue\n        );\n\n        vec4 segFilter = vec4(\n          int(getSegmentIdAtIndex(inIdx)) == currentSeg ? 1 : 0,\n          int(getSegmentIdAtIndex(inIdx + 1)) == currentSeg ? 1 : 0,\n          0,\n          0\n        );\n\n        ${updateSnippet}\n      } else if (${windowSizeVec4Remainder === 3}) {\n        vec4 values = vec4(\n          getValue(batch, inIdx),\n          getValue(batch, inIdx + 1),\n          getValue(batch, inIdx + 2),\n          initializationValue\n        );\n\n        vec4 segFilter = vec4(\n          int(getSegmentIdAtIndex(inIdx)) == currentSeg ? 1 : 0,\n          int(getSegmentIdAtIndex(inIdx + 1)) == currentSeg ? 1 : 0,\n          int(getSegmentIdAtIndex(inIdx + 2)) == currentSeg ? 1 : 0,\n          0\n        );\n\n        ${updateSnippet}\n      }\n      setOutput(${returnValue});\n    }\n    `;\n  }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions
 and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {backend_util, DataType, KernelConfig, KernelFunc, sumOutType, TensorInfo,
UnsortedSegmentSum, UnsortedSegmentSumAttrs, UnsortedSegmentSumInputs, util} from '@tensorflow/tfjs-
core';\n\nimport {MathBackendWebGL} from '../backend_webgl';\nimport {SegmentOpProgram} from
'../segment_gpu';\n\nimport {range} from './Range';\nimport {reshape} from './Reshape';\nimport {tile} from
'./Tile';\nimport {transpose} from './Transpose';\n\nexport function unsortedSegmentSum(args: {\n  inputs:
UnsortedSegmentSumInputs,\n  backend: MathBackendWebGL,\n  attrs: UnsortedSegmentSumAttrs\n}):
TensorInfo {\n  const {inputs, backend, attrs} = args;\n  const {x, segmentIds} = inputs;\n  const {numSegments} =
attrs;\n\n  const xRank = x.shape.length;\n\n  const toDispose = [];\n\n  let axis = 0;\n  const permutation =
backend_util.getAxesPermutation([axis], xRank);\n  let
 permutedX = x;\n  if (permutation != null) {\n    permutedX = transpose({inputs: {x}, backend, attrs: {perm:
permutation}});\n    toDispose.push(permutedX);\n    axis = backend_util.getInnerMostAxes(1, xRank)[0];\n  }\n\n
const outShape = backend_util.segment_util.computeOutShape(\n      permutedX.shape, axis, numSegments);\n
const inSize = util.sizeFromShape([permutedX.shape[axis]]);\n  const a2D =\n      reshape({inputs: {x: permutedX},
backend, attrs: {shape: [-1, inSize]}});\n  toDispose.push(a2D);\n\n  const outputDType =
sumOutType(x.dtype);\n\n  const segOpCompute =\n      (x: TensorInfo, segOpType: 'unsortedSegmentSum',
segmentIds: TensorInfo,\n       dtype: DataType, numSegments: number): TensorInfo => {\n        const batchSize =
x.shape[0];\n        const inSize = x.shape[1];\n        const windowSize =\n
backend_util.segment_util.segOpComputeOptimalWindowSize(\n              inSize, numSegments);\n        const
segOpInfo = {windowSize, inSize, batchSize, numSegments};\n
```

const program = new SegmentOpProgram(segOpInfo, segOpType);\n const output = backend.compileAndRun(program, [x, segmentIds], dtype);\n toDispose.push(output);\n // No need to run another GPGPU program.\n if (output.shape[1] === numSegments) {\n return output;\n }\n const rangeInfo = range({\n backend,\n attrs: {start: 0, stop: numSegments, step: 1, dtype: 'float32'}\n });\n const tileInfo = tile({\n inputs: {x: rangeInfo},\n backend,\n attrs: {reps: [inSize / windowSize]}\n });\n\n toDispose.push(rangeInfo);\n toDispose.push(tileInfo);\n\n const result =\n segOpCompute(output, segOpType, tileInfo, dtype, numSegments);\n return result;\n };\n\n const segOpResult = segOpCompute(\n a2D, 'unsortedSegmentSum', segmentIds, outputDType, numSegments);\n\n const reshaped =\n reshape({inputs: {x: segOpResult},
backend, attrs: {shape: outShape}});\n\n let result = reshaped;\n if (permutation != null) {\n toDispose.push(reshaped);\n const perm = backend_util.getUndoAxesPermutation(permutation);\n result = transpose({inputs: {x: result}, backend, attrs: {perm}});\n }\n\n toDispose.forEach(t => backend.disposeIntermediateTensorInfo(t));\n return result;\n}\n\nexport const unsortedSegmentSumConfig: KernelConfig = {\n kernelName: UnsortedSegmentSum,\n backendName: 'webgl',\n kernelFunc: unsortedSegmentSum as {} as KernelFunc\n};\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n
* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\nimport {KernelConfig, registerKernel} from '@tensorflow/tfjs-core';\n\nimport {_fusedMatMulConfig} from './kernels/_FusedMatMul';\nimport {absConfig} from './kernels/Abs';\nimport {acosConfig} from './kernels/Acos';\nimport {acoshConfig} from './kernels/Acosh';\nimport {addConfig} from './kernels/Add';\nimport {addNConfig} from './kernels/AddN';\nimport {allConfig} from './kernels/All';\nimport {anyConfig} from './kernels/Any';\nimport {argMaxConfig} from './kernels/ArgMax';\nimport {argMinConfig} from './kernels/ArgMin';\nimport {asinConfig} from './kernels/Asin';\nimport {asinhConfig} from './kernels/Asinh';\nimport {atanConfig} from './kernels/Atan';\nimport {atan2Config} from './kernels/Atan2';\nimport {atanhConfig}
from './kernels/Atanh';\nimport {avgPoolConfig} from './kernels/AvgPool';\nimport {avgPool3DConfig} from './kernels/AvgPool3D';\nimport {avgPoolGrad3DConfig} from './kernels/AvgPool3DGrad';\nimport {avgPoolGradConfig} from './kernels/AvgPoolGrad';\nimport {batchMatMulConfig} from './kernels/BatchMatMul';\nimport {batchNormConfig} from './kernels/BatchNorm';\nimport {batchToSpaceNDConfig} from './kernels/BatchToSpaceND';\nimport {bincountConfig} from './kernels/Bincount';\nimport {castConfig} from './kernels/Cast';\nimport {ceilConfig} from './kernels/Ceil';\nimport {clipByValueConfig} from './kernels/ClipByValue';\nimport {complexConfig} from './kernels/Complex';\nimport {complexAbsConfig} from './kernels/ComplexAbs';\nimport {concatConfig} from './kernels/Concat';\nimport {conv2DConfig} from './kernels/Conv2D';\nimport {conv2DBackpropFilterConfig} from './kernels/Conv2DBackpropFilter';\nimport {conv2DBackpropInputConfig} from './kernels/Conv2DBackpropInput';\nimport {conv3DConfig} from
'./kernels/Conv3D';\nimport {conv3DBackpropFilterV2Config} from './kernels/Conv3DBackpropFilterV2';\nimport {conv3DBackpropInputConfig} from './kernels/Conv3DBackpropInputV2';\nimport {cosConfig} from './kernels/Cos';\nimport {coshConfig} from './kernels/Cosh';\nimport {cropAndResizeConfig} from './kernels/CropAndResize';\nimport {cumsumConfig} from './kernels/Cumsum';\nimport {denseBincountConfig} from './kernels/DenseBincount';\nimport {depthToSpaceConfig} from './kernels/DepthToSpace';\nimport {depthwiseConv2dNativeConfig} from './kernels/DepthwiseConv2dNative';\nimport {depthwiseConv2dNativeBackpropFilterConfig} from './kernels/DepthwiseConv2dNativeBackpropFilter';\nimport

{depthwiseConv2dNativeBackpropInputConfig} from './kernels/DepthwiseConv2dNativeBackpropInput';\nimport {diagConfig} from './kernels/Diag';\nimport {dilation2DConfig} from './kernels/Dilation2D';\nimport {eluConfig} from './kernels/Elu';\nimport {eluGradConfig} from './kernels/EluGrad';\nimport {equalConfig} from './kernels/Equal';\nimport {erfConfig} from './kernels/Erf';\nimport {expConfig} from './kernels/Exp';\nimport {expandDimsConfig} from './kernels/ExpandDims';\nimport {expm1Config} from './kernels/Expm1';\nimport {fftConfig} from './kernels/FFT';\nimport {fillConfig} from './kernels/Fill';\nimport {flipLeftRightConfig} from './kernels/FlipLeftRight';\nimport {floorConfig} from './kernels/Floor';\nimport {floorDivConfig} from './kernels/FloorDiv';\nimport {fromPixelsConfig} from './kernels/FromPixels';\nimport {fusedConv2DConfig} from './kernels/FusedConv2D';\nimport {fusedDepthwiseConv2DConfig} from './kernels/FusedDepthwiseConv2D';\nimport {gatherNdConfig} from './kernels/GatherNd';\nimport {gatherV2Config} from './kernels/GatherV2';\nimport {greaterConfig} from './kernels/Greater';\nimport {greaterEqualConfig} from './kernels/GreaterEqual';\nimport {identityConfig} from './kernels/Identity';\nimport {ifftConfig} from './kernels/IFFT';\nimport {imagConfig} from './kernels/Imag';\nimport {isFiniteConfig} from './kernels/IsFinite';\nimport {isInfConfig} from './kernels/IsInf';\nimport {isNaNConfig} from './kernels/IsNaN';\nimport {leakyReluConfig} from './kernels/LeakyRelu';\nimport {lessConfig} from './kernels/Less';\nimport {lessEqualConfig} from './kernels/LessEqual';\nimport {linSpaceConfig} from './kernels/LinSpace';\nimport {logConfig} from './kernels/Log';\nimport {log1pConfig} from './kernels/Log1p';\nimport {logicalAndConfig} from './kernels/LogicalAnd';\nimport {logicalNotConfig} from './kernels/LogicalNot';\nimport {logicalOrConfig} from './kernels/LogicalOr';\nimport {LRNConfig} from './kernels/LRN';\nimport {LRNGradConfig} from './kernels/LRNGrad';\nimport {maxConfig} from './kernels/Max';\nimport {maximumConfig} from './kernels/Maximum';\nimport {maxPoolConfig} from './kernels/MaxPool';\nimport {maxPool3DConfig} from './kernels/MaxPool3D';\nimport {maxPoolGrad3DConfig} from './kernels/MaxPool3DGrad';\nimport {maxPoolGradConfig} from './kernels/MaxPoolGrad';\nimport {maxPoolWithArgmaxConfig} from './kernels/MaxPoolWithArgmax';\nimport {meanConfig} from './kernels/Mean';\nimport {minConfig} from './kernels/Min';\nimport {minimumConfig} from './kernels/Minimum';\nimport {mirrorPadConfig} from './kernels/MirrorPad';\nimport {modConfig} from './kernels/Mod';\nimport {multinomialConfig} from './kernels/Multinomial';\nimport {multiplyConfig} from './kernels/Multiply';\nimport {negConfig} from './kernels/Neg';\nimport {nonMaxSuppressionV3Config} from './kernels/NonMaxSuppressionV3';\nimport {nonMaxSuppressionV4Config} from './kernels/NonMaxSuppressionV4';\nimport {nonMaxSuppressionV5Config} from './kernels/NonMaxSuppressionV5';\nimport {notEqualConfig} from './kernels/NotEqual';\nimport {oneHotConfig} from './kernels/OneHot';\nimport {onesLikeConfig} from './kernels/OnesLike';\nimport {packConfig} from './kernels/Pack';\nimport {padV2Config} from './kernels/PadV2';\nimport {powConfig} from './kernels/Pow';\nimport {preluConfig} from './kernels/Prelu';\nimport {prodConfig} from './kernels/Prod';\nimport {rangeConfig} from './kernels/Range';\nimport {realConfig} from './kernels/Real';\nimport {realDivConfig} from './kernels/RealDiv';\nimport {reciprocalConfig} from './kernels/Reciprocal';\nimport {reluConfig} from './kernels/Relu';\nimport {relu6Config} from './kernels/Relu6';\nimport {reshapeConfig} from './kernels/Reshape';\nimport {resizeBilinearConfig} from './kernels/ResizeBilinear';\nimport {resizeBilinearGradConfig} from './kernels/ResizeBilinearGrad';\nimport {resizeNearestNeighborConfig} from './kernels/ResizeNearestNeighbor';\nimport {resizeNearestNeighborGradConfig} from './kernels/ResizeNearestNeighborGrad';\nimport {reverseConfig} from './kernels/Reverse';\nimport {rotateWithOffsetConfig} from './kernels/RotateWithOffset';\nimport {roundConfig} from './kernels/Round';\nimport {rsqrtConfig} from './kernels/Rsqrt';\nimport {scatterNdConfig} from './kernels/ScatterNd';\nimport {selectConfig} from './kernels/Select';\nimport {seluConfig} from './kernels/Selu';\nimport {sigmoidConfig} from './kernels/Sigmoid';\nimport {signConfig} from './kernels/Sign';\nimport {sinConfig} from './kernels/Sin';\nimport {sinhConfig} from './kernels/Sinh';\nimport {sliceConfig} from './kernels/Slice';\nimport {softmaxConfig} from './kernels/Softmax';\nimport {softplusConfig} from './kernels/Softplus';\nimport {spaceToBatchNDConfig} from './kernels/SpaceToBatchND';\nimport

{sparseToDenseConfig} from './kernels/SparseToDense';\nimport {splitVConfig} from './kernels/SplitV';\nimport {sqrtConfig} from './kernels/Sqrt';\nimport {squareConfig} from './kernels/Square';\nimport {squaredDifferenceConfig} from './kernels/SquaredDifference';\nimport {stepConfig} from './kernels/Step';\nimport {stridedSliceConfig} from './kernels/StridedSlice';\nimport {subConfig} from './kernels/Sub';\nimport {sumConfig} from './kernels/Sum';\nimport {tanConfig} from './kernels/Tan';\nimport {tanhConfig} from './kernels/Tanh';\nimport {tileConfig}
from './kernels/Tile';\nimport {topKConfig} from './kernels/TopK';\nimport {transposeConfig} from './kernels/Transpose';\nimport {uniqueConfig} from './kernels/Unique';\nimport {unpackConfig} from './kernels/Unpack';\nimport {unsortedSegmentSumConfig} from './kernels/UnsortedSegmentSum';\nimport {zerosLikeConfig} from './kernels/ZerosLike';\n\n// List all kernel configs here\nconst kernelConfigs: KernelConfig[] = [\n LRNConfig,\n LRNGradConfig,\n _fusedMatMulConfig,\n absConfig,\n acosConfig,\n acoshConfig,\n addConfig,\n addNConfig,\n allConfig,\n anyConfig,\n argMaxConfig,\n argMinConfig,\n asinConfig,\n asinhConfig,\n atan2Config,\n atanConfig,\n atanhConfig,\n avgPool3DConfig,\n avgPoolConfig,\n avgPoolGrad3DConfig,\n avgPoolGradConfig,\n batchMatMulConfig,\n batchNormConfig,\n batchToSpaceNDConfig,\n bincountConfig,\n castConfig,\n ceilConfig,\n clipByValueConfig,\n complexAbsConfig,\n complexConfig,\n concatConfig,\n conv2DBackpropFilterConfig,\n conv2DBackpropInputConfig,\n conv2DConfig,\n conv3DBackpropFilterV2Config,\n conv3DBackpropInputConfig,\n conv3DConfig,\n cosConfig,\n coshConfig,\n cropAndResizeConfig,\n cumsumConfig,\n denseBincountConfig,\n depthToSpaceConfig,\n depthwiseConv2dNativeBackpropFilterConfig,\n depthwiseConv2dNativeBackpropInputConfig,\n depthwiseConv2dNativeConfig,\n diagConfig,\n dilation2DConfig,\n eluConfig,\n eluGradConfig,\n equalConfig,\n erfConfig,\n expConfig,\n expandDimsConfig,\n expm1Config,\n fftConfig,\n fillConfig,\n flipLeftRightConfig,\n floorConfig,\n floorDivConfig,\n fromPixelsConfig,\n fusedConv2DConfig,\n fusedDepthwiseConv2DConfig,\n gatherNdConfig,\n gatherV2Config,\n greaterConfig,\n greaterEqualConfig,\n identityConfig,\n ifftConfig,\n imagConfig,\n isFiniteConfig,\n isInfConfig,\n isNaNConfig,\n leakyReluConfig,\n lessConfig,\n lessEqualConfig,\n linSpaceConfig,\n log1pConfig,\n logConfig,\n logicalAndConfig,\n logicalNotConfig,\n logicalOrConfig,\n maxConfig,\n maxPool3DConfig,\n maxPoolConfig,\n maxPoolGrad3DConfig,\n maxPoolGradConfig,\n maxPoolWithArgmaxConfig,\n maximumConfig,\n meanConfig,\n minConfig,\n minimumConfig,\n mirrorPadConfig,\n modConfig,\n multinomialConfig,\n multiplyConfig,\n negConfig,\n nonMaxSuppressionV3Config,\n nonMaxSuppressionV4Config,\n nonMaxSuppressionV5Config,\n notEqualConfig,\n oneHotConfig,\n onesLikeConfig,\n packConfig,\n padV2Config,\n powConfig,\n preluConfig,\n prodConfig,\n rangeConfig,\n realConfig,\n realDivConfig,\n reciprocalConfig,\n relu6Config,\n reluConfig,\n reshapeConfig,\n resizeBilinearConfig,\n resizeBilinearGradConfig,\n resizeNearestNeighborConfig,\n resizeNearestNeighborGradConfig,\n reverseConfig,\n rotateWithOffsetConfig,\n roundConfig,\n rsqrtConfig,\n scatterNdConfig,\n selectConfig,\n seluConfig,\n sigmoidConfig,\n signConfig,\n sinConfig,\n sinhConfig,\n sliceConfig,\n softmaxConfig,\n softplusConfig,\n spaceToBatchNDConfig,\n sparseToDenseConfig,\n splitVConfig,\n sqrtConfig,\n squareConfig,\n squaredDifferenceConfig,\n stepConfig,\n stridedSliceConfig,\n subConfig,\n sumConfig,\n tanConfig,\n tanhConfig,\n tileConfig,\n topKConfig,\n transposeConfig,\n uniqueConfig,\n unpackConfig,\n unsortedSegmentSumConfig,\n zerosLikeConfig\n];\n\nfor (const kernelConfig of kernelConfigs) {\n registerKernel(kernelConfig);\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the

License for the specific language governing permissions and\n * limitations under the License.\n *\n * ==========\n */\n\n/* tslint:disable */\n\n/** Properties of an Any. */\nexport declare interface IAny {\n /** Any typeUrl */\n typeUrl?: (string|null);\n\n /** Any value */\n value?: (Uint8Array|null);\n}\n\n/** DataType enum. */\nexport enum DataType {\n 'DT_INVALID' = 0,\n 'DT_FLOAT' = 1,\n 'DT_DOUBLE' = 2,\n 'DT_INT32' = 3,\n 'DT_UINT8' = 4,\n 'DT_INT16' = 5,\n 'DT_INT8' = 6,\n 'DT_STRING' = 7,\n 'DT_COMPLEX64' = 8,\n 'DT_INT64' = 9,\n 'DT_BOOL' = 10,\n 'DT_QINT8' = 11,\n 'DT_QUINT8' = 12,\n 'DT_QINT32' = 13,\n 'DT_BFLOAT16' = 14,\n 'DT_FLOAT_REF' = 101,\n 'DT_DOUBLE_REF' = 102,\n 'DT_INT32_REF' = 103,\n 'DT_UINT8_REF' = 104,\n 'DT_INT16_REF' = 105,\n 'DT_INT8_REF' = 106,\n 'DT_STRING_REF' = 107,\n 'DT_COMPLEX64_REF' = 108,\n 'DT_INT64_REF' = 109,\n 'DT_BOOL_REF' = 110,\n 'DT_QINT8_REF' = 111,\n 'DT_QUINT8_REF' = 112,\n 'DT_QINT32_REF' = 113,\n 'DT_BFLOAT16_REF' = 114\n}\n\n/** Properties of a TensorShape. */\nexport declare interface ITensorShape {\n /** TensorShape dim */\n dim?: (TensorShape.IDim[]|null);\n\n /** TensorShape unknownRank */\n unknownRank?: (boolean|null);\n}\n\nexport namespace TensorShape {\n /** Properties of a Dim. */\n export declare interface IDim {\n /** Dim size */\n size?: (number|string|null);\n\n /** Dim name */\n name?: (string|null);\n }\n}\n\n/** Properties of a Tensor. */\nexport declare interface ITensor {\n /** Tensor dtype */\n dtype?: (DataType|null);\n\n /** Tensor tensorShape */\n tensorShape?: (ITensorShape|null);\n\n /** Tensor versionNumber */\n versionNumber?: (number|null);\n\n /** Tensor tensorContent */\n tensorContent?: (Uint8Array|null);\n\n /** Tensor floatVal */\n floatVal?: (number[]|null);\n\n /** Tensor doubleVal */\n doubleVal?: (number[]|null);\n\n /** Tensor intVal */\n intVal?: (number[]|null);\n\n /** Tensor stringVal */\n stringVal?: (Uint8Array[]|null);\n\n /** Tensor scomplexVal */\n scomplexVal?: (number[]|null);\n\n /** Tensor int64Val */\n int64Val?: ((number | string)[]|null);\n\n /** Tensor boolVal */\n boolVal?: (boolean[]|null);\n\n /** Tensor uint32Val */\n uint32Val?: (number[]|null);\n\n /** Tensor uint64Val */\n uint64Val?: ((number | string)[]|null);\n}\n\n/** Properties of an AttrValue. */\nexport declare interface IAttrValue {\n /** AttrValue list */\n list?: (AttrValue.IListValue|null);\n\n /** AttrValue s */\n s?: (string|null);\n\n /** AttrValue i */\n i?: (number|string|null);\n\n /** AttrValue f */\n f?: (number|null);\n\n /** AttrValue b */\n b?: (boolean|null);\n\n /** AttrValue type */\n type?: (DataType|null);\n\n /** AttrValue shape */\n shape?: (ITensorShape|null);\n\n /** AttrValue tensor */\n tensor?: (ITensor|null);\n\n /** AttrValue placeholder */\n placeholder?: (string|null);\n\n /** AttrValue func */\n func?: (INameAttrList|null);\n}\n\nexport namespace AttrValue {\n /** Properties of a ListValue. */\n export declare interface IListValue {\n /** ListValue s */\n s?: (string[]|null);\n\n /** ListValue i */\n i?: ((number | string)[]|null);\n\n /** ListValue f */\n f?: (number[]|null);\n\n /** ListValue b */\n b?: (boolean[]|null);\n\n /** ListValue type */\n type?: (DataType[]|null);\n\n /** ListValue shape */\n shape?: (ITensorShape[]|null);\n\n /** ListValue tensor */\n tensor?: (ITensor[]|null);\n\n /** ListValue func */\n func?: (INameAttrList[]|null);\n }\n}\n\n/** Properties of a NameAttrList. */\nexport declare interface INameAttrList {\n /** NameAttrList name */\n name?: (string|null);\n\n /** NameAttrList attr */\n attr?: ({[k: string]: IAttrValue}|null);\n}\n\n/** Properties of a NodeDef. */\nexport declare interface INodeDef {\n /** NodeDef name */\n name?: (string|null);\n\n /** NodeDef op */\n op?: (string|null);\n\n /** NodeDef input */\n input?: (string[]|null);\n\n /** NodeDef device */\n device?: (string|null);\n\n /** NodeDef attr */\n attr?: ({[k: string]: IAttrValue}|null);\n}\n\n/** Properties of a VersionDef. */\nexport declare interface IVersionDef {\n /** VersionDef producer */\n producer?: (number|null);\n\n /** VersionDef minConsumer */\n minConsumer?: (number|null);\n\n /** VersionDef badConsumers */\n badConsumers?: (number[]|null);\n}\n\n/** Properties of a GraphDef. */\nexport declare interface IGraphDef {\n /** GraphDef node */\n node?: (INodeDef[]|null);\n\n /** GraphDef versions */\n versions?: (IVersionDef|null);\n\n /** GraphDef library */\n library?: (IFunctionDefLibrary|null);\n}\n\n/** Properties of a CollectionDef. */\nexport declare interface ICollectionDef {\n /** CollectionDef nodeList */\n nodeList?: (CollectionDef.INodeList|null);\n\n /** CollectionDef bytesList */\n bytesList?: (CollectionDef.IBytesList|null);\n\n /** CollectionDef

int64List */\n int64List?: (CollectionDef.IInt64List|null);\n\n /** CollectionDef floatList */\n floatList?: (CollectionDef.IFloatList|null);\n\n /** CollectionDef anyList */\n anyList?: (CollectionDef.IAnyList|null);\n}\n\nexport namespace CollectionDef {\n /** Properties of a NodeList. */\n export declare interface INodeList {\n   /** NodeList value */\n   value?: (string[]|null);\n }\n\n /** Properties of a BytesList. */\n export declare interface IBytesList {\n   /** BytesList value */\n   value?: (Uint8Array[]|null);\n }\n\n /** Properties of an Int64List. */\n export declare interface IInt64List {\n   /** Int64List value */\n   value?: ((number | string)[]|null);\n }\n\n /** Properties of a FloatList. */\n export declare interface IFloatList {\n   /** FloatList value */\n   value?: (number[]|null);\n }\n\n /** Properties of an AnyList. */\n export declare interface IAnyList {\n   /** AnyList value */\n   value?: (IAny[]|null);\n }\n}\n\n/** Properties of a SaverDef. */\nexport declare interface ISaverDef {\n /** SaverDef filenameTensorName */\n filenameTensorName?: (string|null);\n\n /** SaverDef saveTensorName */\n saveTensorName?: (string|null);\n\n /** SaverDef restoreOpName */\n restoreOpName?: (string|null);\n\n /** SaverDef maxToKeep */\n maxToKeep?: (number|null);\n\n /** SaverDef sharded */\n sharded?: (boolean|null);\n\n /** SaverDef keepCheckpointEveryNHours */\n keepCheckpointEveryNHours?: (number|null);\n\n /** SaverDef version */\n version?: (SaverDef.CheckpointFormatVersion|null);\n}\n\nexport namespace SaverDef {\n /** CheckpointFormatVersion enum. */\n export enum CheckpointFormatVersion {'LEGACY' = 0, 'V1' = 1, 'V2' = 2}\n}\n\n/** Properties of a TensorInfo. */\nexport declare interface ITensorInfo {\n /** TensorInfo name */\n name?: (string|null);\n\n /** TensorInfo cooSparse */\n cooSparse?: (TensorInfo.ICooSparse|null);\n\n /** TensorInfo dtype */\n dtype?: (DataType|null);\n\n /** TensorInfo tensorShape */\n tensorShape?: (ITensorShape|null);\n}\n\nexport namespace TensorInfo {\n /** Properties of a CooSparse. */\n export declare interface ICooSparse {\n   /** CooSparse valuesTensorName */\n   valuesTensorName?: (string|null);\n\n   /** CooSparse indicesTensorName */\n   indicesTensorName?: (string|null);\n\n   /** CooSparse denseShapeTensorName */\n   denseShapeTensorName?: (string|null);\n }\n}\n\n/** Properties of a SignatureDef. */\nexport declare interface ISignatureDef {\n /** SignatureDef inputs */\n inputs?: ({[k: string]: ITensorInfo}|null);\n\n /** SignatureDef outputs */\n outputs?: ({[k: string]: ITensorInfo}|null);\n\n /** SignatureDef methodName */\n methodName?: (string|null);\n}\n\n/** Properties of an AssetFileDef. */\nexport declare interface IAssetFileDef {\n /** AssetFileDef tensorInfo */\n tensorInfo?: (ITensorInfo|null);\n\n /** AssetFileDef filename */\n filename?: (string|null);\n}\n\n/** Properties of an OpDef. */\nexport
 declare interface IOpDef {\n /** OpDef name */\n name?: (string|null);\n\n /** OpDef inputArg */\n inputArg?: (OpDef.IArgDef[]|null);\n\n /** OpDef outputArg */\n outputArg?: (OpDef.IArgDef[]|null);\n\n /** OpDef attr */\n attr?: (OpDef.IAttrDef[]|null);\n\n /** OpDef deprecation */\n deprecation?: (OpDef.IOpDeprecation|null);\n\n /** OpDef summary */\n summary?: (string|null);\n\n /** OpDef description */\n description?: (string|null);\n\n /** OpDef isCommutative */\n isCommutative?: (boolean|null);\n\n /** OpDef isAggregate */\n isAggregate?: (boolean|null);\n\n /** OpDef isStateful */\n isStateful?: (boolean|null);\n\n /** OpDef allowsUninitializedInput */\n allowsUninitializedInput?: (boolean|null);\n}\n\nexport namespace OpDef {\n /** Properties of an ArgDef. */\n export declare interface IArgDef {\n   /** ArgDef name */\n   name?: (string|null);\n\n   /** ArgDef description */\n   description?: (string|null);\n\n   /** ArgDef type */\n   type?: (DataType|null);\n\n   /** ArgDef typeAttr */\n   typeAttr?: (string|null);\n\n   /** ArgDef numberAttr */\n   numberAttr?: (string|null);\n\n   /** ArgDef typeListAttr */\n   typeListAttr?: (string|null);\n\n   /** ArgDef isRef */\n   isRef?: (boolean|null);\n }\n\n /** Properties of an AttrDef. */\n export declare interface IAttrDef {\n   /** AttrDef name */\n   name?: (string|null);\n\n   /** AttrDef type */\n   type?: (string|null);\n\n   /** AttrDef defaultValue */\n   defaultValue?: (IAttrValue|null);\n\n   /** AttrDef description */\n   description?: (string|null);\n\n   /** AttrDef hasMinimum */\n   hasMinimum?: (boolean|null);\n\n   /** AttrDef minimum */\n   minimum?: (number|string|null);\n\n   /** AttrDef allowedValues */\n   allowedValues?: (IAttrValue|null);\n }\n\n /** Properties of an OpDeprecation. */\n export declare interface IOpDeprecation {\n   /** OpDeprecation version */\n   version?: (number|null);\n\n   /** OpDeprecation explanation

*/\n explanation?: (string|null);\n }\n}\n\n/** Properties of an OpList. */\nexport declare interface IOpList {\n /** OpList op */\n op?: (IOpDef[]|null);\n}\n\n/** Properties of a MetaGraphDef. */\nexport declare interface IMetaGraphDef {\n /** MetaGraphDef metaInfoDef */\n metaInfoDef?: (MetaGraphDef.IMetaInfoDef|null);\n\n /** MetaGraphDef graphDef */\n graphDef?: (IGraphDef|null);\n\n /** MetaGraphDef saverDef */\n saverDef?: (ISaverDef|null);\n\n /** MetaGraphDef collectionDef */\n collectionDef?: ({[k: string]: ICollectionDef}|null);\n\n /** MetaGraphDef signatureDef */\n signatureDef?: ({[k: string]: ISignatureDef}|null);\n\n /** MetaGraphDef assetFileDef */\n assetFileDef?: (IAssetFileDef[]|null);\n}\n\nexport namespace MetaGraphDef {\n /** Properties of a MetaInfoDef. */\n export declare interface IMetaInfoDef {\n   /** MetaInfoDef metaGraphVersion */\n metaGraphVersion?: (string|null);\n\n   /** MetaInfoDef strippedOpList */\n   strippedOpList?: (IOpList|null);\n\n   /** MetaInfoDef anyInfo */\n   anyInfo?: (IAny|null);\n\n   /** MetaInfoDef tags */\n   tags?: (string[]|null);\n\n   /** MetaInfoDef tensorflowVersion */\n   tensorflowVersion?: (string|null);\n\n   /** MetaInfoDef tensorflowGitVersion */\n   tensorflowGitVersion?: (string|null);\n }\n}\n\n/** Properties of a SavedModel. */\nexport declare interface ISavedModel {\n /** SavedModel savedModelSchemaVersion */\n savedModelSchemaVersion?: (number|string|null);\n\n /** SavedModel metaGraphs */\n metaGraphs?: (IMetaGraphDef[]|null);\n}\n\n/** Properties of a FunctionDefLibrary. */\nexport declare interface IFunctionDefLibrary {\n /** FunctionDefLibrary function */\n 'function'?: (IFunctionDef[]|null);\n\n /** FunctionDefLibrary gradient */\n gradient?: (IGradientDef[]|null);\n}\n\n/** Properties of a FunctionDef. */\nexport declare interface IFunctionDef {\n /** FunctionDef signature */\n signature?: (IOpDef|null);\n\n /** FunctionDef attr */\n attr?: ({[k: string]: IAttrValue}|null);\n\n /** FunctionDef nodeDef */\n nodeDef?: (INodeDef[]|null);\n\n /** FunctionDef ret */\n ret?: ({[k: string]: string}|null);\n}\n\n/** Properties of a GradientDef. */\nexport declare interface IGradientDef {\n /** GradientDef functionName */\n functionName?: (string|null);\n\n /** GradientDef gradientFunc */\n gradientFunc?: (string|null);\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n
 * limitations under the License.\n *\n ==========\n */\n\nimport {OpExecutor, OpMapper} from '../types';\n\nconst CUSTOM_OPS: {[key: string]: OpMapper} = {};\n\n/**\n * Register an Op for graph model executor. This allow you to register\n * TensorFlow custom op or override existing op.\n *\n * Here is an example of registering a new MatMul Op.\n * ```js\n * const customMatmul = (node) =>\n *   tf.matMul(\n *   node.inputs[0], node.inputs[1],\n *   node.attrs['transpose_a'], node.attrs['transpose_b']);\n *\n * tf.registerOp('MatMul', customMatmul);\n * ```\n * The inputs and attrs of the node object is based on the TensorFlow op\n * registry.\n *\n * @param name The Tensorflow Op name.\n * @param opFunc An op function which is called with the current graph node\n * during execution and needs to return a tensor or a list of tensors. The node\n * has the following attributes:\n *   - attr: A map from attribute name to its value\n *   - inputs: A list of input tensors\n *\n * @doc {heading: 'Models', subheading: 'Op Registry'}\n */\nexport function registerOp(name: string, opFunc: OpExecutor) {\n const opMapper: OpMapper = {\n tfOpName: name,\n   category: 'custom',\n   inputs: [],\n   attrs: [],\n   customExecutor: opFunc\n };\n\n CUSTOM_OPS[name] = opMapper;\n}\n\n/**\n * Retrieve the OpMapper object for the registered op.\n *\n * @param name The Tensorflow Op name.\n *\n * @doc {heading: 'Models', subheading: 'Op Registry'}\n */\nexport function getRegisteredOp(name: string): OpMapper {\n return CUSTOM_OPS[name];\n}\n\n/**\n * Deregister the Op for graph model executor.\n *\n * @param name The Tensorflow Op name.\n *\n * @doc {heading: 'Models', subheading: 'Op Registry'}\n */\nexport function deregisterOp(name: string) {\n delete CUSTOM_OPS[name];\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n *

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the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {clone, Tensor, util} from '@tensorflow/tfjs-core';\n\nimport {NamedTensorsMap} from
'../../data/types';\nimport {ExecutionContext} from '../../executor/execution_context';\nimport {ResourceManager}
from '../../executor/resource_manager';\nimport {Node, ValueType} from '../types';\n\nexport function
getParamValue(\n    paramName: string, node: Node, tensorMap: NamedTensorsMap,\n    context:
 ExecutionContext, resourceManager?: ResourceManager): ValueType {\n  const inputParam =
node.inputParams[paramName];\n  if (inputParam && inputParam.inputIndexStart !== undefined) {\n    const start
= inputParam.inputIndexStart;\n    const end = inputParam.inputIndexEnd === 0 ?\n        undefined :\n
(inputParam.inputIndexEnd === undefined ? start + 1 :\n
inputParam.inputIndexEnd);\n    if (inputParam.type === 'tensor') {\n      return getTensor(\n
node.inputNames[inputParam.inputIndexStart], tensorMap, context,\n          resourceManager);\n    }\n    if
(inputParam.type === 'tensors') {\n      const inputs = node.inputNames.slice(start, end);\n\n      return inputs.map(\n
      name => getTensor(name, tensorMap, context, resourceManager));\n    }\n    const tensor = getTensor(\n
node.inputNames.slice(start)[0], tensorMap, context, resourceManager);\n    const data = tensor.dataSync();\n
return inputParam.type
 === 'number' ?\n        data[0] :\n        util.toNestedArray(tensor.shape, data);\n  }\n  const attrParam =
node.attrParams[paramName];\n  return attrParam && attrParam.value;\n}\n\n/**\n * Retrieve the tensor from
tensorsMap based on input name.\n * @param name Node input name\n * @param tensorsMap Tensors map keyed
by the node\n * @param context contains tensors and information for running the current node.\n * @param
resourceManager Optional. Contains global resources of the model.\n */\nexport function getTensor(\n    name:
string, tensorsMap: NamedTensorsMap, context: ExecutionContext,\n    resourceManager?: ResourceManager):
Tensor {\n  const [nodeName, index] = parseNodeName(name);\n\n  if (resourceManager != null) {\n    const tensor
= resourceManager.getHashTableHandleByName(nodeName);\n    if (tensor != null) {\n      return tensor;\n    }\n
}\n\n  const contextId = context.currentContextIds.find(contextId => {\n    return
!!tensorsMap[getNodeNameWithContextId(nodeName,
 contextId)];\n  });\n\n  return contextId !== undefined ?\n      tensorsMap[getNodeNameWithContextId(nodeName,
contextId)][index] :\n      undefined;\n}\n\n/**\n * Retrieve the tensors based on input name for current context.\n *
@param name Node input name\n * @param tensorsMap Tensors map keyed by the node\n */\nexport function
getTensorsForCurrentContenxt(\n    name: string, tensorsMap: NamedTensorsMap,\n    context: ExecutionContext):
Tensor[] {\n  return tensorsMap[getNodeNameWithContextId(name, context.currentContextId)];\n}\n\n/**\n *
Returns the node name and index from the Node input name.\n * @param inputName The input name of the node,
in format of\n * node_name:output_index, i.e. MatMul:0, if the output_index is not set, it is\n * default to 0.\n
*/\nexport function getNodeNameAndIndex(\n    inputName: string, context?: ExecutionContext): [string, number]
{\n  const [nodeName, index] = parseNodeName(inputName);\n\n  return [\n
getNodeNameWithContextId(nodeName, context
 && context.currentContextId),\n    index\n  ];\n}\n\nfunction getNodeNameWithContextId(name: string,
contextId?: string): string {\n  return !!contextId ? `${name}-${contextId}` : name;\n}\n\nexport function
parseNodeName(name: string): [string, number] {\n  const parts = name.split(':');\n  if (parts.length === 1) {\n
return [name, 0];\n  }\n\n  const nodeName = parts[0];\n  return [nodeName, Number(parts[parts.length -
1])];\n}\n\nexport function split(arr: number[], size: number) {\n  const res = [];\n  for (let i = 0; i < arr.length; i +=
size) {\n    res.push(arr.slice(i, i + size));\n  }\n  return res;\n}\nexport function getPadding(\n    node: Node,
tensorMap: NamedTensorsMap,\n    context: ExecutionContext): ValueType {\n  let pad = getParamValue('pad',
```

node, tensorMap, context);\n if (pad === 'explicit') {\n   // This is 1d array, we need to convert it to 2d array\n pad = getParamValue('explicitPaddings', node, tensorMap, context);\n   const explicitPadding: [\n [number, number], [number, number], [number, number], [number, number]\n   ] = [[0, 0], [0, 0], [0, 0], [0, 0]];\n for (let i = 0; i < 4; i++) {\n   explicitPadding[i][0] = (pad as number[])[i * 2];\n   explicitPadding[i][1] = (pad as number[])[i * 2 + 1];\n   }\n   return explicitPadding;\n }\n return pad;\n}\n\n/**\n * Reuse the tensor if it is marked as keep, otherwise clone the tensor to\n * avoid disposal. This is important for TensorArray and TensorList ops, since\n * internally they use a tensor as the id for TensorArray and TensorList, and\n * to simplify lookup, they also use Tensor.id as the key to the internal map.\n * These id tensors have been marked as kept in the backend, we need avoid clone\n * them in order to create new Tensor.id.\n * @param tensor\n */\nexport function cloneTensor(tensor: Tensor): Tensor {\n return tensor.kept ? tensor : clone(tensor);\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the
 Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {OpMapper} from '../types';\n\nexport const json: OpMapper[] = [\n {\n   'tfOpName': 'Add',\n   'category': 'arithmetic',\n   'inputs': [\n   {'start': 0, 'name': 'a', 'type': 'tensor'},\n   {'start': 1, 'name': 'b', 'type': 'tensor'},\n   ],\n   'attrs': [\n   {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n   ]\n },\n {\n   'tfOpName': 'AddV2',\n   'category': 'arithmetic',\n   'inputs': [\n   {'start': 0, 'name': 'a', 'type': 'tensor'},\n   {'start': 1, 'name': 'b', 'type': 'tensor'},\n   ],\n   'attrs': [\n   {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n   ]\n },\n {\n   'tfOpName': 'AddN',\n   'category': 'arithmetic',\n   'inputs': [{'start': 0, 'end': 0, 'name': 'tensors', 'type': 'tensors'}]\n },\n {\n   'tfOpName': 'BiasAdd',\n   'category': 'arithmetic',\n   'inputs': [\n   {'start': 0, 'name': 'a', 'type': 'tensor'},\n   {'start': 1, 'name': 'b', 'type': 'tensor'},\n   ],\n   'attrs': [\n   {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}, {\n   'tfName': 'data_format',\n   'name': 'dataFormat',\n   'type': 'string',\n   'notSupported': true\n   }\n   ]\n },\n {\n   'tfOpName': 'Sub',\n   'category': 'arithmetic',\n   'inputs': [\n   {'start': 0, 'name': 'a', 'type':
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* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'Abs',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Acos',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Asin',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Atan',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Atan2',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'y', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Ceil',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'ClipByValue',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'clipValueMin', 'type': 'number'},\n {'start': 2, 'name': 'clipValueMax', 'type': 'number'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Complex',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'real', 'type': 'tensor'},\n {'start': 1, 'name': 'imag', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'ComplexAbs',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Cos',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Cosh',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Elu',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Exp',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'Floor',\n 'category': 'basic_math',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n

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License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\nimport {OpMapper} from '../types';\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'EmptyTensorList',\n 'category': 'control',\n 'inputs': [\n {'start': 0, 'name': 'elementShape', 'type': 'shape'},\n {'start': 1, 'name': 'maxNumElements', 'type': 'number'},\n],\n 'attrs':\n [{'tfName': 'element_dtype', 'name': 'elementDType', 'type': 'dtype'}]\n },\n {\n 'tfOpName': 'LoopCond',\n 'category': 'control',\n 'inputs': [{'start': 0, 'name': 'pred', 'type': 'tensor'}]\n },\n {\n 'tfOpName': 'Switch',\n 'category': 'control',\n 'inputs': [\n {'start': 0, 'name': 'data', 'type': 'tensor'},\n {'start': 1, 'name':
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* limitations under the License.\n *
==\n
*/\n\nimport {OpMapper} from '../types';\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'AvgPool',\n 'category': 'convolution',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'strides', 'name': 'strides', 'type': 'number[]'},\n {'tfName': 'padding', 'name': 'pad', 'type': 'string'}, {\n 'tfName': 'data_format',\n 'name': 'dataFormat',\n 'type': 'string',\n 'notSupported': true\n },\n {'tfName': 'ksize', 'name': 'kernelSize', 'type': 'number[]'},\n {'tfName': 'T', 'name': 'dtype', 'type': 'dtype', 'notSupported': true}\n]\n },\n {\n 'tfOpName': 'MaxPool',\n 'category': 'convolution',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'strides', 'name': 'strides', 'type': 'number[]'},\n
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==========\n */\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'Fill',\n 'category': 'creation',\n 'inputs': [\n {'start': 0, 'name': 'shape', 'type': 'number[]'},\n {'start': 1, 'name': 'value', 'type': 'number'},\n],\n 'attrs': [{'tfName': 'T', 'name': 'dtype', 'type': 'dtype'}]\n },\n
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*/\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'NonMaxSuppressionV2',\n 'category': 'dynamic',\n 'inputs': [\n {'start': 0, 'name': 'boxes', 'type': 'tensor'},\n {'start': 1, 'name': 'scores', 'type': 'tensor'},\n {'start': 2, 'name': 'maxOutputSize', 'type': 'number'},\n {'start': 3, 'name': 'iouThreshold', 'type': 'number'}\n]\n },\n {\n 'tfOpName': 'NonMaxSuppressionV3',\n 'category': 'dynamic',\n 'inputs': [\n {'start': 0, 'name': 'boxes', 'type': 'tensor'},\n {'start': 1, 'name': 'scores', 'type': 'tensor'},\n {'start': 2, 'name': 'maxOutputSize', 'type': 'number'},\n {'start': 3, 'name': 'iouThreshold', 'type': 'number'},\n {'start': 4, 'name': 'scoreThreshold', 'type': 'number'}\n]\n },\n {\n 'tfOpName': 'NonMaxSuppressionV4',\n 'category': 'dynamic',\n 'inputs': [\n {'start': 0, 'name': 'boxes', 'type': 'tensor'},\n {'start': 1, 'name': 'scores', 'type': 'tensor'},\n
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or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'TopKV2',\n 'category': 'evaluation',\n 'inputs': [\n

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==========\n */\n\nimport {OpMapper} from '../types';\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': '_FusedMatMul',\n 'category': 'matrices',\n 'inputs': [\n {'start': 0, 'name': 'a', 'type': 'tensor'},\n {'start': 1, 'name': 'b', 'type': 'tensor'},\n {'start': 2, end: 0, 'name': 'args', 'type': 'tensors'},\n],\n 'attrs': [\n {'tfName': 'num_args', 'name': 'numArgs', 'type': 'number'}, {\n 'tfName': 'fused_ops',\n 'name': 'fusedOps',\n 'type': 'string[]',\n 'defaultValue': []\n },\n {\n 'tfName': 'epsilon',\n 'name': 'epsilon',\n 'type': 'number',\n 'defaultValue': 0.0001\n
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* See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n*/\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'FusedBatchNorm',\n 'category': 'normalization',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'scale', 'type': 'tensor'},\n {'start': 2, 'name': 'offset', 'type': 'tensor'},\n {'start': 3, 'name': 'mean', 'type': 'tensor'},\n {'start': 4, 'name': 'variance', 'type': 'tensor'},\n],\n 'attrs': [\n {\n 'tfName': 'epsilon',\n 'name': 'epsilon',\n 'type': 'number',\n 'defaultValue': 0.001\n },\n {\n 'tfName': 'data_format',\n 'name': 'dataFormat',\n 'type': 'string',\n 'notSupported': true\n }\n]\n },\n {\n 'tfOpName': 'FusedBatchNormV2',\n 'category': 'normalization',\n 'inputs':
[\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'scale', 'type': 'tensor'},\n {'start': 2, 'name': 'offset', 'type': 'tensor'},\n {'start': 3, 'name': 'mean', 'type': 'tensor'},\n {'start': 4, 'name': 'variance', 'type': 'tensor'},\n],\n 'attrs': [\n {\n 'tfName': 'epsilon',\n 'name': 'epsilon',\n 'type': 'number',\n 'defaultValue': 0.001\n },\n {\n 'tfName': 'data_format',\n 'name': 'dataFormat',\n 'type': 'string',\n 'notSupported': true\n }\n]\n },\n {\n 'tfOpName': 'FusedBatchNormV3',\n 'category': 'normalization',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'scale', 'type': 'tensor'},\n {'start': 2, 'name': 'offset', 'type': 'tensor'},\n {'start': 3, 'name': 'mean', 'type': 'tensor'},\n {'start': 4, 'name': 'variance', 'type': 'tensor'},\n],\n 'attrs': [\n {\n 'tfName': 'epsilon',\n 'name': 'epsilon',\n 'type': 'number',\n 'defaultValue': 0.001\n },\n {\n 'tfName': 'data_format',\n 'name': 'dataFormat',\n 'type': 'string',\n 'notSupported': true\n }\n]\n },\n {\n 'tfOpName': 'LRN',\n 'category': 'normalization',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [\n {\n 'tfName': 'depth_radius',\n 'name': 'radius',\n 'type': 'number',\n 'defaultValue': 5\n },\n {'tfName': 'bias', 'name': 'bias', 'type': 'number', 'defaultValue': 1.0},\n {\n 'tfName': 'alpha',\n 'name': 'alpha',\n 'type': 'number',\n 'defaultValue': 1.0\n },\n {\n 'tfName': 'beta',\n 'name': 'beta',\n 'type': 'number',\n 'defaultValue': 0.5\n }\n]\n },\n {\n 'tfOpName': 'Softmax',\n 'category': 'normalization',\n 'inputs':
[{'start': 0, 'name': 'x', 'type': 'tensor'}]\n },\n {\n 'tfOpName': 'LogSoftmax',\n 'category': 'normalization',\n 'inputs': [{'start': 0, 'name': 'x', 'type': 'tensor'}]\n },\n {\n 'tfOpName': 'SparseToDense',\n 'category': 'normalization',\n 'inputs': [\n {'start': 0, 'name': 'sparseIndices', 'type': 'tensor'},\n {'start': 1, 'name': 'outputShape', 'type': 'number[]'},\n {'start': 2, 'name': 'sparseValues', 'type': 'tensor'},\n {'start': 3, 'name': 'defaultValue', 'type': 'tensor'},\n],\n 'attrs': [{\n 'tfName': 'validate_indices',\n 'name': 'validateIndices',\n 'type': 'bool',\n 'defaultValue': true,\n 'notSupported': true\n }]\n }\n];\n","import {OpMapper} from

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{\n 'tfOpName': 'ArgMin',\n 'category': 'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number'}\n]\n },\n {\n 'tfOpName': 'Prod',\n 'category': 'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number[]'},\n],\n 'attrs': [{'tfName': 'keep_dims', 'name': 'keepDims', 'type': 'bool'}]\n },\n {\n 'tfOpName': 'Cumsum',\n 'category': 'reduction',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number'},\n],\n 'attrs': [\n {'tfName': 'exclusive', 'name': 'exclusive', 'type': 'bool'},\n {'tfName': 'reverse', 'name': 'reverse', 'type': 'bool'}\n]\n }\n];\n","import {OpMapper} from '../types';\n\n/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n
* you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nexport const json: OpMapper[] = [\n {\n 'tfOpName': 'ConcatV2',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'end': -1, 'name': 'tensors', 'type': 'tensors'},\n {'start': -1, 'name': 'axis', 'type': 'number'}\n],\n 'attrs':\n [{'tfName': 'N', 'name': 'n', 'type': 'number', 'defaultValue': 2}]\n },\n {\n 'tfOpName': 'Concat',\n 'category': 'slice_join',\n
'inputs': [\n {'start': 1, 'end': 0, 'name': 'tensors', 'type': 'tensors'},\n {'start': 0, 'name': 'axis', 'type': 'number'}\n],\n 'attrs': [{'tfName': 'N', 'name': 'n', 'type': 'number', 'defaultValue': 2}]\n\n },\n {\n 'tfOpName':

'GatherV2',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'indices', 'type': 'tensor'},\n {'start': 2, 'name': 'axis', 'type': 'number', 'defaultValue': 0}\n],\n 'attrs': [{\n 'tfName': 'batch_dims',\n 'name': 'batchDims',\n 'type': 'number',\n 'defaultValue': 0\n }]\n },\n {\n 'tfOpName': 'Gather',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'indices', 'type': 'tensor'},\n],\n 'attrs': [{\n 'tfName': 'validate_indices',\n 'name': 'validateIndices',\n 'type': 'bool',\n 'notSupported': true\n }]\n },\n {\n 'tfOpName': 'Reverse',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'dims', 'type': 'bool[]'}\n]\n },\n {\n 'tfOpName': 'ReverseV2',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'axis', 'type': 'number[]'}\n]\n },\n {\n 'tfOpName': 'Slice',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'begin', 'type': 'number[]'},\n {'start': 2, 'name': 'size', 'type': 'number[]'}\n]\n },\n {\n 'tfOpName': 'StridedSlice',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'begin', 'type': 'number[]'},\n {'start': 2, 'name': 'end', 'type': 'number[]'},\n {'start': 3, 'name': 'strides', 'type': 'number[]'},\n],\n 'attrs': [\n {\n 'tfName': 'begin_mask',\n 'name': 'beginMask',\n 'type': 'number',\n 'defaultValue': 0\n },\n {\n 'tfName': 'end_mask',\n 'name': 'endMask',\n 'type': 'number',\n 'defaultValue': 0\n },\n {\n 'tfName': 'new_axis_mask',\n 'name': 'newAxisMask',\n 'type': 'number',\n 'defaultValue': 0\n },\n {\n 'tfName': 'ellipsis_mask',\n 'name': 'ellipsisMask',\n 'type': 'number',\n 'defaultValue': 0\n },\n {\n 'tfName': 'shrink_axis_mask',\n 'name': 'shrinkAxisMask',\n 'type': 'number',\n 'defaultValue': 0\n }\n]\n },\n {\n 'tfOpName': 'Pack',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'end': 0, 'name': 'tensors', 'type': 'tensors'},\n],\n 'attrs': [\n {'tfName': 'axis', 'name': 'axis', 'type': 'number', 'defaultValue': 0}\n]\n },\n {\n 'tfOpName': 'Unpack',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'tensor', 'type': 'tensor'},\n],\n 'attrs': [\n {'tfName': 'axis', 'name': 'axis', 'type': 'number', 'defaultValue': 0}, {\n 'tfName': 'num',\n 'name': 'num',\n 'type': 'number',\n 'defaultValue': 0,\n 'notSupported': true\n }\n]\n },\n {\n 'tfOpName': 'Tile',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'reps', 'type': 'number[]'}\n]\n },\n {\n 'tfOpName': 'Split',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'axis', 'type': 'number', 'defaultValue': 0},\n {'start': 1, 'name': 'x', 'type': 'tensor'},\n],\n 'attrs': [{\n 'tfName': 'num_split',\n 'name': 'numOrSizeSplits',\n 'type': 'number',\n 'defaultValue': 1\n }]\n },\n {\n 'tfOpName': 'SplitV',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'numOrSizeSplits', 'type': 'number[]'},\n {'start': 2, 'name': 'axis', 'type': 'number', 'defaultValue': 0}\n]\n },\n {\n 'tfOpName': 'ScatterNd',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'indices', 'type': 'tensor'},\n {'start': 1, 'name': 'values', 'type': 'tensor'},\n {'start': 2, 'name': 'shape', 'type': 'number[]'}\n]\n },\n {\n 'tfOpName': 'GatherNd',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'x', 'type': 'tensor'},\n {'start': 1, 'name': 'indices', 'type': 'tensor'}\n]\n },\n {\n 'tfOpName': 'SparseToDense',\n 'category': 'slice_join',\n 'inputs': [\n {'start': 0, 'name': 'sparseIndices', 'type': 'tensor'},\n {'start': 1, 'name': 'outputShape', 'type': 'number[]'},\n {'start': 2, 'name': 'sparseValues', 'type': 'tensor'},\n {'start': 3, 'name': 'defaultValue', 'type': 'tensor'},\n],\n 'attrs': [{\n 'tfName': 'validate_indices',\n 'name': 'validateIndices',\n 'type': 'bool',\n 'defaultValue': false,\n 'notSupported': true\n }]\n }\n];\n","import {OpMapper} from '../types';\n\n/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n

*/\n\nexport
const json: OpMapper[] = [\n {\n   'tfOpName': 'FFT',\n   'category': 'spectral',\n   'inputs': [{'start': 0, 'name': 'x', 'type': 'tensor'}]\n },\n {\n   'tfOpName': 'IFFT',\n   'category': 'spectral',\n   'inputs': [{'start': 0, 'name': 'x', 'type': 'tensor'}]\n },\n {\n   'tfOpName': 'RFFT',\n   'category': 'spectral',\n   'inputs': [\n   {'start': 0, 'name': 'x', 'type': 'tensor'}, {\n   'start': 1,\n   'name': 'fft_length',\n   'type': 'number',\n   'notSupported': true\n   }\n   ]\n },\n {\n   'tfOpName': 'IRFFT',\n   'category': 'spectral',\n   'inputs': [\n   {'start': 0, 'name': 'x', 'type': 'tensor'}, {\n   'start': 1,\n   'name': 'fft_length',\n   'type': 'number',\n   'notSupported': true\n   }\n   ]\n }\n];\n","import {OpMapper} from '../types';\n\n/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may
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OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language
governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nexport const json: OpMapper[] = [\n {\n   'tfOpName': 'Cast',\n   'category': 'transformation',\n   'inputs': [\n
{'start': 0, 'name': 'x', 'type': 'tensor'},\n   ],\n   'attrs': [\n   {\n   'tfName': 'SrcT',\n   'name': 'sdtype',\n
'type': 'dtype',\n   'notSupported': true\n   },\n   {'tfName': 'DstT', 'name': 'dtype', 'type': 'dtype'}\n   ]\n },\n
{\n   'tfOpName': 'ExpandDims',\n
    'category': 'transformation',\n   'inputs': [\n   {'start': 0, 'name': 'x', 'type': 'tensor'},\n   {'start': 1, 'name': 'axis',
'type': 'number'}\n   ]\n },\n {\n   'tfOpName': 'MirrorPad',\n   'category': 'transformation',\n   'inputs': [\n
{'start': 0, 'name': 'x', 'type': 'tensor'},\n   {'start': 1, 'name': 'padding', 'type': 'number[]'},\n   ],\n   'attrs': [{'tfName':
'mode', 'name': 'mode', 'type': 'string'}]\n },\n {\n   'tfOpName': 'Pad',\n   'category': 'transformation',\n   'inputs':
[\n   {'start': 0, 'name': 'x', 'type': 'tensor'},\n   {'start': 1, 'name': 'padding', 'type': 'number[]'},\n   ],\n   'attrs': [{\n
      'tfName': 'constant_value',\n   'name': 'constantValue',\n   'type': 'number',\n   'defaultValue': 0\n   }]\n },\n
{\n   'tfOpName': 'PadV2',\n   'category': 'transformation',\n   'inputs': [\n   {'start': 0, 'name': 'x', 'type': 'tensor'},\n
      {'start': 1, 'name': 'padding', 'type': 'number[]'},
  {\n   'start': 2,\n   'name': 'constantValue',\n   'type': 'number',\n   'defaultValue': 0\n   }\n   ]\n },\n
{\n   'tfOpName': 'Reshape',\n   'category': 'transformation',\n   'inputs': [\n   {'start': 0, 'name': 'x', 'type':
'tensor'},\n   {'start': 1, 'name': 'shape', 'type': 'number[]'}\n   ]\n },\n {\n   'tfOpName': 'Squeeze',\n   'category':
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'tfDeprecatedName': 'squeeze_dims',\n   'name': 'axis',\n   'type': 'number[]'\n   }]\n },\n {\n   'tfOpName':
'SpaceToBatchND',\n   'category': 'transformation',\n   'inputs': [\n   {'start': 0, 'name': 'x', 'type': 'tensor'},\n
{'start': 1, 'name': 'blockShape', 'type': 'number[]'},\n   {'start': 2, 'name': 'paddings', 'type': 'number[]'}\n   ]\n },\n
{\n   'tfOpName': 'BatchToSpaceND',\n   'category': 'transformation',\n   'inputs':
  [\n   {'start': 0, 'name': 'x', 'type': 'tensor'},\n   {'start': 1, 'name': 'blockShape', 'type': 'number[]'},\n   {'start': 2,
'name': 'crops', 'type': 'number[]'}\n   ]\n },\n {\n   'tfOpName': 'DepthToSpace',\n   'category': 'transformation',\n
'inputs': [\n   {'start': 0, 'name': 'x', 'type': 'tensor'},\n   ],\n   'attrs': [\n   {'tfName': 'block_size', 'name':
'blockSize', 'type': 'number'},\n   {'tfName': 'data_format', 'name': 'dataFormat', 'type': 'string'}\n   ]\n },\n {\n
'tfOpName': 'BroadcastTo',\n   'category': 'transformation',\n   'inputs': [\n   {'start': 0, 'name': 'x', 'type': 'tensor'},\n
    {'start': 1, 'name': 'shape', 'type': 'number[]'},\n   ],\n   'attrs': []\n }\n];\n","/**\n * @license\n * Copyright 2018
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WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific
language governing permissions and\n * limitations under the License.\n *
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```
*/\n\nimport {DataType, env} from '@tensorflow/tfjs-core';\n\nimport * as tensorflow from
'../data/compiled_api';\n\nimport {getRegisteredOp} from './custom_op/register';\nimport {getNodeNameAndIndex}
from './executors/utils';\nimport * as arithmetic from './op_list/arithmetic';\nimport * as basicMath from
'./op_list/basic_math';\nimport * as control from './op_list/control';\nimport * as convolution from
'./op_list/convolution';\nimport * as creation from './op_list/creation';\nimport * as dynamic from
'./op_list/dynamic';\nimport
 * as evaluation from './op_list/evaluation';\nimport * as graph from './op_list/graph';\nimport * as hashTable from
'./op_list/hash_table';\nimport * as image from './op_list/image';\nimport * as logical from './op_list/logical';\nimport
* as matrices from './op_list/matrices';\nimport * as normalization from './op_list/normalization';\nimport * as
reduction from './op_list/reduction';\nimport * as sliceJoin from './op_list/slice_join';\nimport * as spectral from
'./op_list/spectral';\nimport * as transformation from './op_list/transformation';\nimport {Graph, InputParamValue,
Node, OpMapper, ParamValue} from './types';\n\nexport class OperationMapper {\n  private static _instance:
OperationMapper;\n\n  private opMappers: {[key: string]: OpMapper};\n\n  // Singleton instance for the mapper\n
public static get Instance() {\n    return this._instance || (this._instance = new this());\n  }\n\n  // Loads the op
mapping from the JSON file.\n  private constructor() {\n    const ops
 = [\n      arithmetic, basicMath, control, convolution, creation, dynamic,\n      evaluation, logical, image, graph,
matrices, normalization, reduction,\n      sliceJoin, spectral, transformation, hashTable\n    ];\n    const mappersJson:
OpMapper[] = [].concat(...ops.map(op => op.json));\n\n    this.opMappers = mappersJson.reduce<{[key: string]:
OpMapper}>(\n        (map, mapper: OpMapper) => {\n          map[mapper.tfOpName] = mapper;\n          return
map;\n        },\n        {});\n  }\n\n  // Converts the model inference graph from Tensorflow GraphDef to local\n  //
representation for TensorFlow.js API\n  transformGraph(\n      graph: tensorflow.IGraphDef,\n      signature:
tensorflow.ISignatureDef = {}): Graph {\n    const tfNodes = graph.node;\n    const placeholders: Node[] = [];\n
const weights: Node[] = [];\n    const initNodes: Node[] = [];\n    const nodes = tfNodes.reduce<{[key: string]:
Node}>((map, node) => {\n      map[node.name] = this.mapNode(node);\n      if (node.op.startsWith('Placeholder'))
 {\n        placeholders.push(map[node.name]);\n      } else if (node.op === 'Const') {\n
weights.push(map[node.name]);\n      } else if (node.input == null || node.input.length === 0) {\n
initNodes.push(map[node.name]);\n      }\n      return map;\n    }, {});\n\n    let inputs: Node[] = [];\n    const outputs:
Node[] = [];\n    let inputNodeNameToKey: {[key: string]: string} = {};\n    let outputNodeNameToKey: {[key:
string]: string} = {};\n    if (signature != null) {\n      inputNodeNameToKey =
this.mapSignatureEntries(signature.inputs);\n      outputNodeNameToKey =
this.mapSignatureEntries(signature.outputs);\n    }\n    const allNodes = Object.keys(nodes);\n
allNodes.forEach(key => {\n      const node = nodes[key];\n      node.inputNames.forEach(name => {\n        const
[nodeName, ] = getNodeNameAndIndex(name);\n        node.inputs.push(nodes[nodeName]);\n
nodes[nodeName].children.push(node);\n      });\n    });\n\n    // if
 signature has not outputs set, add any node that does not have\n    // outputs.\n    if
(Object.keys(outputNodeNameToKey).length === 0) {\n      allNodes.forEach(key => {\n        const node =
nodes[key];\n        if (node.children.length === 0) {\n          outputs.push(node);\n        }\n      });\n    } else {\n
Object.keys(outputNodeNameToKey).forEach(name => {\n        const [nodeName, ] =
getNodeNameAndIndex(name);\n        const node = nodes[nodeName];\n        if (node != null) {\n
node.signatureKey = outputNodeNameToKey[name];\n          outputs.push(node);\n        }\n      });\n    }\n\n    if
(Object.keys(inputNodeNameToKey).length > 0) {\n      Object.keys(inputNodeNameToKey).forEach(name => {\n
    const [nodeName, ] = getNodeNameAndIndex(name);\n        const node = nodes[nodeName];\n        if (node) {\n
        node.signatureKey = inputNodeNameToKey[name];\n          inputs.push(node);\n        }\n      });\n    } else {\n
 inputs = placeholders;\n
    }\n\n    let functions = {};\n    if (graph.library != null && graph.library.function != null) {\n      functions =
graph.library.function.reduce((functions, func) => {\n        functions[func.signature.name] =
this.mapFunction(func);\n        return functions;\n      }, {} as {[key: string]: Graph});\n    }\n\n    const result: Graph
=\n        {nodes, inputs, outputs, weights, placeholders, signature, functions};\n\n    if (initNodes.length > 0) {\n
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result.initNodes = initNodes;\n  }\n\n  return result;\n }\n\n private mapSignatureEntries(entries: {[k: string]: tensorflow.ITensorInfo}) {\n  return Object.keys(entries || {})\n  .reduce<{[key: string]: string}>((prev, curr) => {\n  prev[entries[curr].name] = curr;\n  return prev;\n  }, {});\n }\n\n private mapNode(node: tensorflow.INodeDef): Node {\n  // Unsupported ops will cause an error at run-time (not parse time), since\n  // they may not be used by the actual execution subgraph.\n
  const mapper =\n  getRegisteredOp(node.op) || this.opMappers[node.op] || {} as OpMapper;\n  if (node.attr == null) {\n  node.attr = {};\n  }\n\n  const newNode: Node = {\n  name: node.name,\n  op: node.op,\n  category: mapper.category,\n  inputNames:\n  (node.input ||\n  []).map(input => input.startsWith('^') ? input.substr(1) : input),\n  inputs: [],\n  children: [],\n  inputParams: {},\n  attrParams: {},\n  rawAttrs: node.attr\n  };\n\n  if (mapper.inputs != null) {\n  newNode.inputParams =\n  mapper.inputs.reduce<{[key: string]: InputParamValue}>(\n  (map, param) => {\n  map[param.name] = {\n  type: param.type,\n  inputIndexStart: param.start,\n  inputIndexEnd: param.end\n  };\n  return map;\n  },\n  {});\n  }\n  if (mapper.attrs != null) {\n  newNode.attrParams =\n  mapper.attrs.reduce<{[key: string]: ParamValue}>((map, param) => {\n  const type = param.type;\n  let value = undefined;\n  switch (param.type) {\n  case 'string':\n  value = getStringParam(\n  node.attr, param.tfName, param.defaultValue as string);\n\n  if (value === undefined && !!param.tfDeprecatedName) {\n  value = getStringParam(\n  node.attr, param.tfDeprecatedName,\n  param.defaultValue as string);\n  }\n  break;\n  case 'string[]':\n  value = getStringArrayParam(\n  node.attr, param.tfName, param.defaultValue as string[]);\n\n  if (value === undefined && !!param.tfDeprecatedName) {\n  value = getStringArrayParam(\n  node.attr, param.tfDeprecatedName,\n  param.defaultValue as string[]);\n  }\n  break;\n  case 'number':\n  value = getNumberParam(\n  node.attr, param.tfName,\n  (param.defaultValue || 0) as number);\n  if (value === undefined && !!param.tfDeprecatedName) {\n  value = getNumberParam(\n  node.attr, param.tfDeprecatedName,\n  param.defaultValue as number);\n  }\n  break;\n  case 'number[]':\n  value = getNumericArrayParam(\n  node.attr, param.tfName, param.defaultValue as number[]);\n  if (value === undefined && !!param.tfDeprecatedName) {\n  value = getNumericArrayParam(\n  node.attr, param.tfDeprecatedName,\n  param.defaultValue as number[]);\n  }\n  break;\n  case 'bool':\n  value = getBoolParam(\n  node.attr, param.tfName, param.defaultValue as boolean);\n  if (value === undefined && !!param.tfDeprecatedName) {\n  value = getBoolParam(\n  node.attr, param.tfDeprecatedName,\n  param.defaultValue as boolean);\n  }\n  break;\n  case 'bool[]':\n  value = getBoolArrayParam(\n  node.attr, param.tfName, param.defaultValue as boolean[]);\n  if (value === undefined && !!param.tfDeprecatedName) {\n  value = getBoolArrayParam(\n  node.attr, param.tfDeprecatedName,\n  param.defaultValue as boolean[]);\n  }\n  break;\n  case 'shape':\n  value = getTensorShapeParam(\n  node.attr, param.tfName, param.defaultValue as number[]);\n  if (value === undefined && !!param.tfDeprecatedName) {\n
  value = getTensorShapeParam(\n  node.attr, param.tfDeprecatedName,\n  param.defaultValue as number[]);\n  }\n  break;\n  case 'shape[]':\n  value = getTensorShapeArrayParam(\n  node.attr, param.tfName, param.defaultValue as number[][]);\n  if (value === undefined && !!param.tfDeprecatedName) {\n  value = getTensorShapeArrayParam(\n  node.attr, param.tfDeprecatedName,\n  param.defaultValue as number[][]);\n  }\n  break;\n  case 'dtype':\n  value = getDtypeParam(\n  node.attr, param.tfName, param.defaultValue as DataType);\n  if (value === undefined && !!param.tfDeprecatedName) {\n  value = getDtypeParam(\n  node.attr, param.tfDeprecatedName,\n  param.defaultValue
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as DataType);\n }\n break;\n case 'dtype[]':\n value = getDtypeArrayParam(\n node.attr, param.tfName, param.defaultValue as DataType[]);\n if (value === undefined &&
!!param.tfDeprecatedName) {\n value = getDtypeArrayParam(\n node.attr,
param.tfDeprecatedName,\n param.defaultValue as DataType[]);\n }\n break;\n
case 'func':\n value = getFuncParam(\n node.attr, param.tfName, param.defaultValue as
string);\n if (value === undefined && !!param.tfDeprecatedName) {\n value = getFuncParam(\n
node.attr, param.tfDeprecatedName,\n param.defaultValue as string);\n }\n
break;\n case 'tensor':\n case 'tensors':\n break;\n
default:\n throw new Error(\n `Unsupported param type: ${param.type} for op:
${node.op}`);\n }\n map[param.name] = {value, type};\n return map;\n }, {});\n }\n
return newNode;\n }\n\n // map the TFunctionDef to TFJS graph object\n private mapFunction(functionDef:
tensorflow.IFunctionDef): Graph {\n const tfNodes = functionDef.nodeDef;\n const placeholders: Node[] = [];\n
const weights: Node[] = [];\n let nodes: {[key: string]: Node} = {};\n if (tfNodes != null) {\n nodes =
tfNodes.reduce<{[key: string]: Node}>((map, node) => {\n map[node.name] = this.mapNode(node);\n if
(node.op === 'Const') {\n weights.push(map[node.name]);\n }\n return map;\n }, {});\n }\n
const inputs: Node[] = [];\n const outputs: Node[] = [];\n\n functionDef.signature.inputArg.forEach(arg => {\n
const [nodeName, ] = getNodeNameAndIndex(arg.name);\n
const node: Node = {\n name: nodeName,\n op: 'Placeholder',\n inputs: [],\n inputNames: [],\n
category: 'graph',\n inputParams: {},\n attrParams: {dtype: {value: parseDtypeParam(arg.type), type:
'dtype'}},\n children: []\n };\n node.signatureKey = arg.name;\n inputs.push(node);\n
nodes[nodeName] = node;\n });\n\n const allNodes = Object.keys(nodes);\n allNodes.forEach(key => {\n
const node = nodes[key];\n node.inputNames.forEach(name => {\n const [nodeName, ] =
getNodeNameAndIndex(name);\n node.inputs.push(nodes[nodeName]);\n
nodes[nodeName].children.push(node);\n });\n });\n\n const returnNodeMap = functionDef.ret;\n\n
functionDef.signature.outputArg.forEach(output => {\n const [nodeName, index] =
getNodeNameAndIndex(returnNodeMap[output.name]);\n const node = nodes[nodeName];\n if (node != null)
{\n node.defaultOutput
= index;\n outputs.push(node);\n }\n });\n\n const signature = this.mapArgsToSignature(functionDef);\n
return {nodes, inputs, outputs, weights, placeholders, signature};\n }\n\n private
mapArgsToSignature(functionDef: tensorflow.IFunctionDef):\n tensorflow.ISignatureDef {\n return {\n
methodName: functionDef.signature.name,\n inputs: functionDef.signature.inputArg.reduce(\n (map, arg)
=> {\n map[arg.name] = this.mapArgToTensorInfo(arg);\n return map;\n },\n {} as {[key:
string]: tensorflow.ITensorInfo}),\n outputs: functionDef.signature.outputArg.reduce(\n (map, arg) => {\n
map[arg.name] = this.mapArgToTensorInfo(arg, functionDef.ret);\n return map;\n },\n {} as
{[key: string]: tensorflow.ITensorInfo}),\n };\n }\n\n private mapArgToTensorInfo(\n arg:
tensorflow.OpDef.IArgDef,\n nameMap?: {[key: string]: string}): tensorflow.ITensorInfo
{\n let name = arg.name;\n if (nameMap != null) {\n name = nameMap[name];\n }\n return {name,
dtype: arg.type};\n }\n}\n\nexport function decodeBase64(text: string): string {\n const global = env().global;\n if
(typeof global.atob !== 'undefined') {\n return global.atob(text);\n } else if (typeof Buffer !== 'undefined') {\n
return new Buffer(text, 'base64').toString();\n } else {\n throw new Error(\n 'Unable to decode base64 in this
environment. ' +\n 'Missing built-in atob() or Buffer()');\n }\n}\n\nexport function parseStringParam(s: []|string,
keepCase: boolean): string {\n const value =\n Array.isArray(s) ? String.fromCharCode.apply(null, s) :
decodeBase64(s);\n return keepCase ? value : value.toLowerCase();\n}\n\nexport function getStringParam(\n
attrs: {[key: string]: tensorflow.IAttrValue}, name: string, def: string,\n keepCase = false): string {\n const param
= attrs[name];\n if (param != null) {\n return
parseStringParam(param.s, keepCase);\n }\n return def;\n}\n\nexport function getBoolParam(\n attrs: {[key:
string]: tensorflow.IAttrValue}, name: string,\n def: boolean): boolean {\n const param = attrs[name];\n return
param ? param.b : def;\n}\n\nexport function getNumberParam(\n attrs: {[key: string]: tensorflow.IAttrValue},
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name: string,\n def: number): number {\n const param = attrs[name] || {};\n const value =\n param['i'] != null ? param['i'] : (param['f'] != null ? param['f'] : def);\n return (typeof value === 'number') ? value : parseInt(value, 10);\n}\n\nexport function parseDtypeParam(value: string|tensorflow.DataType): DataType {\n if (typeof (value) === 'string') {\n // tslint:disable-next-line:no-any\n value = tensorflow.DataType[value as any];\n }\n switch (value) {\n case tensorflow.DataType.DT_FLOAT:\n return 'float32';\n case tensorflow.DataType.DT_INT32:\n case tensorflow.DataType.DT_INT64:\n case tensorflow.DataType.DT_INT8:\n
  case tensorflow.DataType.DT_UINT8:\n return 'int32';\n case tensorflow.DataType.DT_BOOL:\n return 'bool';\n case tensorflow.DataType.DT_DOUBLE:\n return 'float32';\n case tensorflow.DataType.DT_STRING:\n return 'string';\n default:\n // Unknown dtype error will happen at runtime (instead of parse time),\n // since these nodes might not be used by the actual subgraph execution.\n return null;\n }\n}\n\nexport function getFuncParam(\n attrs: {[key: string]: tensorflow.IAttrValue}, name: string,\n def: string): string {\n const param = attrs[name];\n if (param && param.func) {\n return param.func.name;\n }\n return def;\n}\n\nexport function getDtypeParam(\n attrs: {[key: string]: tensorflow.IAttrValue}, name: string,\n def: DataType): DataType {\n const param = attrs[name];\n if (param && param.type) {\n return parseDtypeParam(param.type);\n }\n return def;\n}\n\nexport function getDtypeArrayParam(\n
  attrs: {[key: string]: tensorflow.IAttrValue}, name: string,\n def: DataType[]): DataType[] {\n const param = attrs[name];\n if (param && param.list && param.list.type) {\n return param.list.type.map(v => parseDtypeParam(v));\n }\n return def;\n}\n\nexport function parseTensorShapeParam(shape: tensorflow.ITensorShape): number[]|\n undefined {\n if (shape.unknownRank) {\n return undefined;\n }\n if (shape.dim != null) {\n return shape.dim.map(\n dim =>\n (typeof dim.size === 'number') ? dim.size : parseInt(dim.size, 10));\n }\n return [];\n}\n\nexport function getTensorShapeParam(\n attrs: {[key: string]: tensorflow.IAttrValue}, name: string,\n def?: number[]): number[]|undefined {\n const param = attrs[name];\n if (param && param.shape) {\n return parseTensorShapeParam(param.shape);\n }\n return def;\n}\n\nexport function getNumericArrayParam(\n attrs: {[key: string]: tensorflow.IAttrValue}, name: string,\n def: number[]): number[] {\n const param = attrs[name];\n if (param) {\n return ((param.list.f && param.list.f.length ? param.list.f :\n param.list.i) ||\n [])\n .map(v => (typeof v === 'number') ? v : parseInt(v, 10));\n }\n return def;\n}\n\nexport function getStringArrayParam(\n attrs: {[key: string]: tensorflow.IAttrValue}, name: string, def: string[],\n keepCase = false): string[] {\n const param = attrs[name];\n if (param && param.list && param.list.s) {\n return param.list.s.map((v) => {\n return parseStringParam(v, keepCase);\n });\n }\n return def;\n}\n\nexport function getTensorShapeArrayParam(\n attrs: {[key: string]: tensorflow.IAttrValue}, name: string,\n def: number[][]): number[][] {\n const param = attrs[name];\n if (param && param.list && param.list.shape) {\n return param.list.shape.map((v) => {\n return parseTensorShapeParam(v);\n });\n }\n return def;\n}\n\nexport function
  getBoolArrayParam(\n attrs: {[key: string]: tensorflow.IAttrValue}, name: string,\n def: boolean[]): boolean[] {\n const param = attrs[name];\n if (param && param.list && param.list.b) {\n return param.list.b;\n }\n return def;\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n
*/\n\nimport {DataType, Tensor}
  from '@tensorflow/tfjs-core';\n\nimport {NamedTensorsMap} from '../../data/types';\nimport {ExecutionContext} from '../../executor/execution_context';\nimport {getTensor} from '../executors/utils';\nimport {getBoolArrayParam, getBoolParam, getDtypeArrayParam, getDtypeParam, getNumberParam, getNumericArrayParam,

getStringArrayParam, getStringParam, getTensorShapeArrayParam, getTensorShapeParam} from '../operation_mapper';\nimport {GraphNode, Node, ValueType} from '../types';\n\n/**\n * Helper class for lookup inputs and params for nodes in the model graph.\n */\nexport class NodeValueImpl implements GraphNode {\n public readonly inputs: Tensor[] = [];\n public readonly attrs: {[key: string]: ValueType} = {};\n constructor(\n private node: Node, private tensorMap: NamedTensorsMap,\n private context: ExecutionContext) {\n this.inputs = node.inputNames.map(name => this.getInput(name));\n if (node.rawAttrs != null) {\n this.attrs = Object.keys(node.rawAttrs)\n .reduce((attrs: {[key: string]: ValueType}, key) => {\n attrs[key] = this.getAttr(key);\n return attrs;\n }, {});\n }\n }\n\n /**\n * Return the value of the attribute or input param.\n * @param name String: name of attribute or input param.\n */\n private getInput(name: string): Tensor {\n return getTensor(name, this.tensorMap, this.context);\n }\n\n /**\n * Return the value of the attribute or input param.\n * @param name String: name of attribute or input param.\n */\n private getAttr(name: string, defaultValue?: ValueType): ValueType {\n const value = this.node.rawAttrs[name];\n if (value.tensor != null) {\n return getTensor(name, this.tensorMap, this.context);\n }\n if (value.i != null || value.f != null) {\n return getNumberParam(this.node.rawAttrs, name, defaultValue as number);\n }\n if (value.s != null) {\n return getStringParam(this.node.rawAttrs,\n name, defaultValue as string);\n }\n if (value.b != null) {\n return getBoolParam(this.node.rawAttrs, name, defaultValue as boolean);\n }\n if (value.shape != null) {\n return getTensorShapeParam(\n this.node.rawAttrs, name, defaultValue as number[]);\n }\n if (value.type != null) {\n return getDtypeParam(this.node.rawAttrs, name, defaultValue as DataType);\n }\n if (value.list != null) {\n if (value.list.i != null || value.list.f != null) {\n return getNumericArrayParam(\n this.node.rawAttrs, name, defaultValue as number[]);\n }\n if (value.list.s != null) {\n return getStringArrayParam(\n this.node.rawAttrs, name, defaultValue as string[]);\n }\n if (value.list.shape != null) {\n return getTensorShapeArrayParam(\n this.node.rawAttrs, name, defaultValue as number[][]);\n }\n if (value.list.b != null) {\n return getBoolArrayParam(\n this.node.rawAttrs, name, defaultValue as boolean[]);\n }\n if (value.list.type != null) {\n return getDtypeArrayParam(\n this.node.rawAttrs, name, defaultValue as DataType[]);\n }\n }\n\n return defaultValue;\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\n/**\n * This file exports ops used by the converters executors. By default it\n * re-exports all ops. In a custom build this is aliased to a file that will\n * only exports ops for a given model.json.\n */\nexport * from './ops';\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {Tensor} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\n\nimport {NamedTensorsMap} from '../../data/types';\nimport

{ExecutionContext} from '../../executor/execution_context';\nimport {InternalOpExecutor, Node} from '../types';\n\nimport {getParamValue} from './utils';\n\nexport const executeOp: InternalOpExecutor =\n (node: Node, tensorMap: NamedTensorsMap,\n context: ExecutionContext): Tensor[] => {\n switch (node.op) {\n case 'BiasAdd':\n case 'AddV2':\n case 'Add': {\n return [tfOps.add(\n (getParamValue('a', node, tensorMap, context) as Tensor),\n getParamValue('b', node, tensorMap, context) as Tensor)];\n }\n case 'AddN': {\n return [tfOps.addN((\n getParamValue('tensors', node, tensorMap, context) as Tensor[]))];\n }\n case 'FloorMod':\n case 'Mod':\n return [tfOps.mod(\n getParamValue('a', node, tensorMap, context) as Tensor,\n getParamValue('b', node, tensorMap, context) as Tensor)];\n case 'Mul':\n return [tfOps.mul(\n getParamValue('a', node, tensorMap, context) as Tensor,\n getParamValue('b', node, tensorMap, context) as Tensor)];\n case 'RealDiv':\n case 'Div': {\n return [tfOps.div(\n getParamValue('a', node, tensorMap, context) as Tensor,\n getParamValue('b', node, tensorMap, context) as Tensor)];\n }\n case 'DivNoNan': {\n return [tfOps.divNoNan(\n getParamValue('a', node, tensorMap, context) as Tensor,\n getParamValue('b', node, tensorMap, context) as Tensor)];\n }\n case 'FloorDiv': {\n return [tfOps.floorDiv(\n getParamValue('a', node, tensorMap, context) as Tensor,\n getParamValue('b', node, tensorMap, context) as Tensor)];\n }\n case 'Sub': {\n return [tfOps.sub(\n getParamValue('a', node, tensorMap, context) as Tensor,\n getParamValue('b', node, tensorMap, context) as Tensor)];\n }\n case 'Minimum': {\n return [tfOps.minimum(\n getParamValue('a', node, tensorMap, context) as Tensor,\n getParamValue('b', node, tensorMap, context) as Tensor)];\n }\n case 'Maximum': {\n return [tfOps.maximum(\n getParamValue('a', node, tensorMap, context) as Tensor,\n getParamValue('b', node, tensorMap, context) as Tensor)];\n }\n case 'Pow': {\n return [tfOps.pow(\n getParamValue('a', node, tensorMap, context) as Tensor,\n getParamValue('b', node, tensorMap, context) as Tensor)];\n }\n case 'SquaredDifference': {\n return [tfOps.squaredDifference(\n getParamValue('a', node, tensorMap, context)\n as Tensor,\n getParamValue('b', node, tensorMap, context) as Tensor)];\n }\n default:\n throw TypeError(`Node type ${node.op} is not implemented`);\n }\n };\n\nexport const CATEGORY = 'arithmetic';\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {Tensor} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\n\nimport {NamedTensorsMap} from '../../data/types';\nimport {ExecutionContext} from '../../executor/execution_context';\nimport {InternalOpExecutor, Node} from '../types';\n\nimport {getParamValue, getTensor} from './utils';\n\nexport const executeOp: InternalOpExecutor =\n (node: Node, tensorMap: NamedTensorsMap,\n context: ExecutionContext): Tensor[] => {\n switch (node.op) {\n case 'Abs':\n case 'ComplexAbs':\n return [tfOps.abs(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Acos':\n return [tfOps.acos(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Acosh':\n return [tfOps.acosh(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Asin':\n return [tfOps.asin(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Asinh':\n return [tfOps.asinh(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Atan':\n return [tfOps.atan(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Atan2':\n return [tfOps.atan2(\n

getParamValue('x', node, tensorMap, context) as Tensor,\n getParamValue('y', node, tensorMap, context) as Tensor)];\n case 'Atanh':\n return [tfOps.atanh(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Ceil':\n return [tfOps.ceil(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Complex':\n return [tfOps.complex(\n getParamValue('real', node, tensorMap, context) as Tensor,\n getParamValue('imag', node, tensorMap, context) as Tensor)];\n case 'Cos':\n return [tfOps.cos(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Cosh':\n return [tfOps.cosh(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Elu':\n return [tfOps.elu(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Erf':\n return [tfOps.erf(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Exp':\n return [tfOps.exp(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Expm1': {\n return [tfOps.expm1(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n }\n case 'Floor':\n return [tfOps.floor(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Log':\n return [tfOps.log(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n
case 'Log1p': {\n return [tfOps.log1p(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n }\n case 'Imag':\n return [tfOps.imag(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n\n case 'Neg':\n return [tfOps.neg(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Reciprocal': {\n return [tfOps.reciprocal(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n }\n case 'Real':\n return [tfOps.real(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Relu':\n return [tfOps.relu(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Round': {\n return [tfOps.round(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n }\n case 'Selu':\n return [tfOps.selu(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Sigmoid':\n return [tfOps.sigmoid(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Sin':\n return [tfOps.sin(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Sign': {\n return [tfOps.sign(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n }\n case 'Sinh': {\n return [tfOps.sinh(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n }\n case 'Softplus': {\n return [tfOps.softplus(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n }\n case 'Sqrt': {\n return [tfOps.sqrt(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n }\n case 'Square': {\n return [tfOps.square(\n getParamValue('x', node, tensorMap, context)
as Tensor)];\n }\n case 'Tanh': {\n return [tfOps.tanh(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n }\n case 'Tan':\n return [tfOps.tan(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'ClipByValue':\n return [tfOps.clipByValue(\n getParamValue('x', node, tensorMap, context) as Tensor,\n getParamValue('clipValueMin', node, tensorMap, context) as number,\n getParamValue('clipValueMax', node, tensorMap, context) as\n number)];\n case 'Relu6':\n return [tfOps.relu6(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n case 'Rsqrt':\n return [tfOps.rsqrt(\n getTensor(node.inputNames[0], tensorMap, context))];\n case 'Prod':\n return [tfOps.prod(\n getParamValue('x', node, tensorMap, context) as Tensor,\n
getParamValue('axes', node, tensorMap, context) as number[])];\n case 'LeakyRelu':\n return [tfOps.leakyRelu(\n getParamValue('x', node, tensorMap, context) as Tensor,\n getParamValue('alpha', node, tensorMap, context) as number)];\n case 'Prelu':\n return [tfOps.prelu(\n getParamValue('x', node, tensorMap, context) as Tensor,\n getParamValue('alpha', node, tensorMap, context) as Tensor)];\n default:\n throw TypeError(`Node type ${node.op} is not implemented`);\n }\n };\n\nexport const CATEGORY = 'basic_math';\n","\n/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *

http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n/**\n * This differs from util.assertShapesMatch in that it allows values of\n * negative one, an undefined size of a dimensinon, in a shape to match\n * anything.\n */\n\nimport {Tensor, util} from '@tensorflow/tfjs-core';\n\n/**\n * Used by TensorList and TensorArray to verify if elementShape matches, support\n * negative value as the dim shape.\n * @param shapeA\n * @param shapeB\n * @param errorMessagePrefix\n */\nexport function assertShapesMatchAllowUndefinedSize(\n shapeA: number|number[], shapeB: number|number[],\n errorMessagePrefix = ''): void {\n // constant shape means unknown rank\n if (typeof shapeA === 'number' || typeof shapeB === 'number') {\n return;\n }\n util.assert(\n shapeA.length === shapeB.length,\n () => errorMessagePrefix + ` Shapes ${shapeA} and ${shapeB} must match`);\n for (let i = 0; i < shapeA.length; i++) {\n const dim0 = shapeA[i];\n const dim1 = shapeB[i];\n util.assert(\n dim0 < 0 || dim1 < 0 || dim0 === dim1,\n () =>\n errorMessagePrefix + ` Shapes ${shapeA} and ${shapeB} must match`);\n }\n}\n\nexport function fullDefinedShape(elementShape: number|number[]): boolean {\n if (typeof elementShape === 'number' || elementShape.some(dim => dim < 0)) {\n return false;\n }\n return true;\n}\n/**\n * Generate the output element shape from the list elementShape, list tensors\n * and input param.\n * @param listElementShape\n * @param tensors\n * @param elementShape\n */\nexport function inferElementShape(\n listElementShape: number|number[], tensors: Tensor[],\n elementShape: number|number[]): number[] {\n let partialShape = mergeElementShape(listElementShape, elementShape);\n const notfullDefinedShape = !fullDefinedShape(partialShape);\n if (notfullDefinedShape && tensors.length === 0) {\n throw new Error(\n `Tried to calculate elements of an empty list` +\n ` with non-fully-defined elementShape: ${partialShape}`);\n }\n if (notfullDefinedShape) {\n tensors.forEach(tensor => {\n partialShape = mergeElementShape(tensor.shape, partialShape);\n });\n }\n if (!fullDefinedShape(partialShape)) {\n throw new Error(`Non-fully-defined elementShape: ${partialShape}`);\n }\n return partialShape as number[];\n}\n\nexport function mergeElementShape(\n elementShapeA: number|number[], elementShapeB: number|number[]): number|\n number[] {\n if (typeof elementShapeA === 'number') {\n return elementShapeB;\n }\n if (typeof elementShapeB === 'number') {\n return elementShapeA;\n }\n\n if (elementShapeA.length !== elementShapeB.length) {\n throw new Error(`Incompatible ranks during merge: ${elementShapeA} vs. ${\n elementShapeB}`);\n }\n\n const result: number[] = [];\n for (let i = 0; i < elementShapeA.length; ++i) {\n const dim0 = elementShapeA[i];\n const dim1 = elementShapeB[i];\n if (dim0 >= 0 && dim1 >= 0 && dim0 !== dim1) {\n throw new Error(`Incompatible shape during merge: ${elementShapeA} vs. ${\n elementShapeB}`);\n }\n result[i] = dim0 >= 0 ? dim0 : dim1;\n }\n return result;\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {concat, DataType, keep, reshape, scalar, slice, stack, Tensor, tensor, tidy, unstack} from '@tensorflow/tfjs-core';\n\nimport {assertShapesMatchAllowUndefinedSize} from './tensor_utils';\n\nexport interface TensorWithState {\n tensor?: Tensor;\n written?: boolean;\n read?: boolean;\n cleared?: boolean;\n}\n\n/**\n * The TensorArray object keeps an array of Tensors. It\n * allows reading from the array and writing to the array.\n */\nexport class TensorArray {\n private tensors: TensorWithState[] = [];\n private closed_ =

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false;\n  readonly idTensor: Tensor;\n  constructor(\n      readonly name: string, readonly dtype: DataType, private
maxSize: number,\n      private elementShape: number[], readonly identicalElementShapes: boolean,\n      readonly
dynamicSize: boolean,
 readonly clearAfterRead: boolean) {\n    this.idTensor = scalar(0);\n    keep(this.idTensor);\n  }\n\n  get id() {\n
return this.idTensor.id;\n  }\n\n  get closed() {\n    return this.closed_;\n  }\n\n  /**\n   * Dispose the tensors and
idTensor and mark the TensoryArray as closed.\n   */\n  clearAndClose(keepIds?: Set<number>) {\n
this.tensors.forEach(tensor => {\n      if (keepIds == null || !keepIds.has(tensor.tensor.id)) {\n
tensor.tensor.dispose();\n      }\n    });\n    this.tensors = [];\n    this.closed_ = true;\n    this.idTensor.dispose();\n
}\n\n  size(): number {\n    return this.tensors.length;\n  }\n\n  /**\n   * Read the value at location index in the
TensorArray.\n   * @param index Number the index to read from.\n   */\n  read(index: number): Tensor {\n    if
(this.closed_) {\n      throw new Error(`TensorArray ${this.name} has already been closed.`);\n    }\n\n    if (index <
0 || index >= this.size()) {\n      throw new Error(`Tried to read from index
 ${index}, but array size is: ${\n          this.size()}`);\n    }\n\n    const tensorWithState = this.tensors[index];\n    if
(tensorWithState.cleared) {\n      throw new Error(\n          `TensorArray ${this.name}: Could not read index ${\n
      index} twice because it was cleared after a previous read ` +\n          `(perhaps try setting clear_after_read =
false?).`);\n    }\n\n    if (this.clearAfterRead) {\n      tensorWithState.cleared = true;\n    }\n\n    tensorWithState.read
= true;\n    return tensorWithState.tensor;\n  }\n\n  /**\n   * Helper method to read multiple tensors from the
specified indices.\n   */\n  readMany(indices: number[]): Tensor[] {\n    return indices.map(index =>
this.read(index));\n  }\n\n  /**\n   * Write value into the index of the TensorArray.\n   * @param index number the
index to write to.\n   * @param tensor\n   */\n  write(index: number, tensor: Tensor) {\n    if (this.closed_) {\n
throw new Error(`TensorArray ${this.name} has already
 been closed.`);\n    }\n\n    if (index < 0 || !this.dynamicSize && index >= this.maxSize) {\n      throw new
Error(`Tried to write to index ${\n          index}, but array is not resizeable and size is: ${this.maxSize}`);\n    }\n\n
const t = this.tensors[index] || {};\n\n    if (tensor.dtype !== this.dtype) {\n      throw new Error(`TensorArray ${\n
  this.name}: Could not write to TensorArray index ${index},\n          because the value dtype is ${\n
tensor.dtype}, but TensorArray dtype is ${this.dtype}.`);\n    }\n\n    // Set the shape for the first time write to
unknow shape tensor array\n    if (this.size() === 0 &&\n        (this.elementShape == null || this.elementShape.length
=== 0)) {\n      this.elementShape = tensor.shape;\n    }\n\n    assertShapesMatchAllowUndefinedSize(\n
this.elementShape, tensor.shape,\n        `TensorArray ${this.name}: Could not write to TensorArray index ${\n
 index}.`);\n\n    if (t.read) {\n      throw new Error(\n
        `TensorArray ${this.name}: Could not write to TensorArray index ${\n          index}, because it has already
been read.`);\n    }\n\n    if (t.written) {\n      throw new Error(\n          `TensorArray ${this.name}: Could not write
to TensorArray index ${\n          index}, because it has already been written.`);\n    }\n\n    t.tensor = tensor;\n
keep(tensor);\n    t.written = true;\n\n    this.tensors[index] = t;\n  }\n\n  /**\n   * Helper method to write multiple
tensors to the specified indices.\n   */\n  writeMany(indices: number[], tensors: Tensor[]) {\n    if (indices.length !==
tensors.length) {\n      throw new Error(\n          `TensorArray ${this.name}: could not write multiple tensors,` +\n
    `because the index size: ${\n          indices.length} is not the same as tensors size: ${\n
tensors.length}.`);\n    }\n\n    indices.forEach((i, index) => this.write(i, tensors[index]));\n  }\n\n  /**\n   * Return
selected values in the
 TensorArray as a packed Tensor. All of\n   * selected values must have been written and their shapes must all
match.\n   * @param [indices] number[] Optional. Taking values in [0, max_value). If the\n   *    TensorArray is not
dynamic, max_value=size(). If not specified returns\n   *    all tensors in the original order.\n   * @param [dtype]\n
*/\n  gather(indices?: number[], dtype?: DataType): Tensor {\n    if (!!dtype && dtype !== this.dtype) {\n      throw
new Error(`TensorArray dtype is ${\n          this.dtype} but gather requested dtype ${dtype}`);\n    }\n\n    if
(!indices) {\n      indices = [];\n      for (let i = 0; i < this.size(); i++) {\n        indices.push(i);\n      }\n    } else {\n
indices = indices.slice(0, this.size());\n    }\n\n    if (indices.length === 0) {\n      return tensor([],
[0].concat(this.elementShape));\n    }\n\n    // Read all the PersistentTensors into a vector to keep track of\n    // their
memory.\n    const tensors = this.readMany(indices);\n\n
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    assertShapesMatchAllowUndefinedSize(\n        this.elementShape, tensors[0].shape, 'TensorArray shape
mismatch: ');\n\n    return stack(tensors, 0);\n  }\n\n  /**\n   * Return the values in the TensorArray as a concatenated
Tensor.\n   */\n  concat(dtype?: DataType): Tensor {\n    if (!!dtype && dtype !== this.dtype) {\n      throw new
Error(`TensorArray dtype is ${\n          this.dtype} but concat requested dtype ${dtype}`);\n    }\n\n    if (this.size()
=== 0) {\n      return tensor([], [0].concat(this.elementShape));\n    }\n\n    const indices = [];\n    for (let i = 0; i <
this.size(); i++) {\n      indices.push(i);\n    }\n    // Collect all the tensors from the tensors array.\n    const tensors =
this.readMany(indices);\n\n    assertShapesMatchAllowUndefinedSize(\n        this.elementShape, tensors[0].shape,\n
      `TensorArray shape mismatch: tensor array shape (${\n          this.elementShape}) vs first tensor shape
(${tensors[0].shape})`);\n\n    return concat(tensors,
 0);\n  }\n\n  /**\n   * Scatter the values of a Tensor in specific indices of a TensorArray.\n   * @param indices
nummber[] values in [0, max_value). If the\n   *    TensorArray is not dynamic, max_value=size().\n   * @param
tensor Tensor input tensor.\n   */\n  scatter(indices: number[], tensor: Tensor) {\n    if (tensor.dtype !== this.dtype)
{\n      throw new Error(`TensorArray dtype is ${\n          this.dtype} but tensor has dtype ${tensor.dtype}`);\n
}\n\n    if (indices.length !== tensor.shape[0]) {\n      throw new Error(`Expected len(indices) == tensor.shape[0], but
saw: ${\n          indices.length} vs. ${tensor.shape[0]}`);\n    }\n\n    const maxIndex = Math.max(...indices);\n\n    if
(!this.dynamicSize && maxIndex >= this.maxSize) {\n      throw new Error(\n          `Max index must be < array
size (${maxIndex}  vs. ${this.maxSize})`);\n    }\n\n    this.writeMany(indices, unstack(tensor, 0));\n  }\n\n  /**\n
* Split the values of a Tensor into the TensorArray.\n
   * @param length number[] with the lengths to use when splitting value along\n   *    its first dimension.\n   *
@param tensor Tensor, the tensor to split.\n   */\n  split(length: number[], tensor: Tensor) {\n    if (tensor.dtype !==
this.dtype) {\n      throw new Error(`TensorArray dtype is ${\n          this.dtype} but tensor has dtype
${tensor.dtype}`);\n    }\n    let totalLength = 0;\n    const cumulativeLengths = length.map(len => {\n
totalLength += len;\n      return totalLength;\n    });\n\n    if (totalLength !== tensor.shape[0]) {\n      throw new
Error(`Expected sum of lengths to be equal to\n          tensor.shape[0], but sum of lengths is\n        ${totalLength},
and tensor's shape is: ${tensor.shape}`);\n    }\n\n    if (!this.dynamicSize && length.length !== this.maxSize) {\n
throw new Error(\n          `TensorArray's size is not equal to the size of lengths (${\n              this.maxSize} vs.
${length.length}), ` +\n          'and the TensorArray is
 not marked as dynamically resizeable');\n    }\n\n    const elementPerRow = totalLength === 0 ? 0 : tensor.size /
totalLength;\n    const tensors: Tensor[] = [];\n    tidy(() => {\n      tensor = reshape(tensor, [1, totalLength,
elementPerRow]);\n      for (let i = 0; i < length.length; ++i) {\n        const previousLength = (i === 0) ? 0 :
cumulativeLengths[i - 1];\n        const indices = [0, previousLength, 0];\n        const sizes = [1, length[i],
elementPerRow];\n        tensors[i] = reshape(slice(tensor, indices, sizes), this.elementShape);\n      }\n      return
tensors;\n    });\n    const indices = [];\n    for (let i = 0; i < length.length; i++) {\n      indices[i] = i;\n    }\n
this.writeMany(indices, tensors);\n  }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights
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==========================================================================\n
*/\n\nimport {concat, DataType, keep, reshape, scalar, slice, stack, Tensor, tensor, tidy, unstack} from
'@tensorflow/tfjs-core';\n\nimport {assertShapesMatchAllowUndefinedSize, inferElementShape,
mergeElementShape} from './tensor_utils';\n\n/**\n * TensorList stores a container of `tf.Tensor` objects, which are
accessible\n * via tensors field.\n *\n * In order to get a copy of the underlying list, use the copy method:\n * ```\n *
TensorList b = a.copy();\n *    b.tensors().pushBack(t);  // This does not modify a.tensors().\n
 * ```\n *\n * Note that this is not a deep copy: the memory locations of the underlying\n * tensors will still point to
the same locations of the corresponding tensors\n * in the original.\n */\n\nexport class TensorList {\n  readonly
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idTensor: Tensor;\n  maxNumElements: number;\n\n  get id() {\n    return this.idTensor.id;\n  }\n  /**\n   *\n   * @param tensors list of tensors\n   * @param elementShape shape of each tensor, this can be a single number (any\n * shape is allowed) or partial shape (dim = -1).\n   * @param elementDtype data type of each tensor\n   * @param maxNumElements The maximum allowed size of `tensors`. Defaults to -1\n   *   meaning that the size of `tensors` is unbounded.\n   */\n  constructor(\n      readonly tensors: Tensor[], readonly elementShape: number|number[],\n readonly elementDtype: DataType, maxNumElements = -1) {\n    if (tensors != null) {\n      tensors.forEach(tensor => {\n        if (elementDtype !== tensor.dtype) {\n          throw new Error(`Invalid
 data types; op elements ${\n              elementDtype}, but list elements ${tensor.dtype}`);\n        }\n
assertShapesMatchAllowUndefinedSize(\n            elementShape, tensor.shape, 'TensorList shape mismatch: ');\n\n
    keep(tensor);\n      });\n    }\n    this.idTensor = scalar(0);\n    this.maxNumElements = maxNumElements;\n
keep(this.idTensor);\n  }\n\n  /**\n   * Get a new TensorList containing a copy of the underlying tensor container.\n
*/\n  copy(): TensorList {\n    return new TensorList(\n        [...this.tensors], this.elementShape,
this.elementDtype);\n  }\n\n  /**\n   * Dispose the tensors and idTensor and clear the tensor list.\n   */\n
clearAndClose(keepIds?: Set<number>) {\n    this.tensors.forEach(tensor => {\n      if (keepIds == null ||
!keepIds.has(tensor.id)) {\n        tensor.dispose();\n      }\n    });\n    this.tensors.length = 0;\n
this.idTensor.dispose();\n  }\n  /**\n   * The size of the tensors in the tensor list.\n   */\n
  size() {\n    return this.tensors.length;\n  }\n\n  /**\n   * Return a tensor that stacks a list of rank-R tf.Tensors into
one rank-(R+1)\n   * tf.Tensor.\n   * @param elementShape shape of each tensor\n   * @param elementDtype data
type of each tensor\n   * @param numElements the number of elements to stack\n   */\n  stack(elementShape:
number[], elementDtype: DataType, numElements = -1):\n      Tensor {\n    if (elementDtype !== this.elementDtype)
{\n      throw new Error(`Invalid data types; op elements ${\n          elementDtype}, but list elements
${this.elementDtype}`);\n    }\n    if (numElements !== -1 && this.tensors.length !== numElements) {\n      throw
new Error(`Operation expected a list with ${\n          numElements} elements but got a list with ${\n
this.tensors.length} elements.`);\n    }\n    assertShapesMatchAllowUndefinedSize(\n        elementShape,
this.elementShape, 'TensorList shape mismatch: ');\n    const outputElementShape =\n
inferElementShape(this.elementShape,
 this.tensors, elementShape);\n    return tidy(() => {\n      const reshapedTensors =\n          this.tensors.map(tensor =>
reshape(tensor, outputElementShape));\n      return stack(reshapedTensors, 0);\n    });\n  }\n\n  /**\n   * Pop a tensor
from the end of the list.\n   * @param elementShape shape of the tensor\n   * @param elementDtype data type of the
tensor\n   */\n  popBack(elementShape: number[], elementDtype: DataType): Tensor {\n    if (elementDtype !==
this.elementDtype) {\n      throw new Error(`Invalid data types; op elements ${\n          elementDtype}, but list
elements ${this.elementDtype}`);\n    }\n\n    if (this.size() === 0) {\n      throw new Error('Trying to pop from an
empty list.');\n    }\n    const outputElementShape =\n        inferElementShape(this.elementShape, this.tensors,
elementShape);\n    const tensor = this.tensors.pop();\n\n    assertShapesMatchAllowUndefinedSize(\n
tensor.shape, elementShape, 'TensorList shape mismatch:
 ');\n\n    return reshape(tensor, outputElementShape);\n  }\n\n  /**\n   * Push a tensor to the end of the list.\n   *
@param tensor Tensor to be pushed.\n   */\n  pushBack(tensor: Tensor) {\n    if (tensor.dtype !==
this.elementDtype) {\n      throw new Error(`Invalid data types; op elements ${\n          tensor.dtype}, but list
elements ${this.elementDtype}`);\n    }\n\n    assertShapesMatchAllowUndefinedSize(\n        tensor.shape,
this.elementShape, 'TensorList shape mismatch: ');\n\n    if (this.maxNumElements === this.size()) {\n      throw
new Error(`Trying to push element into a full list.`);\n    }\n    keep(tensor);\n    this.tensors.push(tensor);\n  }\n\n
/**\n   * Update the size of the list.\n   * @param size the new size of the list.\n   */\n  resize(size: number) {\n    if
(size < 0) {\n      throw new Error(\n          `TensorListResize expects size to be non-negative. Got: ${size}`);\n
}\n\n    if (this.maxNumElements !== -1 && size > this.maxNumElements) {\n
  throw new Error(`TensorListResize input size ${\n          size} is greater maxNumElement
${this.maxNumElements}.`);\n    }\n    this.tensors.length = size;\n  }\n\n  /**\n   * Retrieve the element at the
provided index\n   * @param elementShape shape of the tensor\n   * @param elementDtype dtype of the tensor\n   *
@param elementIndex index of the tensor\n   */\n  getItem(elementIndex: number, elementShape: number[],
```

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elementDtype: DataType):\n      Tensor {\n    if (elementDtype !== this.elementDtype) {\n      throw new
Error(`Invalid data types; op elements ${\n          elementDtype}, but list elements ${this.elementDtype}`);\n    }\n
if (elementIndex < 0 || elementIndex > this.tensors.length) {\n      throw new Error(`Trying to access element ${\n
  elementIndex} in a list with ${this.tensors.length} elements.`);\n    }\n\n    if (this.tensors[elementIndex] == null)
{\n      throw new Error(`element at index ${elementIndex} is null.`);\n    }\n\n
assertShapesMatchAllowUndefinedSize(\n
      this.tensors[elementIndex].shape, elementShape,\n        'TensorList shape mismatch: ');\n    const
outputElementShape =\n        inferElementShape(this.elementShape, this.tensors, elementShape);\n    return
reshape(this.tensors[elementIndex], outputElementShape);\n  }\n\n  /**\n   * Set the tensor at the index\n   *
@param elementIndex index of the tensor\n   * @param tensor the tensor to be inserted into the list\n   */\n
setItem(elementIndex: number, tensor: Tensor) {\n    if (tensor.dtype !== this.elementDtype) {\n      throw new
Error(`Invalid data types; op elements ${\n          tensor.dtype}, but list elements ${this.elementDtype}`);\n    }\n\n
if (elementIndex < 0 ||\n        this.maxNumElements !== -1 && elementIndex >= this.maxNumElements) {\n
throw new Error(`Trying to set element ${\n          elementIndex} in a list with max ${this.maxNumElements}
elements.`);\n    }\n\n    assertShapesMatchAllowUndefinedSize(\n        this.elementShape,
 tensor.shape, 'TensorList shape mismatch: ');\n    keep(tensor);\n    this.tensors[elementIndex] = tensor;\n  }\n\n
/**\n   * Return selected values in the TensorList as a stacked Tensor. All of\n   * selected values must have been
written and their shapes must all match.\n   * @param indices indices of tensors to gather\n   * @param
elementDtype output tensor dtype\n   * @param elementShape output tensor element shape\n   */\n  gather(indices:
number[], elementDtype: DataType, elementShape: number[]):\n      Tensor {\n    if (elementDtype !==
this.elementDtype) {\n      throw new Error(`Invalid data types; op elements ${\n          elementDtype}, but list
elements ${this.elementDtype}`);\n    }\n\n    assertShapesMatchAllowUndefinedSize(\n        this.elementShape,
elementShape, 'TensorList shape mismatch: ');\n\n    // When indices is greater than the size of the list, indices
beyond the\n    // size of the list are ignored.\n    indices = indices.slice(0, this.size());\n    const
 outputElementShape =\n        inferElementShape(this.elementShape, this.tensors, elementShape);\n    if
(indices.length === 0) {\n      return tensor([], [0].concat(outputElementShape));\n    }\n\n    return tidy(() => {\n
const tensors =\n          indices.map(i => reshape(this.tensors[i], outputElementShape));\n      return stack(tensors,
0);\n    });\n  }\n\n  /**\n   * Return the values in the TensorList as a concatenated Tensor.\n   * @param
elementDtype output tensor dtype\n   * @param elementShape output tensor element shape\n   */\n
concat(elementDtype: DataType, elementShape: number[]): Tensor {\n    if (!!elementDtype && elementDtype !==
this.elementDtype) {\n      throw new Error(`TensorList dtype is ${\n          this.elementDtype} but concat requested
dtype ${elementDtype}`);\n    }\n\n    assertShapesMatchAllowUndefinedSize(\n        this.elementShape,
elementShape, 'TensorList shape mismatch: ');\n    const outputElementShape =\n
inferElementShape(this.elementShape,
 this.tensors, elementShape);\n\n    if (this.size() === 0) {\n      return tensor([], [0].concat(outputElementShape));\n
}\n    return tidy(() => {\n      const tensors = this.tensors.map(t => reshape(t, outputElementShape));\n      return
concat(tensors, 0);\n    });\n  }\n}\n\n/**\n * Creates a TensorList which, when stacked, has the value of tensor.\n *
@param tensor from tensor\n * @param elementShape output tensor element shape\n */\nexport function
fromTensor(\n    tensor: Tensor, elementShape: number[], elementDtype: DataType) {\n  const dtype =
tensor.dtype;\n  if (tensor.shape.length < 1) {\n    throw new Error(\n        `Tensor must be at least a vector, but saw
shape: ${tensor.shape}`);\n  }\n  if (tensor.dtype !== elementDtype) {\n    throw new Error(`Invalid data types; op
elements ${\n        tensor.dtype}, but list elements ${elementDtype}`);\n  }\n  const tensorElementShape =
tensor.shape.slice(1);\n  assertShapesMatchAllowUndefinedSize(\n      tensorElementShape,
 elementShape, 'TensorList shape mismatch: ');\n  const tensorList: Tensor[] = unstack(tensor);\n  return new
TensorList(tensorList, elementShape, dtype);\n}\n\n/**\n * Return a TensorList of the given size with empty
elements.\n * @param elementShape the shape of the future elements of the list\n * @param elementDtype the
desired type of elements in the list\n * @param numElements the number of elements to reserve\n */\nexport
function reserve(\n    elementShape: number[], elementDtype: DataType, numElements: number) {\n  return new
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TensorList([], elementShape, elementDtype, numElements);\n}\n\n/**\n * Put tensors at specific indices of a stacked tensor into a TensorList.\n * @param indices list of indices on how to scatter the tensor.\n * @param tensor input tensor.\n * @param elementShape the shape of the future elements of the list\n * @param numElements the number of elements to scatter\n */\nexport function scatter(\n tensor: Tensor, indices: number[], elementShape: number[],\n numElements?: number): TensorList {\n if (indices.length !== tensor.shape[0]) {\n throw new Error(`Expected len(indices) == tensor.shape[0], but saw: ${\n indices.length} vs. ${tensor.shape[0]}`);\n }\n\n const maxIndex = Math.max(...indices);\n\n if (numElements != null && numElements !== -1 && maxIndex >= numElements) {\n throw new Error(\n `Max index must be < array size (${maxIndex} vs. ${numElements})`);\n }\n\n const list = new TensorList([], elementShape, tensor.dtype, numElements);\n const tensors = unstack(tensor, 0);\n indices.forEach((value, index) => {\n list.setItem(value, tensors[index]);\n });\n return list;\n}\n\n/**\n * Split the values of a Tensor into a TensorList.\n * @param length the lengths to use when splitting value along\n * its first dimension.\n * @param tensor the tensor to split.\n * @param elementShape the shape of the future elements of the list\n */\nexport function split(\n tensor: Tensor, length: number[],\n elementShape: number[]) {\n let totalLength = 0;\n const cumulativeLengths = length.map(len => {\n totalLength += len;\n return totalLength;\n });\n\n if (totalLength !== tensor.shape[0]) {\n throw new Error(`Expected sum of lengths to be equal to\n tensor.shape[0], but sum of lengths is\n ${totalLength}, and tensor's shape is: ${tensor.shape}`);\n }\n\n const shapeWithoutFirstDim = tensor.shape.slice(1);\n const outputElementShape =\n mergeElementShape(shapeWithoutFirstDim, elementShape);\n const elementPerRow = totalLength === 0 ? 0 : tensor.size / totalLength;\n const tensors: Tensor[] = tidy(() => {\n const tensors = [];\n tensor = reshape(tensor, [1, totalLength, elementPerRow]);\n for (let i = 0; i < length.length; ++i) {\n const previousLength = (i === 0) ? 0 : cumulativeLengths[i - 1];\n const indices = [0, previousLength, 0];\n const sizes = [1, length[i], elementPerRow];\n tensors[i] = reshape(\n slice(tensor, indices, sizes), outputElementShape as number[]);\n }\n tensor.dispose();\n return tensors;\n });\n\n const list = new TensorList([], elementShape, tensor.dtype, length.length);\n\n for (let i = 0; i < tensors.length; i++) {\n list.setItem(i, tensors[i]);\n }\n return list;\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {DataType, scalar, Tensor} from '@tensorflow/tfjs-core';\n\nimport {NamedTensorsMap} from '../../data/types';\nimport {ExecutionContext} from '../../executor/execution_context';\nimport {TensorArray} from '../../executor/tensor_array';\nimport {fromTensor, reserve, scatter, split} from '../../executor/tensor_list';\nimport {InternalOpAsyncExecutor, Node} from '../types';\n\nimport {cloneTensor, getParamValue, getTensor} from './utils';\n\nexport const executeOp: InternalOpAsyncExecutor = async(\n node: Node, tensorMap: NamedTensorsMap,\n context: ExecutionContext): Promise<Tensor[]> => {\n switch (node.op) {\n case 'If':\n case 'StatelessIf': {\n const thenFunc =\n getParamValue('thenBranch', node, tensorMap, context) as string;\n const elseFunc =\n getParamValue('elseBranch', node, tensorMap, context) as string;\n const cond = getParamValue('cond', node, tensorMap, context) as Tensor;\n const args = getParamValue('args', node, tensorMap, context) as Tensor[];\n const condValue = await cond.data();\n if (condValue[0]) {\n return context.functionMap[thenFunc].executeFunctionAsync(\n args, context.tensorArrayMap, context.tensorListMap);\n } else {\n return context.functionMap[elseFunc].executeFunctionAsync(\n args, context.tensorArrayMap, context.tensorListMap);\n }\n }\n case 'While':\n case 'StatelessWhile': {\n const bodyFunc =\n getParamValue('body', node, tensorMap, context) as string;\n const condFunc =\n getParamValue('cond',

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node, tensorMap, context) as string;\n      const args = getParamValue('args', node, tensorMap, context) as
Tensor[];\n\n      // Calculate the condition of the loop\n      const condResult =\n          (await
context.functionMap[condFunc].executeFunctionAsync(\n              args, context.tensorArrayMap,
context.tensorListMap));\n      const argIds =
 args.map(tensor => tensor.id);\n      let condValue = await condResult[0].data();\n      // Dispose the intermediate
tensors for condition function\n      condResult.forEach(tensor => {\n        if (!tensor.kept &&
argIds.indexOf(tensor.id) === -1) {\n          tensor.dispose();\n        }\n      });\n\n      let result: Tensor[] = args;\n\n
 while (condValue[0]) {\n        // Record the previous result for intermediate tensor tracking\n        const origResult =
result;\n        // Execution the body of the loop\n        result = await
context.functionMap[bodyFunc].executeFunctionAsync(\n            result, context.tensorArrayMap,
context.tensorListMap);\n        const resultIds = result.map(tensor => tensor.id);\n\n        // Dispose the intermediate
tensor for body function that is not global\n        // kept, not input/output of the body function\n
origResult.forEach(tensor => {\n          if (!tensor.kept && argIds.indexOf(tensor.id) === -1 &&\n
resultIds.indexOf(tensor.id)
 === -1) {\n            tensor.dispose();\n          }\n        });\n\n        // Recalcuate the condition of the loop using the
latest results.\n        const condResult =\n            (await context.functionMap[condFunc].executeFunctionAsync(\n
          result, context.tensorArrayMap, context.tensorListMap));\n        condValue = await condResult[0].data();\n
 // Dispose the intermediate tensors for condition function\n        condResult.forEach(tensor => {\n          if
(!tensor.kept && argIds.indexOf(tensor.id) === -1 &&\n              resultIds.indexOf(tensor.id) === -1) {\n
tensor.dispose();\n          }\n        });\n      }\n      return result;\n    }\n    case 'LoopCond': {\n      const pred =
getParamValue('pred', node, tensorMap, context) as Tensor;\n      return [cloneTensor(pred)];\n    }\n    case 'Switch':
{\n      const pred = getParamValue('pred', node, tensorMap, context) as Tensor;\n      let data =
getParamValue('data', node,
 tensorMap, context) as Tensor;\n      if (!data.kept) {\n        data = cloneTensor(data);\n      }\n      // Outputs nodes
:0 => false, :1 => true\n      return (await pred.data())[0] ? [undefined, data] : [data, undefined];\n    }\n    case
'Merge': {\n      const inputName = node.inputNames.find(\n          name => getTensor(name, tensorMap, context)
!== undefined);\n      if (inputName) {\n        const data = getTensor(inputName, tensorMap, context);\n        return
[cloneTensor(data)];\n      }\n      return undefined;\n    }\n    case 'Enter': {\n      const frameId =\n
getParamValue('frameName', node, tensorMap, context) as string;\n      const data = getParamValue('tensor', node,
tensorMap, context) as Tensor;\n      context.enterFrame(frameId);\n      return [cloneTensor(data)];\n    }\n    case
'Exit': {\n      const data = getParamValue('tensor', node, tensorMap, context) as Tensor;\n      context.exitFrame();\n
    return [cloneTensor(data)];\n    }\n    case 'NextIteration':
 {\n      const data = getParamValue('tensor', node, tensorMap, context) as Tensor;\n      context.nextIteration();\n
return [cloneTensor(data)];\n    }\n    case 'TensorArrayV3': {\n      const size = getParamValue('size', node,
tensorMap, context) as number;\n      const dtype =\n          getParamValue('dtype', node, tensorMap, context) as
DataType;\n      const elementShape =\n          getParamValue('elementShape', node, tensorMap, context) as
number[];\n      const dynamicSize =\n          getParamValue('dynamicSize', node, tensorMap, context) as boolean;\n
    const clearAfterRead =\n          getParamValue('clearAfterRead', node, tensorMap, context) as boolean;\n      const
identicalElementShapes =\n          getParamValue('identicalElementShapes', node, tensorMap, context) as\n
boolean;\n      const name = getParamValue('name', node, tensorMap, context) as string;\n      const tensorArray =
new TensorArray(\n          name, dtype, size, elementShape,
 identicalElementShapes, dynamicSize,\n          clearAfterRead);\n      context.addTensorArray(tensorArray);\n
return [tensorArray.idTensor, scalar(1.0)];\n    }\n    case 'TensorArrayWriteV3': {\n      const id =\n
getParamValue('tensorArrayId', node, tensorMap, context) as Tensor;\n      const index = getParamValue('index',
node, tensorMap, context) as number;\n      const writeTensor =\n          getParamValue('tensor', node, tensorMap,
context) as Tensor;\n      const writeTensorArray = context.getTensorArray(id.id);\n
writeTensorArray.write(index, writeTensor);\n      return [writeTensorArray.idTensor];\n    }\n    case
'TensorArrayReadV3': {\n      const readId =\n          getParamValue('tensorArrayId', node, tensorMap, context) as
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Tensor;\n      const readIndex =\n          getParamValue('index', node, tensorMap, context) as number;\n      const
readTensorArray = context.getTensorArray(readId.id);\n      return [readTensorArray.read(readIndex)];\n    }\n
  case 'TensorArrayGatherV3': {\n      const gatherId =\n          getParamValue('tensorArrayId', node, tensorMap,
context) as Tensor;\n      const gatherIndices =\n          getParamValue('indices', node, tensorMap, context) as
number[];\n      const gatherDtype =\n          getParamValue('dtype', node, tensorMap, context) as DataType;\n
const gatherTensorArray = context.getTensorArray(gatherId.id);\n      return
[gatherTensorArray.gather(gatherIndices, gatherDtype)];\n    }\n    case 'TensorArrayScatterV3': {\n      const
scatterId =\n          getParamValue('tensorArrayId', node, tensorMap, context) as Tensor;\n      const scatterIndices
=\n          getParamValue('indices', node, tensorMap, context) as number[];\n      const scatterTensor =\n
getParamValue('tensor', node, tensorMap, context) as Tensor;\n      const scatterTensorArray =
context.getTensorArray(scatterId.id);\n      scatterTensorArray.scatter(scatterIndices, scatterTensor);\n      return
[scatterTensorArray.idTensor];\n
  }\n    case 'TensorArrayConcatV3': {\n      const concatId =\n          getParamValue('tensorArrayId', node,
tensorMap, context) as Tensor;\n      const concatTensorArray = context.getTensorArray(concatId.id);\n      const
concatDtype =\n          getParamValue('dtype', node, tensorMap, context) as DataType;\n      return
[concatTensorArray.concat(concatDtype)];\n    }\n    case 'TensorArraySplitV3': {\n      const splitId =\n
getParamValue('tensorArrayId', node, tensorMap, context) as Tensor;\n      const splitTensor =\n
getParamValue('tensor', node, tensorMap, context) as Tensor;\n      const lengths =\n          getParamValue('lengths',
node, tensorMap, context) as number[];\n      const splitTensorArray = context.getTensorArray(splitId.id);\n
splitTensorArray.split(lengths, splitTensor);\n      return [splitTensorArray.idTensor];\n    }\n    case
'TensorArraySizeV3': {\n      const sizeId =\n          getParamValue('tensorArrayId', node,
 tensorMap, context) as Tensor;\n      const sizeTensorArray = context.getTensorArray(sizeId.id);\n      return
[scalar(sizeTensorArray.size(), 'int32')];\n    }\n    case 'TensorArrayCloseV3': {\n      const closeId =\n
getParamValue('tensorArrayId', node, tensorMap, context) as Tensor;\n      const closeTensorArray =
context.getTensorArray(closeId.id);\n      closeTensorArray.clearAndClose();\n      return
[closeTensorArray.idTensor];\n    }\n    case 'TensorListSetItem': {\n      const idTensor =\n
getParamValue('tensorListId', node, tensorMap, context) as Tensor;\n      const index = getParamValue('index', node,
tensorMap, context) as number;\n      const writeTensor =\n          getParamValue('tensor', node, tensorMap, context)
as Tensor;\n      const tensorList = context.getTensorList(idTensor.id);\n      tensorList.setItem(index,
writeTensor);\n      return [tensorList.idTensor];\n    }\n    case 'TensorListGetItem': {\n      const idTensor =\n
getParamValue('tensorListId',
 node, tensorMap, context) as Tensor;\n      const readIndex =\n          getParamValue('index', node, tensorMap,
context) as number;\n      const elementShape =\n          getParamValue('elementShape', node, tensorMap, context)
as number[];\n\n      const elementDType =\n          getParamValue('elementDType', node, tensorMap, context) as
DataType;\n      const tensorList = context.getTensorList(idTensor.id);\n      return [tensorList.getItem(readIndex,
elementShape, elementDType)];\n    }\n    case 'TensorListScatterV2':\n    case 'TensorListScatter': {\n      const
scatterIndices =\n          getParamValue('indices', node, tensorMap, context) as number[];\n      const scatterTensor
=\n          getParamValue('tensor', node, tensorMap, context) as Tensor;\n      const elementShape =\n
getParamValue('elementShape', node, tensorMap, context) as number[];\n      const numElements =\n
getParamValue('numElements', node, tensorMap, context) as number;\n
      const tensorList =\n          scatter(scatterTensor, scatterIndices, elementShape, numElements);\n
context.addTensorList(tensorList);\n      return [tensorList.idTensor];\n    }\n    case 'TensorListReserve':\n    case
'EmptyTensorList': {\n      const elementShape =\n          getParamValue('elementShape', node, tensorMap, context)
as number[];\n      const elementDtype =\n          getParamValue('elementDType', node, tensorMap, context) as
DataType;\n      let numElementsParam;\n\n      if (node.op === 'TensorListReserve') {\n        numElementsParam =
'numElements';\n      } else {\n        numElementsParam = 'maxNumElements';\n      }\n\n      const numElements =\n
        getParamValue(numElementsParam, node, tensorMap, context) as number;\n\n      const tensorList =
reserve(elementShape, elementDtype, numElements);\n      context.addTensorList(tensorList);\n      return
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[tensorList.idTensor];\n }\n case 'TensorListGather': {\n const gatherId =\n getParamValue('tensorListId', node, tensorMap, context) as Tensor;\n const gatherIndices =\n getParamValue('indices', node, tensorMap, context) as number[];\n const elementShape =\n getParamValue('elementShape', node, tensorMap, context) as number[];\n const elementDtype =\n getParamValue('elementDType', node, tensorMap, context) as DataType;\n const tensorList =\n context.getTensorList(gatherId.id);\n return [tensorList.gather(gatherIndices, elementDtype, elementShape)];\n }\n case 'TensorListStack': {\n const idTensor =\n getParamValue('tensorListId', node, tensorMap, context) as Tensor;\n const elementShape =\n getParamValue('elementShape', node, tensorMap, context) as number[];\n const elementDtype =\n getParamValue('elementDType', node, tensorMap, context) as DataType;\n const numElements =\n getParamValue('numElements', node, tensorMap, context) as number;\n const
tensorList = context.getTensorList(idTensor.id);\n return [tensorList.stack(elementShape, elementDtype, numElements)];\n }\n case 'TensorListFromTensor': {\n const tensor =\n getParamValue('tensor', node, tensorMap, context) as Tensor;\n const elementShape =\n getParamValue('elementShape', node, tensorMap, context) as number[];\n const elementDtype =\n getParamValue('elementDType', node, tensorMap, context) as DataType;\n const tensorList = fromTensor(tensor, elementShape, elementDtype);\n context.addTensorList(tensorList);\n return [tensorList.idTensor];\n }\n case 'TensorListConcat': {\n const concatId =\n getParamValue('tensorListId', node, tensorMap, context) as Tensor;\n const tensorList =\n context.getTensorList(concatId.id);\n const concatDtype =\n getParamValue('dtype', node, tensorMap, context) as DataType;\n const elementShape =\n getParamValue('elementShape',
node, tensorMap, context) as number[];\n return [tensorList.concat(concatDtype, elementShape)];\n }\n case 'TensorListPushBack': {\n const idTensor =\n getParamValue('tensorListId', node, tensorMap, context) as Tensor;\n const writeTensor =\n getParamValue('tensor', node, tensorMap, context) as Tensor;\n const tensorList = context.getTensorList(idTensor.id);\n tensorList.pushBack(writeTensor);\n return [tensorList.idTensor];\n }\n case 'TensorListPopBack': {\n const idTensor =\n getParamValue('tensorListId', node, tensorMap, context) as Tensor;\n const elementShape =\n getParamValue('elementShape', node, tensorMap, context) as number[];\n const elementDType =\n getParamValue('elementDType', node, tensorMap, context) as DataType;\n const tensorList =\n context.getTensorList(idTensor.id);\n return [tensorList.popBack(elementShape, elementDType)];\n }\n case 'TensorListSplit':
{\n const splitTensor =\n getParamValue('tensor', node, tensorMap, context) as Tensor;\n const elementShape =\n getParamValue('elementShape', node, tensorMap, context) as number[];\n const lengths =\n getParamValue('lengths', node, tensorMap, context) as number[];\n\n const tensorList =\n split(splitTensor, lengths, elementShape);\n context.addTensorList(tensorList);\n return [tensorList.idTensor];\n }\n default:\n throw TypeError(`Node type ${node.op} is not implemented`);\n }\n};\n\nexport const CATEGORY = 'control';\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under
the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n\nimport {Rank, Tensor, Tensor3D, Tensor4D, Tensor5D} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\n\nimport {NamedTensorsMap} from '../../data/types';\nimport {ExecutionContext} from '../../executor/execution_context';\nimport {InternalOpExecutor, Node} from '../types';\n\nimport {getPadding,

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getParamValue} from './utils';\n\nfunction fusedConvAndDepthWiseParams(\n    node: Node, tensorMap:
NamedTensorsMap, context: ExecutionContext) {\n  const [extraOp, activationFunc] =\n
(getParamValue('fusedOps', node, tensorMap, context) as string[]);\n\n  const isBiasAdd
 = extraOp === 'biasadd';\n  const isPrelu = activationFunc === 'prelu';\n  const isBatchNorm = extraOp ===
'fusedbatchnorm';\n\n  const numArgs =\n      (getParamValue('numArgs', node, tensorMap, context) as number);\n
if (isBiasAdd) {\n    if (isPrelu && numArgs !== 2) {\n      throw new Error(\n          'FusedConv2d and
DepthwiseConv2d with BiasAdd and Prelu ' +\n          'must have two extra arguments: bias and alpha.');\n    }\n    if
(!isPrelu && numArgs !== 1) {\n      throw new Error(\n          'FusedConv2d and DepthwiseConv2d with BiasAdd
must have ' +\n          'one extra argument: bias.');\n    }\n  }\n  if (isBatchNorm) {\n    throw new Error(\n
'FusedConv2d and DepthwiseConv2d with FusedBatchNorm is not supported.');\n  }\n  const stride =
getParamValue('strides', node, tensorMap, context) as number[];\n  const pad = getPadding(node, tensorMap,
context);\n  const dataFormat =\n      (getParamValue('dataFormat', node, tensorMap, context) as string)\n
      .toUpperCase();\n  const dilations =\n      getParamValue('dilations', node, tensorMap, context) as number[];\n
const [biasArg, preluArg] =\n      getParamValue('args', node, tensorMap, context) as Tensor[];\n  const
leakyreluAlpha =\n      getParamValue('leakyreluAlpha', node, tensorMap, context) as number;\n\n  return {\n
stride,\n    pad,\n    dataFormat,\n    dilations,\n    biasArg,\n    preluArg,\n    activationFunc,\n    leakyreluAlpha\n
};\n}\n\nexport const executeOp: InternalOpExecutor =\n    (node: Node, tensorMap: NamedTensorsMap,\n
context: ExecutionContext): Tensor[] => {\n      switch (node.op) {\n        case 'Conv1D': {\n          const stride =\n
        getParamValue('stride', node, tensorMap, context) as number;\n          const pad = getParamValue('pad', node,
tensorMap, context);\n          const dataFormat =\n              (getParamValue('dataFormat', node, tensorMap, context)
as string)\n                  .toUpperCase();\n          const dilation
 =\n              getParamValue('dilation', node, tensorMap, context) as number;\n          return [tfOps.conv1d(\n
getParamValue('x', node, tensorMap, context) as Tensor3D,\n              getParamValue('filter', node, tensorMap,
context) as Tensor3D,\n              stride, pad as 'valid' | 'same', dataFormat as 'NWC' | 'NCW',\n              dilation)];\n
  }\n        case 'Conv2D': {\n          const stride =\n              getParamValue('strides', node, tensorMap, context) as
number[];\n          const pad = getPadding(node, tensorMap, context);\n          const dataFormat =\n
(getParamValue('dataFormat', node, tensorMap, context) as string)\n                  .toUpperCase();\n          const
dilations =\n              getParamValue('dilations', node, tensorMap, context) as number[];\n          return
[tfOps.conv2d(\n              getParamValue('x', node, tensorMap, context) as Tensor3D |\n                  Tensor4D,\n
    getParamValue('filter',
 node, tensorMap, context) as Tensor4D,\n              [stride[1], stride[2]], pad as 'valid' | 'same',\n              dataFormat
as 'NHWC' | 'NCHW', [dilations[1], dilations[2]])];\n        }\n        case '_FusedConv2D': {\n          const {\n
stride,\n            pad,\n            dataFormat,\n            dilations,\n            biasArg,\n            preluArg,\n
activationFunc,\n            leakyreluAlpha\n          } = fusedConvAndDepthWiseParams(node, tensorMap,
context);\n\n          return [tfOps.fused.conv2d({\n            x: getParamValue('x', node, tensorMap, context) as
Tensor3D |\n                Tensor4D,\n            filter: getParamValue('filter', node, tensorMap, context) as\n
Tensor4D,\n            strides: [stride[1], stride[2]],\n            pad: pad as 'valid' | 'same',\n            dataFormat:
dataFormat as 'NHWC' | 'NCHW',\n            dilations: [dilations[1], dilations[2]],\n            bias: biasArg,\n
activation:
 activationFunc as tfOps.fused.Activation,\n            preluActivationWeights: preluArg,\n            leakyreluAlpha\n
  })];\n        }\n\n        case 'FusedDepthwiseConv2dNative': {\n          const {\n            stride,\n            pad,\n
dataFormat,\n            dilations,\n            biasArg,\n            preluArg,\n            activationFunc,\n
leakyreluAlpha,\n          } = fusedConvAndDepthWiseParams(node, tensorMap, context);\n\n          return
[tfOps.fused.depthwiseConv2d({\n            x: getParamValue('x', node, tensorMap, context) as Tensor3D |\n
Tensor4D,\n            filter: getParamValue('filter', node, tensorMap, context) as\n                Tensor4D,\n
strides: [stride[1], stride[2]],\n            pad: pad as 'valid' | 'same',\n            dataFormat: dataFormat as 'NHWC' |
'NCHW',\n            dilations: [dilations[1], dilations[2]],\n            bias: biasArg,\n            activation: activationFunc
```

```
as tfOps.fused.Activation,\n preluActivationWeights: preluArg,\n leakyreluAlpha\n })];\n }\n case 'Conv2DBackpropInput':\n case 'Conv2dTranspose': {\n const shape = getParamValue(\n 'outputShape', node, tensorMap,\n context) as [number, number, number] |\n [number, number, number, number];\n const stride =\n getParamValue('strides', node, tensorMap, context) as number[];\n const pad = getPadding(node, tensorMap, context);\n return [tfOps.conv2dTranspose(\n getParamValue('x', node, tensorMap, context) as Tensor3D |\n Tensor4D,\n getParamValue('filter', node, tensorMap, context) as Tensor4D,\n shape, [stride[1], stride[2]], pad as 'valid' | 'same')];\n }\n case 'DepthwiseConv2dNative':\n case 'DepthwiseConv2d': {\n const stride =\n getParamValue('strides', node, tensorMap, context) as number[];\n const pad = getPadding(node, tensorMap, context);\n const dilations =\n getParamValue('dilations', node, tensorMap, context) as number[];\n const dataFormat =\n (getParamValue('dataFormat', node, tensorMap, context) as string)\n .toUpperCase();\n\n return [tfOps.depthwiseConv2d(\n getParamValue('input', node, tensorMap, context) as Tensor3D |\n Tensor4D,\n getParamValue('filter', node, tensorMap, context) as Tensor4D,\n [stride[1], stride[2]], pad as 'valid' | 'same',\n dataFormat as 'NHWC' | 'NCHW', [dilations[1], dilations[2]])];\n }\n case 'Conv3D': {\n const stride =\n getParamValue('strides', node, tensorMap, context) as number[];\n const pad = getParamValue('pad', node, tensorMap, context);\n const dataFormat\n =\n (getParamValue('dataFormat', node, tensorMap, context) as string)\n .toUpperCase();\n const dilations =\n getParamValue('dilations', node, tensorMap, context) as number[];\n return [tfOps.conv3d(\n getParamValue('x', node, tensorMap, context) as Tensor4D |\n Tensor<Rank.R5>,\n getParamValue('filter', node, tensorMap, context) as\n Tensor<Rank.R5>,\n [stride[1], stride[2], stride[3]], pad as 'valid' | 'same',\n dataFormat as 'NDHWC' | 'NCDHW',\n [dilations[1], dilations[2], dilations[3]])];\n }\n case 'AvgPool': {\n const stride =\n getParamValue('strides', node, tensorMap, context) as number[];\n const pad = getParamValue('pad', node, tensorMap, context);\n const kernelSize =\n getParamValue('kernelSize', node, tensorMap, context) as number[];\n\n return\n [tfOps.avgPool(\n getParamValue('x', node, tensorMap, context) as Tensor3D |\n Tensor4D,\n [kernelSize[1], kernelSize[2]], [stride[1], stride[2]],\n pad as 'valid' | 'same')];\n }\n case 'MaxPool': {\n const stride =\n getParamValue('strides', node, tensorMap, context) as number[];\n const pad = getParamValue('pad', node, tensorMap, context);\n const kernelSize =\n getParamValue('kernelSize', node, tensorMap, context) as number[];\n\n return [tfOps.maxPool(\n getParamValue('x', node, tensorMap, context) as Tensor3D |\n Tensor4D,\n [kernelSize[1], kernelSize[2]], [stride[1], stride[2]],\n pad as 'valid' | 'same')];\n }\n case 'MaxPoolWithArgmax': {\n const stride =\n getParamValue('strides', node, tensorMap, context) as number[];\n const pad = getParamValue('pad',\n node, tensorMap, context);\n const kernelSize =\n getParamValue('kernelSize', node, tensorMap, context) as number[];\n const includeBatchInIndex =\n getParamValue('includeBatchInIndex', node, tensorMap, context) as\n boolean;\n const {result, indexes} = tfOps.maxPoolWithArgmax(\n getParamValue('x', node, tensorMap, context) as Tensor4D,\n [kernelSize[1], kernelSize[2]], [stride[1], stride[2]],\n pad as 'valid' | 'same', includeBatchInIndex);\n return [result, indexes];\n }\n case 'AvgPool3D': {\n const stride =\n getParamValue('strides', node, tensorMap, context) as number[];\n const pad = getParamValue('pad', node, tensorMap, context);\n const kernelSize =\n getParamValue('kernelSize', node, tensorMap, context) as number[];\n\n return [tfOps.avgPool3d(\n getParamValue('x',\n node, tensorMap, context) as Tensor5D,\n [kernelSize[1], kernelSize[2], kernelSize[3]],\n [stride[1], stride[2], stride[3]], pad as 'valid' | 'same')];\n }\n\n case 'MaxPool3D': {\n const stride =\n getParamValue('strides', node, tensorMap, context) as number[];\n const pad = getParamValue('pad',
```

node, tensorMap, context);\n const kernelSize =\n getParamValue('kernelSize', node, tensorMap, context) as number[];\n\n return [tfOps.maxPool3d(\n getParamValue('x', node, tensorMap, context) as Tensor5D,\n [kernelSize[1], kernelSize[2], kernelSize[3]],\n [stride[1], stride[2], stride[3]], pad as 'valid' | 'same')];\n }\n\n case 'Dilation2D': {\n const strides =\n getParamValue('strides', node, tensorMap, context) as number[];\n const pad = getParamValue('pad', node, tensorMap, context);\n const dilations
=\n getParamValue('dilations', node, tensorMap, context) as number[];\n\n // strides: [1, stride_height, stride_width, 1].\n const strideHeight = strides[1];\n const strideWidth = strides[2];\n\n // dilations: [1, dilation_height, dilation_width, 1].\n const dilationHeight = dilations[1];\n const dilationWidth = dilations[2];\n\n return [tfOps.dilation2d(\n getParamValue('x', node, tensorMap, context) as Tensor3D |\n Tensor4D,\n getParamValue('filter', node, tensorMap, context) as Tensor3D,\n [strideHeight, strideWidth], pad as 'valid' | 'same',\n [dilationHeight, dilationWidth], 'NHWC' /* dataFormat */)];\n }\n\n default:\n throw TypeError(`Node type ${node.op} is not implemented`);\n }\n };\n\nexport const CATEGORY = 'convolution';\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n
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http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {DataType, Tensor, Tensor1D} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\n\nimport {NamedTensorsMap} from '../../data/types';\nimport {ExecutionContext} from '../../executor/execution_context';\nimport {InternalOpExecutor, Node}
from '../types';\n\nimport {getParamValue} from './utils';\n\nexport const executeOp: InternalOpExecutor =\n (node: Node, tensorMap: NamedTensorsMap,\n context: ExecutionContext): Tensor[] => {\n switch (node.op) {\n case 'Fill': {\n const shape =\n getParamValue('shape', node, tensorMap, context) as number[];\n const dtype =\n getParamValue('dtype', node, tensorMap, context) as DataType;\n const value =\n getParamValue('value', node, tensorMap, context) as number;\n return [tfOps.fill(shape, value, dtype)];\n }\n case 'LinSpace': {\n const start =\n getParamValue('start', node, tensorMap, context) as number;\n const stop =\n getParamValue('stop', node, tensorMap, context) as number;\n const num = getParamValue('num', node, tensorMap, context) as number;\n return [tfOps.linspace(start, stop, num)];\n }\n
case 'Multinomial': {\n const logits =\n getParamValue('logits', node, tensorMap, context) as Tensor1D;\n const numSamples =\n getParamValue('numSamples', node, tensorMap, context) as number;\n const seed =\n getParamValue('seed', node, tensorMap, context) as number;\n return [tfOps.multinomial(logits, numSamples, seed)];\n }\n case 'OneHot': {\n const indices =\n getParamValue('indices', node, tensorMap, context) as Tensor1D;\n const depth =\n getParamValue('depth', node, tensorMap, context) as number;\n const onValue =\n getParamValue('onValue', node, tensorMap, context) as number;\n const offValue =\n getParamValue('offValue', node, tensorMap, context) as number;\n return [tfOps.oneHot(indices, depth, onValue, offValue)];\n }\n case 'Ones': {\n return [tfOps.ones(\n getParamValue('shape', node, tensorMap, context) as number[],\n getParamValue('dtype', node, tensorMap, context) as DataType)];\n }\n case 'OnesLike': {\n return [tfOps.onesLike(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n }\n case 'RandomUniform': {\n return [tfOps.randomUniform(\n // tslint:disable-next-line:no-any\n getParamValue('shape', node,

tensorMap, context) as any,\n getParamValue('minval', node, tensorMap, context) as number,\n getParamValue('maxval', node, tensorMap, context) as number,\n getParamValue('dtype', node, tensorMap, context) as DataType)];\n }\n case 'Range': {\n const start =\n getParamValue('start', node, tensorMap, context) as number;\n const stop =\n getParamValue('stop', node, tensorMap, context) as number;\n const step =\n getParamValue('step', node, tensorMap, context) as number;\n return [tfOps.range(\n start, stop, step,\n getParamValue('dtype', node, tensorMap, context) as 'float32' |\n 'int32')];\n }\n case 'TruncatedNormal': {\n const shape =\n getParamValue('shape', node, tensorMap, context) as number[];\n const mean =\n getParamValue('mean', node, tensorMap, context) as number;\n const stdDev =\n getParamValue('stdDev', node, tensorMap, context) as number;\n const seed =\n getParamValue('seed', node, tensorMap, context) as number;\n return [tfOps.truncatedNormal(\n shape, mean, stdDev,\n getParamValue('dtype', node, tensorMap, context) as 'float32' |\n 'int32',\n seed)];\n }\n case 'Zeros': {\n return [tfOps.zeros(\n getParamValue('shape', node, tensorMap, context) as number[],\n getParamValue('dtype', node, tensorMap, context) as DataType)];\n }\n case 'ZerosLike': {\n return [tfOps.zerosLike(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n }\n default:\n throw TypeError(`Node type ${node.op} is not implemented`);\n }\n};\n\nexport const CATEGORY = 'creation';\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing\n permissions and\n * limitations under the License.\n *\n ==\n */\n\nimport {Tensor, Tensor1D, Tensor2D} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\n\nimport {NamedTensorsMap} from '../../data/types';\nimport {ExecutionContext} from '../../executor/execution_context';\nimport {InternalOpAsyncExecutor, Node} from '../types';\n\nimport {getParamValue} from './utils';\n\nfunction nmsParams(\n node: Node, tensorMap: NamedTensorsMap, context: ExecutionContext) {\n const boxes = getParamValue('boxes', node, tensorMap, context) as Tensor;\n const scores = getParamValue('scores', node, tensorMap, context) as Tensor;\n const maxOutputSize =\n getParamValue('maxOutputSize', node, tensorMap, context) as number;\n const iouThreshold =\n getParamValue('iouThreshold', node, tensorMap, context)\n as number;\n const scoreThreshold =\n getParamValue('scoreThreshold', node, tensorMap, context) as number;\n const softNmsSigma =\n getParamValue('softNmsSigma', node, tensorMap, context) as number;\n\n return {\n boxes,\n scores,\n maxOutputSize,\n iouThreshold,\n scoreThreshold,\n softNmsSigma\n };\n}\n\nexport const executeOp: InternalOpAsyncExecutor = async(\n node: Node, tensorMap: NamedTensorsMap,\n context: ExecutionContext): Promise<Tensor[]> => {\n switch (node.op) {\n case 'NonMaxSuppressionV5': {\n const {\n boxes,\n scores,\n maxOutputSize,\n iouThreshold,\n scoreThreshold,\n softNmsSigma\n } = nmsParams(node, tensorMap, context);\n\n const result = await tfOps.image.nonMaxSuppressionWithScoreAsync(\n boxes as Tensor2D, scores as Tensor1D, maxOutputSize, iouThreshold,\n scoreThreshold, softNmsSigma);\n\n return [result.selectedIndices, result.selectedScores];\n }\n case 'NonMaxSuppressionV4': {\n const {boxes, scores, maxOutputSize, iouThreshold, scoreThreshold} =\n nmsParams(node, tensorMap, context);\n\n const padToMaxOutputSize =\n getParamValue('padToMaxOutputSize', node, tensorMap, context) as\n boolean;\n\n const result = await tfOps.image.nonMaxSuppressionPaddedAsync(\n boxes as Tensor2D, scores as Tensor1D, maxOutputSize,

iouThreshold,\n scoreThreshold, padToMaxOutputSize);\n\n return [result.selectedIndices, result.validOutputs];\n }\n case 'NonMaxSuppressionV3':\n case 'NonMaxSuppressionV2': {\n const {boxes, scores, maxOutputSize, iouThreshold, scoreThreshold} =\n nmsParams(node, tensorMap, context);\n\n return [await tfOps.image.nonMaxSuppressionAsync(\n boxes as Tensor2D, scores as Tensor1D, maxOutputSize, iouThreshold,\n scoreThreshold)];\n }\n case 'Where': {\n const condition = tfOps.cast(\n (getParamValue('condition', node, tensorMap, context) as Tensor),\n 'bool');\n const result = [await tfOps.whereAsync(condition)];\n condition.dispose();\n return result;\n }\n case 'ListDiff': {\n return tfOps.setdiff1dAsync(\n getParamValue('x', node, tensorMap, context) as Tensor,\n getParamValue('y', node, tensorMap, context) as Tensor);\n }\n default:\n throw TypeError(`Node type ${node.op} is not implemented`);\n }\n};\n\nexport const CATEGORY = 'dynamic';\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ===\n */\n\nimport {Tensor} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\n\nimport {NamedTensorsMap} from '../../data/types';\nimport {ExecutionContext} from '../../executor/execution_context';\nimport {InternalOpExecutor, Node} from '../types';\n\nimport {getParamValue} from './utils';\n\nexport const executeOp: InternalOpExecutor =\n (node: Node, tensorMap: NamedTensorsMap, context: ExecutionContext):\n Tensor[] => {\n switch (node.op) {\n case 'TopKV2': {\n const x = getParamValue('x', node, tensorMap, context) as Tensor;\n const k = getParamValue('k', node, tensorMap,\n context) as number;\n const sorted =\n getParamValue('sorted', node, tensorMap, context) as boolean;\n const result = tfOps.topk(x, k, sorted);\n return [result.values, result.indices];\n }\n case 'Unique': {\n const x = getParamValue('x', node, tensorMap, context) as Tensor;\n const result = tfOps.unique(x);\n return [result.values, result.indices];\n }\n case 'UniqueV2': {\n const x = getParamValue('x', node, tensorMap, context) as Tensor;\n const axis =\n getParamValue('axis', node, tensorMap, context) as number;\n const result = tfOps.unique(x, axis);\n return [result.values, result.indices];\n }\n default:\n throw TypeError(`Node type ${node.op} is not implemented`);\n }\n};\n\nexport const CATEGORY = 'evaluation';\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ===\n */\n\nimport {Tensor} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\n\nimport {NamedTensorsMap} from '../../data/types';\nimport {ExecutionContext} from '../../executor/execution_context';\nimport {InternalOpExecutor, Node} from '../types';\n\nimport {cloneTensor, getParamValue, getTensor} from './utils';\n\nexport const executeOp: InternalOpExecutor =\n (node: Node, tensorMap: NamedTensorsMap,\n context: ExecutionContext): Tensor[] => {\n switch (node.op) {\n case 'Const': {\n return tensorMap[node.name];\n }\n case 'PlaceholderWithDefault':\n const def =\n getParamValue('default', node, tensorMap, context) as Tensor;\n return [getTensor(node.name, tensorMap,

context) || def];\n case 'Placeholder':\n return [getTensor(node.name, tensorMap, context)];\n case 'Identity':\n case 'StopGradient':\n case 'FakeQuantWithMinMaxVars': { // This op is currently ignored.\n const data = getParamValue('x', node, tensorMap, context) as Tensor;\n return [cloneTensor(data)];\n }\n case 'IdentityN':\n return (getParamValue('x',\n node, tensorMap, context) as Tensor[])\n .map((t: Tensor) => cloneTensor(t));\n case 'Snapshot':\n const snapshot =\n (getParamValue('x', node, tensorMap, context) as Tensor);\n return [cloneTensor(snapshot)];\n case 'Shape':\n return [tfOps.tensor1d(\n (getParamValue('x', node, tensorMap, context) as Tensor).shape,\n 'int32')];\n case 'ShapeN':\n return (getParamValue('x', node, tensorMap, context) as Tensor[])\n .map((t: Tensor) => tfOps.tensor1d(t.shape));\n case 'Size':\n return [tfOps.scalar(\n (getParamValue('x', node, tensorMap, context) as Tensor).size,\n 'int32')];\n case 'Rank':\n return [tfOps.scalar(\n (getParamValue('x', node, tensorMap, context) as Tensor).rank,\n 'int32')];\n case 'NoOp':\n return [tfOps.scalar(1)];\n case 'Print':\n const input = getParamValue('x', node, tensorMap, context) as Tensor;\n const data =\n getParamValue('data', node, tensorMap, context) as Tensor[];\n const message =\n getParamValue('message', node, tensorMap, context) as string;\n const summarize =\n getParamValue('summarize', node, tensorMap, context) as number;\n console.warn(\n 'The graph has a tf.print() operation,' +\n 'usually used for debugging, which slows down performance.');\n console.log(message);\n for (let i = 0; i < data.length; i++) {\n console.log(Array.prototype.slice.call(data[i].dataSync())\n .slice(0, summarize));\n }\n return [input];\n\n default:\n throw TypeError(`Node type ${node.op} is not implemented`);\n }\n };\n\nexport const CATEGORY = 'graph';\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==\n */\nimport {DataType, keep, scalar, stack, Tensor, tidy, unstack, util} from '@tensorflow/tfjs-core';\n\n/**\n * Hashtable contains a set of tensors, which can be accessed by key.\n */\nexport class HashTable {\n readonly handle: Tensor;\n\n // tslint:disable-next-line: no-any\n private tensorMap: Map<any, Tensor>;\n\n get id() {\n return this.handle.id;\n }\n\n /**\n * Constructor of HashTable. Creates a hash table.\n *\n * @param keyDType `dtype` of the table keys.\n * @param valueDType `dtype` of the table values.\n */\n constructor(readonly keyDType: DataType, readonly valueDType: DataType) {\n this.handle = scalar(0);\n // tslint:disable-next-line: no-any\n this.tensorMap = new Map<any, Tensor>();\n\n keep(this.handle);\n }\n\n /**\n * Dispose the tensors and handle and clear the hashtable.\n */\n clearAndClose() {\n this.tensorMap.forEach(value => value.dispose());\n this.tensorMap.clear();\n this.handle.dispose();\n }\n\n /**\n * The number of items in the hash table.\n */\n size(): number {\n return this.tensorMap.size;\n }\n\n /**\n * Replaces the contents of the table with the specified keys and values.\n * @param keys Keys to store in the hashtable.\n * @param values Values to store in the hashtable.\n */\n async import(keys: Tensor, values: Tensor): Promise<Tensor> {\n this.checkKeyAndValueTensor(keys, values);\n\n // We only store the primitive values of the keys, this allows lookup\n // to be O(1).\n const $keys = await keys.data();\n\n // Clear the hashTable before inserting new values.\n this.tensorMap.forEach(value => value.dispose());\n this.tensorMap.clear();\n\n return tidy(() => {\n const $values = unstack(values);\n\n const keysLength = $keys.length;\n const valuesLength = $values.length;\n\n util.assert(\n keysLength === valuesLength,\n () => `The number of elements doesn't match, keys has ` +\n `${keysLength} elements, the values has ${valuesLength} ` +\n `elements.`);\n\n for (let i = 0; i < keysLength; i++) {\n const key = $keys[i];\n const value = $values[i];\n\n keep(value);\n this.tensorMap.set(key, value);\n }\n

return this.handle;\n });\n }\n\n /**\n * Looks up
 keys in a hash table, outputs the corresponding values.\n *\n * Performs batch lookups, for every element in the key tensor, `find`\n * stacks the corresponding value into the return tensor.\n *\n * If an element is not present in the table, the given `defaultValue` is\n * used.\n *\n * @param keys Keys to look up. Must have the same type as the keys of the\n *   table.\n * @param defaultValue The scalar `defaultValue` is the value output for keys\n *   not present in the table. It must also be of the same type as the\n *   table values.\n */\n async find(keys: Tensor, defaultValue: Tensor): Promise<Tensor> {\n this.checkKeyAndValueTensor(keys, defaultValue);\n\n const $keys = await keys.data();\n\n return tidy(() => {\n const result: Tensor[] = [];\n\n for (let i = 0; i < $keys.length; i++) {\n const key = $keys[i];\n\n const value = this.findWithDefault(key, defaultValue);\n
 result.push(value);\n }\n\n
 return stack(result);\n });\n }\n\n // tslint:disable-next-line: no-any\n private findWithDefault(key: any, defaultValue: Tensor): Tensor {\n const result = this.tensorMap.get(key);\n\n return result != null ? result : defaultValue;\n }\n\n private checkKeyAndValueTensor(key: Tensor, value: Tensor) {\n if (key.dtype !== this.keyDType) {\n throw new Error(\n `Expect key dtype ${this.keyDType}, but got ` +\n `${key.dtype}`);\n }\n\n if (value.dtype !== this.valueDType) {\n throw new Error(\n `Expect value dtype ${this.valueDType}, but got ` +\n `${value.dtype}`);\n }\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law
 or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
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*/\n\nimport {DataType, Tensor} from '@tensorflow/tfjs-core';\n\nimport {NamedTensorsMap} from '../../data/types';\nimport {ExecutionContext} from '../../executor/execution_context';\nimport {HashTable} from '../../executor/hash_table';\nimport {ResourceManager} from '../../executor/resource_manager';\nimport {InternalOpAsyncExecutor, Node} from '../types';\n\nimport {getParamValue} from './utils';\n\nexport const executeOp: InternalOpAsyncExecutor = async(\n node: Node, tensorMap: NamedTensorsMap, context: ExecutionContext,\n resourceManager: ResourceManager): Promise<Tensor[]> => {\n switch (node.op) {\n
 case 'HashTable':\n case 'HashTableV2': {\n const keyDType =\n getParamValue('keyDType', node, tensorMap, context) as DataType;\n const valueDType =\n getParamValue('valueDType', node, tensorMap, context) as DataType;\n\n const hashTable = new HashTable(keyDType, valueDType);\n resourceManager.addHashTable(node.name, hashTable);\n return [hashTable.handle];\n }\n case 'LookupTableImport':\n case 'LookupTableImportV2': {\n const handle = getParamValue(\n 'tableHandle', node, tensorMap, context,\n resourceManager) as Tensor;\n const keys = getParamValue('keys', node, tensorMap, context) as Tensor;\n const values =\n getParamValue('values', node, tensorMap, context) as Tensor;\n\n const hashTable = resourceManager.getHashTableById(handle.id);\n\n
  return [await hashTable.import(keys, values)];\n }\n case 'LookupTableFind':\n case 'LookupTableFindV2': {\n const handle = getParamValue(\n 'tableHandle', node, tensorMap, context,\n resourceManager) as Tensor;\n const keys = getParamValue('keys', node, tensorMap, context) as Tensor;\n const defaultValue =\n getParamValue('defaultValue', node, tensorMap, context) as Tensor;\n\n const hashTable = resourceManager.getHashTableById(handle.id);\n return [await hashTable.find(keys, defaultValue)];\n }\n default:\n throw TypeError(`Node type ${node.op} is not implemented`);\n }\n};\n\nexport const CATEGORY = 'hash_table';\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n

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 * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {Tensor, Tensor1D, Tensor2D, Tensor3D, Tensor4D} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\n\nimport {NamedTensorsMap} from '../../data/types';\nimport {ExecutionContext} from '../../executor/execution_context';\nimport {InternalOpExecutor, Node} from '../types';\n\nimport {getParamValue} from './utils';\n\nexport const executeOp: InternalOpExecutor =\n    (node: Node, tensorMap: NamedTensorsMap,\n     context: ExecutionContext): Tensor[] => {\n      switch (node.op) {\n case 'ResizeBilinear': {\n          const images
 =\n              getParamValue('images', node, tensorMap, context) as Tensor;\n          const size =\n getParamValue('size', node, tensorMap, context) as number[];\n          const alignCorners =\n getParamValue('alignCorners', node, tensorMap, context) as\n              boolean;\n          const halfPixelCenters =\n              getParamValue('halfPixelCenters', node, tensorMap, context) as\n              boolean;\n          return [tfOps.image.resizeBilinear(\n              images as Tensor3D | Tensor4D, [size[0], size[1]], alignCorners,\n halfPixelCenters)];\n        }\n        case 'ResizeNearestNeighbor': {\n          const images =\n getParamValue('images', node, tensorMap, context) as Tensor;\n          const size =\n              getParamValue('size', node, tensorMap, context) as number[];\n          const alignCorners =\n              getParamValue('alignCorners', node, tensorMap, context) as\n              boolean;\n
    const halfPixelCenters =\n              getParamValue('halfPixelCenters', node, tensorMap, context) as\n boolean;\n          return [tfOps.image.resizeNearestNeighbor(\n              images as Tensor3D | Tensor4D, [size[0], size[1]], alignCorners,\n              halfPixelCenters)];\n        }\n        case 'CropAndResize': {\n          const image =\n            getParamValue('image', node, tensorMap, context) as Tensor;\n          const boxes =\n getParamValue('boxes', node, tensorMap, context) as Tensor;\n          const boxInd =\n getParamValue('boxInd', node, tensorMap, context) as Tensor;\n          const cropSize =\n getParamValue('cropSize', node, tensorMap, context) as number[];\n          const method =\n getParamValue('method', node, tensorMap, context) as string;\n          const extrapolationValue =\n getParamValue('extrapolationValue', node, tensorMap, context) as\n              number;\n          return [tfOps.image.cropAndResize(\n              image as Tensor4D, boxes as Tensor2D, boxInd as Tensor1D,\n              cropSize as [number, number], method as 'bilinear' | 'nearest',\n              extrapolationValue)];\n        }\n default:\n          throw TypeError(`Node type ${node.op} is not implemented`);\n      }\n    };\n\nexport const CATEGORY = 'image';\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations
 under the License.\n *
==========================================================================\n
*/\n\nimport {Tensor} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\n\nimport {NamedTensorsMap} from '../../data/types';\nimport {ExecutionContext} from '../../executor/execution_context';\nimport {InternalOpExecutor, Node} from '../types';\n\nimport {getParamValue} from './utils';\n\nexport const executeOp: InternalOpExecutor =\n  (node: Node, tensorMap: NamedTensorsMap,\n     context: ExecutionContext): Tensor[] => {\n      switch (node.op) {\n        case 'Equal': {\n          return [tfOps.equal(\n              getParamValue('a', node, tensorMap, context) as Tensor,\n              getParamValue('b', node, tensorMap, context) as Tensor)];\n        }\n        case 'NotEqual': {\n          return [tfOps.notEqual(\n              getParamValue('a', node, tensorMap, context)
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as Tensor,\n getParamValue('b', node, tensorMap, context) as Tensor)];\n }\n case 'Greater': {\n return [tfOps.greater(\n getParamValue('a', node, tensorMap, context) as Tensor,\n getParamValue('b', node, tensorMap, context) as Tensor)];\n }\n case 'GreaterEqual': {\n return [tfOps.greaterEqual(\n getParamValue('a', node, tensorMap, context) as Tensor,\n getParamValue('b', node, tensorMap, context) as Tensor)];\n }\n case 'Less': {\n return [tfOps.less(\n getParamValue('a', node, tensorMap, context) as Tensor,\n getParamValue('b', node, tensorMap, context) as Tensor)];\n }\n case 'LessEqual': {\n return [tfOps.lessEqual(\n getParamValue('a', node, tensorMap, context) as Tensor,\n getParamValue('b', node, tensorMap, context) as Tensor)];\n }\n case 'LogicalAnd':
{\n return [tfOps.logicalAnd(\n getParamValue('a', node, tensorMap, context) as Tensor,\n getParamValue('b', node, tensorMap, context) as Tensor)];\n }\n case 'LogicalNot': {\n return [tfOps.logicalNot(\n getParamValue('a', node, tensorMap, context) as Tensor)];\n }\n case 'LogicalOr': {\n return [tfOps.logicalOr(\n getParamValue('a', node, tensorMap, context) as Tensor,\n getParamValue('b', node, tensorMap, context) as Tensor)];\n }\n case 'Select':\n case 'SelectV2': {\n return [tfOps.where(\n getParamValue('condition', node, tensorMap, context) as Tensor,\n getParamValue('a', node, tensorMap, context) as Tensor,\n getParamValue('b', node, tensorMap, context) as Tensor)];\n }\n default:\n throw TypeError(`Node type ${node.op} is not implemented`);\n }\n};\n\nexport const
CATEGORY = 'logical';\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {Tensor, Tensor2D} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\n\nimport {NamedTensorsMap} from '../../data/types';\nimport
{ExecutionContext} from '../../executor/execution_context';\nimport {InternalOpExecutor, Node} from '../types';\n\nimport {getParamValue} from './utils';\n\nexport const executeOp: InternalOpExecutor =\n (node: Node, tensorMap: NamedTensorsMap,\n context: ExecutionContext): Tensor[] => {\n switch (node.op) {\n case 'BatchMatMul':\n case 'BatchMatMulV2':\n case 'MatMul':\n return [tfOps.matMul(\n getParamValue('a', node, tensorMap, context) as Tensor2D,\n getParamValue('b', node, tensorMap, context) as Tensor2D,\n getParamValue('transposeA', node, tensorMap, context) as boolean,\n getParamValue('transposeB', node, tensorMap, context) as\n boolean)];\n\n case 'Transpose':\n return [tfOps.transpose(\n getParamValue('x', node, tensorMap, context) as Tensor,\n getParamValue('perm', node, tensorMap, context) as number[])];\n\n case '_FusedMatMul':\n const [extraOp, activationFunc] =\n (getParamValue('fusedOps', node, tensorMap, context) as string[]);\n\n const isBiasAdd = extraOp === 'biasadd';\n const isPrelu = activationFunc === 'prelu';\n\n const numArgs =\n (getParamValue('numArgs', node, tensorMap, context) as number);\n const leakyreluAlpha =\n getParamValue('leakyreluAlpha', node, tensorMap, context) as\n number;\n\n if (isBiasAdd) {\n if (isPrelu && numArgs !== 2) {\n throw new Error(\n 'Fused MatMul with BiasAdd and Prelu must have two ' +\n 'extra arguments: bias and alpha.');\n }\n if (!isPrelu && numArgs !== 1) {\n throw new Error(\n 'Fused MatMul with BiasAdd must have one extra argument: bias.');\n }\n }\n const [biasArg, preluArg] =\n getParamValue('args',
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node, tensorMap, context) as Tensor[];\n return [tfOps.fused.matMul({\n a: getParamValue('a', node, tensorMap, context) as Tensor2D,\n b: getParamValue('b', node, tensorMap, context) as Tensor2D,\n transposeA: getParamValue('transposeA', node, tensorMap, context) as\n boolean,\n transposeB: getParamValue('transposeB', node, tensorMap, context) as\n boolean,\n bias: biasArg,\n activation: activationFunc as tfOps.fused.Activation,\n preluActivationWeights: preluArg,\n leakyreluAlpha\n })];\n\n default:\n throw TypeError(`Node type ${node.op} is not implemented`);\n }\n };\n\nexport const CATEGORY = 'matrices';\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n
* You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n*/\n\nimport {Scalar, Tensor, Tensor3D, Tensor4D} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\n\nimport {NamedTensorsMap} from '../../data/types';\nimport {ExecutionContext} from '../../executor/execution_context';\nimport {InternalOpExecutor, Node} from '../types';\n\nimport {getParamValue} from './utils';\n\nexport const executeOp: InternalOpExecutor =\n (node: Node, tensorMap: NamedTensorsMap,\n context: ExecutionContext): Tensor[] => {\n switch (node.op) {\n case 'FusedBatchNorm':\n case 'FusedBatchNormV2': {\n return [tfOps.batchNorm(\n getParamValue('x', node, tensorMap, context) as Tensor,\n getParamValue('mean', node, tensorMap, context) as Tensor,\n getParamValue('variance', node, tensorMap, context) as Tensor,\n getParamValue('offset', node, tensorMap, context) as Tensor,\n getParamValue('scale', node, tensorMap, context) as Tensor,\n getParamValue('epsilon', node, tensorMap, context) as number)];\n }\n case 'FusedBatchNormV3': {\n return [tfOps.batchNorm(\n getParamValue('x', node, tensorMap, context) as Tensor,\n getParamValue('mean', node, tensorMap, context) as Tensor,\n getParamValue('variance', node, tensorMap, context) as Tensor,\n getParamValue('offset',
node, tensorMap, context) as Tensor,\n getParamValue('scale', node, tensorMap, context) as Tensor,\n getParamValue('epsilon', node, tensorMap, context) as number)];\n }\n case 'LRN': {\n return [tfOps.localResponseNormalization(\n getParamValue('x', node, tensorMap, context) as Tensor3D |\n Tensor4D,\n getParamValue('radius', node, tensorMap, context) as number,\n getParamValue('bias', node, tensorMap, context) as number,\n getParamValue('alpha', node, tensorMap, context) as number,\n getParamValue('beta', node, tensorMap, context) as number)];\n }\n case 'Softmax': {\n return [tfOps.softmax(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n }\n case 'LogSoftmax': {\n return [tfOps.logSoftmax(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n }\n case
'SparseToDense': {\n return [tfOps.sparseToDense(\n getParamValue('sparseIndices', node, tensorMap, context) as\n Tensor,\n getParamValue('outputShape', node, tensorMap, context) as Tensor,\n getParamValue('sparseValues', node, tensorMap, context) as\n number[],\n getParamValue('defaultValue', node, tensorMap, context) as\n Scalar)];\n }\n default:\n throw TypeError(`Node type ${node.op} is not implemented`);\n }\n };\n\nexport const CATEGORY = 'normalization';\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n *
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permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\n\nimport {Tensor, Tensor1D, Tensor2D} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-
from-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\n\nimport
{NamedTensorsMap} from '../../data/types';\nimport {ExecutionContext} from
'../../executor/execution_context';\nimport {InternalOpExecutor, Node} from '../types';\n\nimport {getParamValue}
from './utils';\n\nexport const executeOp: InternalOpExecutor =\n    (node: Node, tensorMap: NamedTensorsMap,\n
  context: ExecutionContext): Tensor[] => {\n      switch (node.op) {\n        case 'Max': {\n          const axis =\n
  getParamValue('axis',
 node, tensorMap, context) as number[];\n          const keepDims =\n              getParamValue('keepDims', node,
tensorMap, context) as boolean;\n          return [tfOps.max(\n              getParamValue('x', node, tensorMap, context)
as Tensor, axis,\n              keepDims)];\n        }\n        case 'Mean': {\n          const axis =\n
getParamValue('axis', node, tensorMap, context) as number[];\n          const keepDims =\n
getParamValue('keepDims', node, tensorMap, context) as boolean;\n          return [tfOps.mean(\n
getParamValue('x', node, tensorMap, context) as Tensor, axis,\n              keepDims)];\n        }\n        case 'Min': {\n
    const axis =\n              getParamValue('axis', node, tensorMap, context) as number[];\n          const keepDims =\n
        getParamValue('keepDims', node, tensorMap, context) as boolean;\n          return [tfOps.min(\n
getParamValue('x', node, tensorMap, context) as Tensor,
 axis,\n              keepDims)];\n        }\n        case 'Sum': {\n          const axis =\n              getParamValue('axis', node,
tensorMap, context) as number[];\n          const keepDims =\n              getParamValue('keepDims', node, tensorMap,
context) as boolean;\n          return [tfOps.sum(\n              getParamValue('x', node, tensorMap, context) as Tensor,
axis,\n              keepDims)];\n        }\n        case 'All': {\n          const axis =\n              getParamValue('axis', node,
tensorMap, context) as number[];\n          const keepDims =\n              getParamValue('keepDims', node, tensorMap,
context) as boolean;\n          return [tfOps.all(\n              getParamValue('x', node, tensorMap, context) as Tensor,
axis,\n              keepDims)];\n        }\n        case 'Any': {\n          const axis =\n              getParamValue('axis', node,
tensorMap, context) as number[];\n          const keepDims =\n              getParamValue('keepDims', node, tensorMap,
 context) as boolean;\n          return [tfOps.any(\n              getParamValue('x', node, tensorMap, context) as Tensor,
axis,\n              keepDims)];\n        }\n        case 'ArgMax': {\n          const axis =\n              getParamValue('axis',
node, tensorMap, context) as number;\n          return [tfOps.argMax(\n              getParamValue('x', node, tensorMap,
context) as Tensor, axis)];\n        }\n        case 'ArgMin': {\n          const axis =\n              getParamValue('axis', node,
tensorMap, context) as number;\n          return [tfOps.argMin(\n              getParamValue('x', node, tensorMap,
context) as Tensor, axis)];\n        }\n        case 'Prod': {\n          const axis =\n              getParamValue('axis', node,
tensorMap, context) as number[];\n          const keepDims =\n              getParamValue('keepDims', node, tensorMap,
context) as boolean;\n          return [tfOps.prod(\n              getParamValue('x', node, tensorMap, context) as Tensor,
axis,\n
              keepDims)];\n        }\n        case 'Cumsum': {\n          const axis =\n              getParamValue('axis', node,
tensorMap, context) as number;\n          const exclusive =\n              getParamValue('exclusive', node, tensorMap,
context) as boolean;\n          const reverse =\n              getParamValue('reverse', node, tensorMap, context) as
boolean;\n          return [tfOps.cumsum(\n              getParamValue('x', node, tensorMap, context) as Tensor, axis,\n
          exclusive, reverse)];\n        }\n        case 'Bincount':\n          const x = getParamValue('x', node, tensorMap,
context) as Tensor1D;\n          const weights =\n              getParamValue('weights', node, tensorMap, context) as
Tensor1D;\n          const size =\n              getParamValue('size', node, tensorMap, context) as number;\n\n
return [tfOps.bincount(x, weights, size)];\n        case 'DenseBincount': {\n          const x = getParamValue('x', node,
tensorMap, context)
 as Tensor1D |\n              Tensor2D;\n          const weights =\n              getParamValue('weights', node, tensorMap,
context) as Tensor1D |\n              Tensor2D;\n          const size =\n              getParamValue('size', node, tensorMap,
context) as number;\n\n          const binaryOutput =\n              getParamValue('binaryOutput', node, tensorMap,
context) as\n              boolean;\n\n          return [tfOps.denseBincount(x, weights, size, binaryOutput)];\n        }\n
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default:\n          throw TypeError(`Node type ${node.op} is not implemented`);\n      }\n    };\n\nexport const CATEGORY = 'reduction';\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========================================================================\n */\n\nimport {Scalar, Tensor, Tensor1D, tidy, util} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\n\nimport {NamedTensorsMap} from '../../data/types';\nimport {ExecutionContext} from '../../executor/execution_context';\nimport {InternalOpExecutor, Node} from '../types';\n\nimport {getParamValue} from './utils';\n\nexport const executeOp: InternalOpExecutor =\n    (node: Node, tensorMap: NamedTensorsMap,\n     context: ExecutionContext): Tensor[] => {\n      switch (node.op) {\n        case 'ConcatV2':\n        case 'Concat': {\n          const n = getParamValue('n', node, tensorMap, context) as number;\n          const axis =\n              getParamValue('axis', node, tensorMap, context) as number;\n          let inputs =\n              getParamValue('tensors', node, tensorMap, context) as Tensor[];\n          inputs = inputs.slice(0, n);\n          return [tfOps.concat(inputs, axis)];\n        }\n        case 'Gather': {\n          const input = getParamValue('x', node, tensorMap, context) as Tensor;\n          const indices =\n              getParamValue('indices', node, tensorMap, context) as Tensor1D;\n          return [tfOps.gather(input, tfOps.cast(indices, 'int32'), 0)];\n        }\n        case 'GatherV2': {\n          const axis =\n              getParamValue('axis', node, tensorMap, context) as number;\n          const batchDims =\n              getParamValue('batchDims', node, tensorMap, context) as number;\n          const input = getParamValue('x', node, tensorMap, context) as Tensor;\n\n          const indices =\n              getParamValue('indices', node, tensorMap, context) as Tensor1D;\n          return [tfOps.gather(\n              input, tfOps.cast(indices, 'int32'), axis, batchDims)];\n        }\n        case 'Reverse': {\n          const dims =\n              getParamValue('dims', node, tensorMap, context) as boolean[];\n          const axis = [];\n          for (let i = 0; i < dims.length; i++) {\n            if (dims[i]) {\n              axis.push(i);\n            }\n          }\n          const input = getParamValue('x', node, tensorMap, context) as Tensor;\n          return [tfOps.reverse(input, axis)];\n        }\n        case 'ReverseV2': {\n          const axis =\n              getParamValue('axis', node, tensorMap, context) as number[];\n          const input = getParamValue('x', node, tensorMap, context) as Tensor;\n          return [tfOps.reverse(input, axis)];\n        }\n        case 'Slice': {\n          // tslint:disable-next-line:no-any\n          const begin = getParamValue('begin', node, tensorMap, context) as any;\n          // tslint:disable-next-line:no-any\n          const size = getParamValue('size', node, tensorMap, context) as any;\n          return [tfOps.slice(\n              getParamValue('x', node, tensorMap, context) as Tensor, begin,\n              size)];\n        }\n        case 'StridedSlice': {\n          const begin =\n              getParamValue('begin', node, tensorMap, context) as number[];\n          const end =\n              getParamValue('end', node, tensorMap, context) as number[];\n          const strides =\n              getParamValue('strides', node, tensorMap, context) as number[];\n          const beginMask =\n              getParamValue('beginMask', node, tensorMap, context) as number;\n          const endMask =\n              getParamValue('endMask', node, tensorMap, context) as number;\n          const ellipsisMask =\n              getParamValue('ellipsisMask', node, tensorMap, context) as number;\n          const newAxisMask =\n              getParamValue('newAxisMask', node, tensorMap, context) as number;\n          const shrinkAxisMask =\n              getParamValue('shrinkAxisMask', node, tensorMap, context) as\n              number;\n          const tensor = getParamValue('x', node, tensorMap, context) as Tensor;\n\n          return [tfOps.stridedSlice(\n              tensor, begin, end, strides, beginMask, endMask, ellipsisMask,\n              newAxisMask, shrinkAxisMask)];\n        }\n        case 'Pack': {\n          return tidy(() => {\n            const axis =\n                getParamValue('axis', node, tensorMap, context) as number;\n            const tensors =\n                getParamValue('tensors', node, tensorMap, context) as Tensor[];\n            // Reshape the tensors to the first tensor's
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shape if they don't\n // match.\n const shape = tensors[0].shape;\n const squeezedShape = tfOps.squeeze(tensors[0]).shape;\n const
mapped = tensors.map(tensor => {\n const sameShape = util.arraysEqual(tensor.shape, shape);\n if (!sameShape &&\n !util.arraysEqual(\n tfOps.squeeze(tensor).shape, squeezedShape)) {\n throw new Error('the input tensors shape does not match');\n }\n return sameShape ? tensor : tfOps.reshape(tensor, shape);\n });\n return [tfOps.stack(mapped, axis)];\n });\n }\n case 'Unpack': {\n const axis =\n getParamValue('axis', node, tensorMap, context) as number;\n const tensor =\n getParamValue('tensor', node, tensorMap, context) as Tensor;\n return tfOps.unstack(tensor, axis);\n }\n case 'Tile': {\n const reps =\n getParamValue('reps', node, tensorMap, context) as number[];\n return [tfOps.tile(\n getParamValue('x', node, tensorMap, context)
as Tensor, reps)];\n }\n case 'Split':\n case 'SplitV': {\n const axis =\n getParamValue('axis', node, tensorMap, context) as number;\n const numOrSizeSplits =\n getParamValue('numOrSizeSplits', node, tensorMap, context) as\n number |\n number[];\n const tensor = getParamValue('x', node, tensorMap, context) as Tensor;\n\n return tfOps.split(tensor, numOrSizeSplits, axis);\n }\n case 'ScatterNd': {\n const indices =\n getParamValue('indices', node, tensorMap, context) as Tensor;\n const values =\n getParamValue('values', node, tensorMap, context) as Tensor;\n const shape =\n getParamValue('shape', node, tensorMap, context) as number[];\n return [tfOps.scatterND(indices, values, shape)];\n }\n case 'GatherNd': {\n const x = getParamValue('x', node, tensorMap, context)
as Tensor;\n const indices =\n getParamValue('indices', node, tensorMap, context) as Tensor;\n return [tfOps.gatherND(x, indices)];\n }\n case 'SparseToDense': {\n const indices =\n getParamValue('sparseIndices', node, tensorMap, context) as\n Tensor;\n const shape =\n getParamValue('outputShape', node, tensorMap, context) as\n number[];\n const sparseValues =\n getParamValue('sparseValues', node, tensorMap, context) as Tensor;\n const defaultValue =\n getParamValue('defaultValue', node, tensorMap, context) as Scalar;\n return [tfOps.sparseToDense(\n indices, sparseValues, shape,\n sparseValues.dtype === defaultValue.dtype ?\n defaultValue :\n tfOps.cast(defaultValue, sparseValues.dtype))];\n }\n default:\n throw TypeError(`Node type ${node.op} is not implemented`);\n }\n };\n\nexport const CATEGORY = 'slice_join';\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n
*/\n\nimport {Tensor} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport * as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\n\nimport
{NamedTensorsMap} from '../../data/types';\nimport {ExecutionContext} from '../../executor/execution_context';\nimport {InternalOpExecutor, Node} from '../types';\n\nimport {getParamValue} from './utils';\n\nexport const executeOp: InternalOpExecutor =\n (node: Node, tensorMap: NamedTensorsMap, context: ExecutionContext):\n Tensor[] => {\n switch (node.op) {\n case 'FFT': {\n return [tfOps.fft(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n }\n case 'IFFT': {\n return [tfOps.ifft(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n }\n case 'RFFT': {\n return [tfOps.rfft(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n }\n case 'IRFFT': {\n return [tfOps.irfft(\n getParamValue('x', node, tensorMap, context) as Tensor)];\n\n }\n default:\n throw TypeError(`Node type ${node.op} is not implemented`);\n }\n};\n\nexport const CATEGORY = 'spectral';\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights

Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========\n */\n\nimport {Tensor, Tensor4D} from '@tensorflow/tfjs-core';\n// tslint:disable-next-line: no-imports-from-dist\nimport
* as tfOps from '@tensorflow/tfjs-core/dist/ops/ops_for_converter';\n\nimport {NamedTensorsMap} from '../../data/types';\nimport {ExecutionContext} from '../../executor/execution_context';\nimport {InternalOpExecutor, Node} from '../types';\n\nimport {getParamValue} from './utils';\n\nexport const executeOp: InternalOpExecutor =\n (node: Node, tensorMap: NamedTensorsMap,\n context: ExecutionContext): Tensor[] => {\n switch (node.op) {\n case 'Cast': {\n return [tfOps.cast(\n getParamValue('x', node, tensorMap, context) as Tensor,\n getParamValue('dtype', node, tensorMap, context) as 'int32' |\n 'float32' | 'bool')];\n }\n case 'ExpandDims': {\n const axis =\n getParamValue('axis', node, tensorMap, context) as number;\n return [tfOps.expandDims(\n getParamValue('x', node, tensorMap, context) as Tensor, axis)];\n }\n case 'Squeeze': {\n const axis =\n getParamValue('axis', node, tensorMap, context) as number[];\n return [tfOps.squeeze(\n getParamValue('x', node, tensorMap, context) as Tensor, axis)];\n }\n\n case 'Reshape': {\n return [tfOps.reshape(\n getParamValue('x', node, tensorMap, context) as Tensor,\n getParamValue('shape', node, tensorMap, context) as number[])];\n }\n case 'MirrorPad': {\n return [tfOps.mirrorPad(\n getParamValue('x', node, tensorMap, context) as Tensor,\n getParamValue('padding', node, tensorMap, context) as\n Array<[number, number]>,\n getParamValue('mode', node, tensorMap, context) as 'reflect' |\n 'symmetric')];\n }\n case 'PadV2':\n case 'Pad': {\n return [tfOps.pad(\n getParamValue('x', node, tensorMap, context) as Tensor,\n getParamValue('padding',
node, tensorMap, context) as\n Array<[number, number]>,\n getParamValue('constantValue', node, tensorMap, context) as\n number)];\n }\n case 'SpaceToBatchND': {\n const blockShape =\n getParamValue('blockShape', node, tensorMap, context) as number[];\n const paddings =\n getParamValue('paddings', node, tensorMap, context) as number[][];\n return [tfOps.spaceToBatchND(\n getParamValue('x', node, tensorMap, context) as Tensor,\n blockShape, paddings)];\n }\n case 'BatchToSpaceND': {\n const blockShape =\n getParamValue('blockShape', node, tensorMap, context) as number[];\n const crops =\n getParamValue('crops', node, tensorMap, context) as number[][];\n return [tfOps.batchToSpaceND(\n getParamValue('x', node, tensorMap, context) as Tensor,\n blockShape,
crops)];\n }\n case 'DepthToSpace': {\n const blockSize =\n getParamValue('blockSize', node, tensorMap, context) as number;\n const dataFormat =\n (getParamValue('dataFormat', node, tensorMap, context) as\n string).toUpperCase() as 'NHWC' |\n 'NCHW';\n return [tfOps.depthToSpace(\n getParamValue('x', node, tensorMap, context) as Tensor4D,\n blockSize, dataFormat)];\n }\n case 'BroadcastTo': {\n return [tfOps.broadcastTo(\n getParamValue('x', node, tensorMap, context) as Tensor,\n getParamValue('shape', node, tensorMap, context) as number[])];\n }\n default:\n throw TypeError(`Node type ${node.op} is not implemented`);\n }\n };\n\nexport const CATEGORY = 'transformation';\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version
2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n *

WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport * as tfc from '@tensorflow/tfjs-core';\n\nimport {NamedTensorsMap} from '../data/types';\nimport {ExecutionContext} from '../executor/execution_context';\nimport {ResourceManager} from '../executor/resource_manager';\n\nimport {NodeValueImpl} from './custom_op/node_value_impl';\nimport {getRegisteredOp} from './custom_op/register';\nimport * as arithmetic from './executors/arithmetic_executor';\nimport * as basicMath from './executors/basic_math_executor';\nimport * as control from './executors/control_executor';\nimport * as convolution from './executors/convolution_executor';\nimport * as creation from './executors/creation_executor';\nimport * as dynamic from './executors/dynamic_executor';\nimport * as evaluation from './executors/evaluation_executor';\nimport * as graph from './executors/graph_executor';\nimport * as hashTable from './executors/hash_table_executor';\nimport * as image from './executors/image_executor';\nimport * as logical from './executors/logical_executor';\nimport * as matrices from './executors/matrices_executor';\nimport * as normalization from './executors/normalization_executor';\nimport * as reduction from './executors/reduction_executor';\nimport * as sliceJoin from './executors/slice_join_executor';\nimport * as spectral from './executors/spectral_executor';\nimport * as transformation from './executors/transformation_executor';\nimport {Node} from './types';\n\n/**\n * Executes the op defined by the node object.\n * @param node\n * @param tensorMap contains tensors for executed nodes and weights\n * @param context contains tensors and information for running the current node.\n * @param resourceManager Optional. Contains global resources of the model.\n */\nexport function executeOp(\n   node: Node, tensorMap: NamedTensorsMap, context: ExecutionContext,\n   resourceManager?: ResourceManager): tfc.Tensor[]|Promise<tfc.Tensor[]> {\n const value =\n   ((node: Node, tensorMap: NamedTensorsMap, context: ExecutionContext) => {\n   switch (node.category) {\n   case 'arithmetic':\n   return tfc.tidy(\n   () => arithmetic.executeOp(node, tensorMap, context));\n   case 'basic_math':\n   return tfc.tidy(\n   () => basicMath.executeOp(node, tensorMap, context));\n   case 'control':\n   return control.executeOp(node, tensorMap, context);\n   case 'convolution':\n   return tfc.tidy(\n   () => convolution.executeOp(node, tensorMap, context));\n   case 'creation':\n   return tfc.tidy(() => creation.executeOp(node, tensorMap, context));\n   case 'dynamic':\n   return dynamic.executeOp(node, tensorMap, context);\n   case 'evaluation':\n   return tfc.tidy(\n   () => evaluation.executeOp(node, tensorMap, context));\n   case 'image':\n   return tfc.tidy(() => image.executeOp(node, tensorMap, context));\n   case 'graph':\n   return tfc.tidy(() => graph.executeOp(node, tensorMap, context));\n   case 'logical':\n   return tfc.tidy(() => logical.executeOp(node, tensorMap, context));\n   case 'matrices':\n   return tfc.tidy(() => matrices.executeOp(node, tensorMap, context));\n   case 'normalization':\n   return tfc.tidy(\n   () => normalization.executeOp(node,\n   tensorMap, context));\n   case 'reduction':\n   return tfc.tidy(\n   () => reduction.executeOp(node, tensorMap, context));\n   case 'slice_join':\n   return tfc.tidy(\n   () => sliceJoin.executeOp(node, tensorMap, context));\n   case 'spectral':\n   return tfc.tidy(() => spectral.executeOp(node, tensorMap, context));\n   case 'transformation':\n   return tfc.tidy(\n   () => transformation.executeOp(node, tensorMap, context));\n   case 'hash_table':\n   return hashTable.executeOp(\n   node, tensorMap, context, resourceManager);\n   case 'custom':\n   const opMapper = getRegisteredOp(node.op);\n   if (opMapper && opMapper.customExecutor) {\n   return opMapper.customExecutor(\n   new NodeValueImpl(node, tensorMap, context));\n   } else {\n   throw TypeError(`Custom op ${node.op} is not registered.`);\n   }\n   default:\n   throw TypeError(\n   `Unknown op '${node.op}'. File an issue at ` +\n   `https://github.com/tensorflow/tfjs/issues so we can add it` +\n   `, or register a custom execution with tf.registerOp()`);\n   }\n   })(node, tensorMap, context);\n if (tfc.util.isPromise(value)) {\n   return (value as Promise<tfc.Tensor>).then((data) => [].concat(data));\n }\n return

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[].concat(value);\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==========================================================================\n
*/\nimport {Tensor} from '@tensorflow/tfjs-core';\n\nimport {NamedTensorsMap, TensorArrayMap, TensorListMap} from '../data/types';\n\nimport {TensorArray} from './tensor_array';\nimport {TensorList} from './tensor_list';\nimport {FunctionExecutor} from './types';\n\nexport interface ExecutionContextInfo {\n  id: number;
    // the unique id of the context info\n  frameName: string;    // The frame name of the loop, this comes from\n
        // the TensorFlow NodeDef.\n  iterationId: number;  // The iteration id of the loop\n}\n\n/**\n *
ExecutionContext captures the runtime environment of the node. It keeps\n * track of the current frame and iteration for the control flow ops.\n *\n * For example, typical Dynamic RNN model may contain loops, for which\n * TensorFlow will generate graphs with Enter/Exit nodes to control the\n * current execution frame, and NextIteration Nodes for iteration id increment.\n * For model with branch logic, TensorFLow will generate Switch/Merge ops.\n */\nexport class ExecutionContext {\n  private rootContext = {id: 0, frameName: '', iterationId: 0};\n  private contexts: ExecutionContextInfo[] = [this.rootContext];\n  private lastId = 0;\n  private _currentContextIds: string[];\n\n  constructor(\n      readonly weightMap: NamedTensorsMap = {},\n      readonly tensorArrayMap: TensorArrayMap = {},\n      readonly tensorListMap: TensorListMap = {},\n      readonly functionMap: {[key: string]: FunctionExecutor} = {}) {\n    this.generateCurrentContextIds();\n  }\n\n  private newFrame(id: number, frameName: string) {\n    return {id, frameName, iterationId: 0};\n  }\n\n  /**\n   * Set the current context\n   * @param contexts: ExecutionContextInfo[] the current path of execution\n   * frames\n   */\n  set currentContext(contexts: ExecutionContextInfo[]) {\n    if (this.contexts !== contexts) {\n      this.contexts = contexts;\n      this.generateCurrentContextIds();\n    }\n  }\n\n  get currentContext(): ExecutionContextInfo[] {\n    return this.contexts;\n  }\n\n  /**\n   * Returns the current context in string format.\n   */\n  get currentContextId(): string {\n    return this._currentContextIds[0];\n  }\n\n  /**\n   * Returns the current context and all parent contexts in string format.\n   * This allow access to the nodes in the current and parent frames.\n   */\n  get currentContextIds(): string[] {\n    return this._currentContextIds;\n  }\n\n  private generateCurrentContextIds() {\n    const names = [];\n    for (let i = 0; i < this.contexts.length - 1; i++) {\n      const contexts = this.contexts.slice(0, this.contexts.length - i);\n      names.push(this.contextIdforContexts(contexts));\n    }\n    names.push('');\n    this._currentContextIds = names;\n  }\n\n  private contextIdforContexts(contexts: ExecutionContextInfo[]) {\n    return contexts ?\n        contexts\n            .map(\n                context => (context.id === 0 && context.iterationId === 0) ?\n                    '' :\n                    `${context.frameName}-${context.iterationId}`)\n            .join('/') :\n        '';\n  }\n\n  /**\n   * Enter a new frame, a new context is pushed on the current context list.\n   * @param frameId new frame id\n   */\n  enterFrame(frameId: string) {\n    if (this.contexts) {\n      this.lastId++;\n      this.contexts = this.contexts.slice();\n      this.contexts.push(this.newFrame(this.lastId, frameId));\n      this._currentContextIds.unshift(this.contextIdforContexts(this.contexts));\n    }\n  }\n\n  /**\n   * Exit the current frame, the last context is removed from the current\n   * context list.\n   */\n  exitFrame() {\n    if (this.contexts && this.contexts.length > 1) {\n      this.contexts = this.contexts.slice();\n      this.contexts.splice(-1);\n      this.currentContextIds.shift();\n    } else {\n      throw new Error('Cannot exit frame, the context is empty');\n    }\n  }\n\n  /**\n   * Enter the next iteration of a loop, the iteration id of last context is\n   * increased.\n   */\n  nextIteration() {\n    if (this.contexts && this.contexts.length > 0) {\n      this.contexts = this.contexts.slice();\n      this.lastId++;\n      const context =\n          Object.assign({}, this.contexts[this.contexts.length - 1]);\n      context.iterationId += 1;\n      context.id = this.lastId;\n      this.contexts.splice(-1, 1, context);\n      this._currentContextIds.splice(\n          0, 1, this.contextIdforContexts(this.contexts));\n    } else {\n      throw new
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Error('Cannot increase frame iteration, the context is empty');\n }\n }\n\n getWeight(name: string): Tensor[] {\n return this.weightMap[name];\n }\n\n addTensorArray(tensorArray: TensorArray) {\n this.tensorArrayMap[tensorArray.id] = tensorArray;\n }\n\n getTensorArray(id: number): TensorArray {\n return this.tensorArrayMap[id];\n }\n\n addTensorList(tensorList: TensorList) {\n this.tensorListMap[tensorList.id] = tensorList;\n }\n\n getTensorList(id: number): TensorList {\n return this.tensorListMap[id];\n }\n\n dispose(keepIds: Set<number>) {\n for (const key in this.tensorArrayMap) {\n this.tensorArrayMap[key].clearAndClose(keepIds);\n }\n\n for (const key in this.tensorListMap) {\n this.tensorListMap[key].clearAndClose(keepIds);\n }\n }\n}\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ===\n */\n\nimport {NamedTensorMap} from '@tensorflow/tfjs-core';\n\nimport {NamedTensorsMap} from '../data/types';\nimport {parseNodeName} from '../operations/executors/utils';\nimport {Graph, Node} from '../operations/types';\n\nexport interface ExecutionInfo {\n inputs: NamedTensorMap;\n outputs: Node[];\n usedNodes: Set<string>;\n missingInputs: string[];\n dynamicNode: Node;\n syncInputs: string[];\n}\n\n/**\n * Given graph inputs and desired outputs, find the minimal set of nodes\n * to execute in order to compute the outputs. In addition return other useful\n * info such:\n * - Missing inputs needed to compute the output.\n * - Whether the subgraph contains dynamic ops (control flow, dynamic shape).\n * - Alternative inputs in order to avoid async (dynamic op) execution.\n */\nexport function getExecutionSubgraph(\n inputs: NamedTensorMap, outputs: Node[], weightMap: NamedTensorsMap,\n initNodes?: Node[]): ExecutionInfo {\n const usedNodes = new Set<string>();\n const missingInputs: string[] = [];\n let dynamicNode: Node = null;\n let syncInputs: string[] = null;\n\n // Start with the outputs, going backwards and find all the nodes that are\n // needed to compute those outputs.\n const seen = new Set<string>();\n const inputNodeNames =\n Object.keys(inputs).map(name => parseNodeName(name)[0]);\n\n let initNodeNames: string[] = [];\n if (initNodes != null) {\n initNodeNames = initNodes.map(node => parseNodeName(node.name)[0]);\n }\n\n const frontier = [...outputs];\n while (frontier.length > 0) {\n const node = frontier.pop();\n if (isControlFlow(node) || isDynamicShape(node) || isHashTable(node)) {\n if (dynamicNode == null) {\n dynamicNode = node;\n syncInputs = dynamicNode.children.map(child => child.name)\n .filter(name => usedNodes.has(name));\n }\n }\n usedNodes.add(node.name);\n\n // Weights are dead end since we already have their values.\n if (weightMap[node.name] != null) {\n continue;\n }\n // This node is a dead end since it's one of the user-provided inputs.\n if (inputNodeNames.indexOf(node.name) !== -1) {\n continue;\n }\n // This node is a dead end since it doesn't have any inputs.\n if (initNodeNames.indexOf(node.name) !== -1) {\n continue;\n }\n if (node.inputs.length === 0) {\n missingInputs.push(node.name);\n continue;\n }\n node.inputs.forEach(input => {\n // Don't add to the frontier if it is already there.\n if (seen.has(input.name)) {\n return;\n }\n seen.add(input.name);\n frontier.push(input);\n });\n }\n return {inputs, outputs, usedNodes, missingInputs, dynamicNode, syncInputs};\n}\n\n/**\n * Given the execution info, return a list of nodes in topological order that\n * need to be executed to compute the output.\n */\nexport function getNodesInTopologicalOrder(\n graph: Graph, weightMap: NamedTensorsMap,\n executionInfo: ExecutionInfo): Node[] {\n const {usedNodes, inputs} = executionInfo;\n const frontier: Node[] = [];\n const inputNodes = Object.keys(inputs)\n .map(name => parseNodeName(name)[0])\n .map(name => graph.nodes[name]);\n const initNodes = graph.initNodes;\n\n inputNodes.forEach(input => {\n if (usedNodes.has(input.name)) {\n frontier.push(input);\n }\n });\n graph.weights.forEach(weight => {\n if (usedNodes.has(weight.name)) {\n frontier.push(weight);\n }\n });\n if (initNodes != null) {\n

initNodes.forEach(node => {\n if (usedNodes.has(node.name)) {\n frontier.push(node);\n }\n });\n }\n const seen = new Set<string>();\n const orderedNodes:
Node[] = [];\n while (frontier.length > 0) {\n const node = frontier.pop();\n seen.add(node.name);\n if (!weightMap[node.name]) {\n orderedNodes.push(node);\n }\n node.children.forEach(child => {\n if (!seen.has(child.name) && usedNodes.has(child.name) &&\n child.inputs.every(input => seen.has(input.name))) {\n frontier.push(child);\n }\n });\n }\n return orderedNodes;\n}\n\nconst CONTROL_FLOW_OPS = [\n 'Switch', 'Merge', 'Enter', 'Exit', 'NextIteration', 'StatelessIf',\n 'StatelessWhile', 'if', 'While'\n];\nconst DYNAMIC_SHAPE_OPS = [\n 'NonMaxSuppressionV2', 'NonMaxSuppressionV3', 'NonMaxSuppressionV5', 'Where'\n];\nconst HASH_TABLE_OPS = [\n 'HashTable', 'HashTableV2', 'LookupTableImport', 'LookupTableImportV2',\n 'LookupTableFind', 'LookupTableFindV2'\n];\n\nexport function isControlFlow(node: Node) {\n return CONTROL_FLOW_OPS.indexOf(node.op) >= 0;\n}\n\nexport function isDynamicShape(node: Node) {\n return DYNAMIC_SHAPE_OPS.indexOf(node.op) >= 0;\n}\n\nexport function isHashTable(node: Node) {\n return HASH_TABLE_OPS.indexOf(node.op) >= 0;\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n*/\n\nimport {DataType, NamedTensorMap, Tensor, tidy, util} from '@tensorflow/tfjs-core';\n\nimport {ISignatureDef} from '../data/compiled_api';\nimport {NamedTensorsMap, TensorArrayMap, TensorInfo, TensorListMap} from '../data/types';\nimport {getNodeNameAndIndex, getParamValue, getTensor, getTensorsForCurrentContenxt, parseNodeName} from '../operations/executors/utils';\nimport {executeOp} from '../operations/operation_executor';\nimport {Graph, Node} from '../operations/types';\n\nimport {ExecutionContext, ExecutionContextInfo} from './execution_context';\nimport {getExecutionSubgraph, getNodesInTopologicalOrder, isControlFlow} from './model_analysis';\nimport {ResourceManager} from './resource_manager';\nimport {FunctionExecutor} from './types';\n\ninterface NodeWithContexts {\n contexts: ExecutionContextInfo[];\n node: Node;\n}\n\nexport class GraphExecutor implements FunctionExecutor {\n private compiledMap: Map<string, Node[]> = new Map();\n private _weightMap: NamedTensorsMap = {};\n private _weightIds: number[];\n private _signature: ISignatureDef;\n private _inputs: Node[];\n private _outputs: Node[];\n private _initNodes:
Node[]; // Internal init nodes to start initialization.\n private SEPERATOR = ',';\n private _functions: {[key: string]: Graph} = {};\n private _functionExecutorMap: {[key: string]: FunctionExecutor} = {};\n private _resourceManager: ResourceManager;\n\n get weightIds(): number[] {\n return this.parent ? this.parent.weightIds : this._weightIds;\n }\n\n get functionExecutorMap(): {[key: string]: FunctionExecutor} {\n return this.parent ? this.parent.functionExecutorMap :\n this._functionExecutorMap;\n }\n\n get weightMap(): NamedTensorsMap {\n return this.parent ? this.parent.weightMap : this._weightMap;\n }\n\n set weightMap(weightMap: NamedTensorsMap) {\n const weightIds = Object.keys(weightMap).map(\n key => weightMap[key].map(tensor => tensor.id));\n this._weightIds = [].concat(...weightIds);\n this._weightMap = weightMap;\n }\n\n /**\n * Set `ResourceManager` shared by executors of a model.\n * @param resourceManager:
`ResourceManager` of the `GraphModel`.\n */\n set resourceManager(resourceManager: ResourceManager) {\n this._resourceManager = resourceManager;\n }\n\n get inputs(): TensorInfo[] {\n return this._inputs.map(node => {\n return {\n name: node.name,\n shape: node.attrParams['shape'] ?\n node.attrParams['shape'].value as number[] :\n undefined,\n dtype: node.attrParams['dtype'] ?\n node.attrParams['dtype'].value as DataType :\n undefined\n };\n });\n }\n\n get outputs(): TensorInfo[] {\n return this._outputs.map(node => {\n return {\n name: node.name,\n shape:

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node.attrParams['shape'] ?\n            node.attrParams['shape'].value as number[] :\n            undefined,\n        dtype:
node.attrParams['dtype'] ?\n            node.attrParams['dtype'].value as DataType :\n            undefined\n      };\n    });\n
}\n\n  get inputNodes(): string[] {\n    return this._inputs.map(node
 => node.signatureKey || node.name);\n  }\n\n  get outputNodes(): string[] {\n    return this._outputs.map((node) =>
{\n      const name = node.signatureKey || node.name;\n      return node.defaultOutput ?
(`${name}:${node.defaultOutput}`) : name;\n    });\n  }\n\n  get functions(): {[key: string]: ISignatureDef} {\n
return Object.keys(this._functions).reduce((map, key) => {\n      map[key] = this._functions[key].signature;\n
return map;\n    }, {} as {[key: string]: ISignatureDef});\n  }\n\n  /**\n   *\n   * @param graph Graph the model or
function graph to be executed.\n   * @param parent When building function exector you need to set the parent\n   *
executor. Since the weights and function executor maps are set at parant\n   * level, that function executor can
access the function maps and weight maps\n   * through the parent.\n   */\n  constructor(private graph: Graph,
private parent?: GraphExecutor) {\n    this._outputs = graph.outputs;\n    this._inputs = graph.inputs;\n
    this._initNodes = graph.initNodes;\n    this._signature = graph.signature;\n    this._functions = graph.functions;\n
// create sub-graph executors\n    if (graph.functions != null) {\n      Object.keys(graph.functions).forEach(name =>
{\n        this._functionExecutorMap[name] =\n            new GraphExecutor(graph.functions[name], this);\n      });\n
}\n  }\n\n  private getCompilationKey(inputs: Node[], outputs: Node[]): string {\n    const sortedInputs =
inputs.map(node => node.name).sort();\n    const sortedOutputs = outputs.map(node => node.name).sort();\n
return sortedInputs.join(this.SEPERATOR) + '--' +\n        sortedOutputs.join(this.SEPERATOR);\n  }\n\n  /**\n   *
Compiles the inference graph and returns the minimal set of nodes that are\n   * required for execution, in the correct
execution order.\n   */\n  private compile(inputs: NamedTensorMap, outputs: Node[]): Node[] {\n    const
executionInfo =\n        getExecutionSubgraph(inputs, outputs, this.weightMap,
 this._initNodes);\n    const {missingInputs, dynamicNode, syncInputs} = executionInfo;\n    if (dynamicNode !=
null) {\n      throw new Error(\n          `This execution contains the node '${dynamicNode.name}', which has ` +\n
    `the dynamic op '${dynamicNode.op}'. Please use ` +\n          `model.executeAsync() instead. Alternatively, to
avoid the ` +\n          `dynamic ops, specify the inputs [${syncInputs}]`);\n    }\n\n    if (missingInputs.length > 0) {\n
    const outNames = outputs.map(n => n.name);\n      const inNames = Object.keys(inputs);\n      throw new Error(\n
        `Cannot compute the outputs [${outNames}] from the provided inputs ` +\n          `[${inNames}]. Missing the
following inputs: [${missingInputs}]`);\n    }\n\n    return getNodesInTopologicalOrder(\n        this.graph,
this.weightMap, executionInfo);\n  }\n\n  /**\n   * Executes the inference for given input tensors.\n   * @param
inputs Tensor map for the model inputs, keyed by the input
 node\n   * names.\n   * @param outputs Optional. output node name from the Tensorflow model, if\n   * no outputs
are specified, the default outputs of the model would be used.\n   * You can inspect intermediate nodes of the model
by adding them to the\n   * outputs array.\n   */\n  execute(inputs: NamedTensorMap, outputs?: string[]): Tensor[]
{\n    inputs = this.mapInputs(inputs);\n    const names = Object.keys(inputs).sort();\n    this.checkInputs(inputs);\n
this.checkInputShapeAndType(inputs);\n    outputs = this.mapOutputs(outputs);\n    this.checkOutputs(outputs);\n
const inputNodes =\n        names.map(name => this.graph.nodes[parseNodeName(name)[0]]);\n    const
outputNodeNames = outputs.map(name => parseNodeName(name)[0]);\n    let outputNodes =
outputNodeNames.map(name => this.graph.nodes[name]);\n\n    // If no outputs are specified, then use the default
outputs of the model.\n    if (outputNodes.length === 0) {\n      outputNodes = this._outputs;\n    }\n\n    const
compilationKey
 = this.getCompilationKey(inputNodes, outputNodes);\n\n    // Do nothing if the compiled graph cache contains the
input.\n    let orderedNodes = this.compiledMap.get(compilationKey);\n    if (orderedNodes == null) {\n
orderedNodes = this.compile(inputs, outputNodes);\n      this.compiledMap.set(compilationKey, orderedNodes);\n
}\n\n    const tensorArrayMap: TensorArrayMap = {};\n    const tensorListMap: TensorListMap = {};\n\n    return
tidy(() => {\n      const context = new ExecutionContext(\n          this.weightMap, tensorArrayMap, tensorListMap,\n
        this.functionExecutorMap);\n      const tensorsMap: NamedTensorsMap = {...this.weightMap};\n\n
Object.keys(inputs).forEach(name => {\n        const [nodeName, index] = parseNodeName(name);\n        const
tensors: Tensor[] = [];\n        tensors[index] = inputs[name];\n        tensorsMap[nodeName] = tensors;\n      });\n\n
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const tensorsToKeep = this.getFrozenTensorIds(tensorsMap);\n      const intermediateTensorConsumerCount:
 {[key: number]: number} = {};\n      for (let i = 0; i < orderedNodes.length; i++) {\n        const node =
orderedNodes[i];\n        if (!tensorsMap[node.name]) {\n          const tensors =\n              executeOp(node,
tensorsMap, context, this._resourceManager) as\n              Tensor[];\n          if (util.isPromise(tensors)) {\n
throw new Error(\n              `The execution of the op '${node.op}' returned a promise. ` +\n              `Please use
model.executeAsync() instead.`);\n          }\n          tensorsMap[node.name] = tensors;\n
this.checkTensorForDisposal(\n              node.name, node, tensorsMap, context, tensorsToKeep,\n
outputNodeNames, intermediateTensorConsumerCount);\n        }\n      }\n      // dispose the context for the root
executor\n      if (this.parent == null) {\n        context.dispose(tensorsToKeep);\n      }\n      return outputs.map(name
=> getTensor(name, tensorsMap, context));\n    });\n
  }\n\n  private getFrozenTensorIds(tensorMap: NamedTensorsMap): Set<number> {\n    const ids =
[].concat.apply(\n        [],\n        Object.keys(tensorMap)\n            .map(key => tensorMap[key])\n
.map(tensors => tensors.map(tensor => tensor.id)));\n    return new Set(ids);\n  }\n  private
checkTensorForDisposal(\n      nodeName: string, node: Node, tensorMap: NamedTensorsMap,\n      context:
ExecutionContext, tensorsToKeep: Set<number>,\n      outputNames: string[],\n
intermediateTensorConsumerCount: {[key: string]: number}) {\n    // Skip output nodes and any control flow nodes,
since its dependency is\n    // tricky to track correctly.\n    if (node.category === 'control' ||
outputNames.indexOf(nodeName) !== -1) {\n      return;\n    }\n\n    tensorMap[nodeName].forEach(tensor => {\n
 if (tensor != null) {\n        intermediateTensorConsumerCount[tensor.id] =\n
(intermediateTensorConsumerCount[tensor.id] || 0) +\n            node.children.length;\n
    }\n    });\n    node.inputs.forEach(input => {\n      // Skip any control flow nodes, since its dependency is tricky
to track\n      // correctly.\n      if (input.category !== 'control') {\n        const tensors =\n
getTensorsForCurrentContenxt(input.name, tensorMap, context);\n        if (tensors != null) {\n
tensors.forEach(tensor => {\n            if (tensor && !tensorsToKeep.has(tensor.id)) {\n              const count =
intermediateTensorConsumerCount[tensor.id];\n              if (count === 1) {\n                tensor.dispose();\n
delete intermediateTensorConsumerCount[tensor.id];\n              } else if (count != null) {\n                // only
intermediate nodes has count set, inputs and weights are\n                // not.\n
intermediateTensorConsumerCount[tensor.id]--;\n              }\n            }\n          });\n        }\n      }\n    });\n  }\n\n
/**\n   * Executes the inference for given input tensors in
 Async fashion.\n   * @param inputs Tensor map for the model inputs, keyed by the input node\n   * names.\n   *
@param outputs output node name from the Tensorflow model, if no outputs\n   * are specified, the default outputs
of the model would be used. You can\n   * inspect intermediate nodes of the model by adding them to the outputs\n
* array.\n   */\n  async executeAsync(inputs: NamedTensorMap, outputs?: string[]):\n      Promise<Tensor[]> {\n
return this._executeAsync(inputs, outputs);\n  }\n\n  /**\n   * Executes the inference for given input tensors in
Async fashion.\n   * @param inputs Tensor map for the model inputs, keyed by the input node\n   * names.\n   *
@param outputs Optional. output node name from the Tensorflow model,\n   * if no outputs are specified, the
default outputs of the model would be\n   * used. You can inspect intermediate nodes of the model by adding them
to the\n   * outputs array.\n   * @param isFunctionExecution Optional. Flag for executing a function.\n
   * @param tensorArrayMap Optional, global TensorArray map by id. Used for\n   * function execution.\n   *
@param tensorArrayMap Optinal global TensorList map by id. Used for\n   * function execution.\n   */\n  private
async _executeAsync(\n      inputs: NamedTensorMap, outputs?: string[], isFunctionExecution = false,\n
tensorArrayMap: TensorArrayMap = {},\n      tensorListMap: TensorListMap = {}): Promise<Tensor[]> {\n    if
(!isFunctionExecution) {\n      inputs = this.mapInputs(inputs);\n      this.checkInputs(inputs);\n
this.checkInputShapeAndType(inputs);\n      outputs = this.mapOutputs(outputs);\n      this.checkOutputs(outputs);\n
  }\n\n    const context = new ExecutionContext(\n        this.weightMap, tensorArrayMap, tensorListMap,\n
this.functionExecutorMap);\n\n    // Graph with control flow op requires runtime evaluation of the execution\n    //
order, while without control flow the execution order is pre-determined\n    // in the compile method.\n
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    const tensorMap = await this.executeWithControlFlow(\n        inputs, context, outputs, isFunctionExecution);\n
const results = outputs.map(name => getTensor(name, tensorMap, context));\n\n    // dispose all the intermediate
tensors\n    const outputIds = results.map(t => t.id);\n    const inputIds = Object.keys(inputs).map(name =>
inputs[name].id);\n    const keepIds =\n        new Set<number>([...outputIds, ...inputIds, ...this.weightIds]);\n
Object.keys(tensorMap).forEach(key => {\n      const tensorArray = tensorMap[key];\n
tensorArray.forEach(tensor => {\n        if (tensor && !tensor.isDisposed && !keepIds.has(tensor.id)) {\n
tensor.dispose();\n        }\n      });\n    });\n    // dispose the context for the root executor\n    if (this.parent == null)
{\n      context.dispose(keepIds);\n    }\n\n    return results;\n  }\n\n  async executeFunctionAsync(\n      inputs:
Tensor[], tensorArrayMap: TensorArrayMap,\n      tensorListMap: TensorListMap): Promise<Tensor[]>
 {\n    const mappedInputs = inputs.reduce((map, tensor, index) => {\n      map[this.inputs[index].name] = tensor;\n
  return map;\n    }, {} as NamedTensorMap);\n\n    return this._executeAsync(\n        mappedInputs,
this.outputNodes, true, tensorArrayMap, tensorListMap);\n  }\n  /**\n   * When there are control flow nodes in the
graph, the graph execution use\n   * ExecutionContext to keep track of the frames and loop iterators.\n   * @param
inputs placeholder tensors for the graph.\n   * @param context the execution context object for current execution.\n
* @param outputNames Optional. output node name from the Tensorflow model,\n   * if no outputs are specified,
the default outputs of the model would be\n   * used. You can inspect intermediate nodes of the model by adding
them to the\n   * outputs array.\n   * @param isFunctionExecution Flag for executing a function.\n   */\n  private
async executeWithControlFlow(\n      inputs: NamedTensorMap, context: ExecutionContext,
 outputNames?: string[],\n      isFunctionExecution?: boolean): Promise<NamedTensorsMap> {\n    const names =
Object.keys(inputs);\n    const inputNodes =\n        names.map(name =>
this.graph.nodes[parseNodeName(name)[0]]);\n    const outputNodeNames = outputNames.map(name =>
parseNodeName(name)[0]);\n    let outputNodes = outputNodeNames.map(name => this.graph.nodes[name]);\n\n
// If no outputs are specified, then use the default outputs of the model.\n    if (outputNodes.length === 0) {\n
outputNodes = this._outputs;\n    }\n\n    const {usedNodes, missingInputs, dynamicNode, syncInputs} =\n
getExecutionSubgraph(\n            inputs, outputNodes, this.weightMap, this._initNodes);\n\n    // First nodes to
execute include inputNodes, weights, and initNodes.\n    const stack: NodeWithContexts[] = [\n      ...inputNodes,
...this.graph.weights, ...(this._initNodes || [])\n    ].map(node => {\n      return {node, contexts:
context.currentContext};\n    });\n    const tensorsMap:
 NamedTensorsMap = {...this.weightMap};\n    Object.keys(inputs).forEach(name => {\n      const [nodeName,
index] = parseNodeName(name);\n      const tensors: Tensor[] = [];\n      tensors[index] = inputs[name];\n
tensorsMap[nodeName] = tensors;\n    });\n    const intermediateTensorConsumerCount: {[key: number]: number} =
{};\n    const tensorsToKeep = this.getFrozenTensorIds(tensorsMap);\n    const added: {[key: string]: boolean} =
{};\n    while (stack.length > 0) {\n      const promises = this.processStack(\n          inputNodes, stack, context,
tensorsMap, added, tensorsToKeep,\n          outputNodeNames, intermediateTensorConsumerCount, usedNodes);\n
  await Promise.all(promises);\n    }\n    if (dynamicNode == null && !isFunctionExecution) {\n      console.warn(\n
      `This model execution did not contain any nodes with control flow ` +\n          `or dynamic output shapes. You
can use model.execute() instead.`);\n    }\n    const missingOutputs =\n        outputNodes\n
          .filter(\n              node => !isControlFlow(node) &&\n                  !getTensor(node.name, tensorsMap,
context))\n          .map(node => node.name);\n    if (missingOutputs.length > 0) {\n      let alternativeMsg = '';\n
if (dynamicNode != null) {\n        alternativeMsg =\n            `Alternatively, to avoid the dynamic ops, use
model.execute() ` +\n            `and specify the inputs [${syncInputs}]`;\n      }\n      throw new Error(\n
`Cannot compute the outputs [${missingOutputs}] from the provided ` +\n          `inputs [${names}]. Consider providing the
following inputs: ` +\n          `[${missingInputs}]. ${alternativeMsg}`);\n    }\n    return tensorsMap;\n  }\n\n  private
processStack(\n      inputNodes: Node[], stack: NodeWithContexts[], context: ExecutionContext,\n      tensorMap:
NamedTensorsMap, added: {[key: string]: boolean},\n      tensorsToKeep: Set<number>, outputNames: string[],\n
intermediateTensorConsumerCount:
 {[key: number]: number},\n      usedNodes: Set<string>) {\n    const promises: Array<Promise<Tensor[]>> = [];\n
while (stack.length > 0) {\n      const item = stack.pop();\n      context.currentContext = item.contexts;\n      let
```

```
nodeName = '';\n      // The tensor of the Enter op with isConstant set should be set\n      // in the parent scope, so it will be available as constant for the\n      // whole loop.\n      if (item.node.op === 'Enter' &&\n getParamValue('isConstant', item.node, tensorMap, context)) {\n        [nodeName] = getNodeNameAndIndex(item.node.name, context);\n      }\n\n      // only process nodes that are not in the tensorMap yet, this include\n      // inputNodes and internal initNodes.\n      if (tensorMap[item.node.name] == null) {\n const tensors =\n            executeOp(item.node, tensorMap, context, this._resourceManager);\n        if (!nodeName) {\n          [nodeName] = getNodeNameAndIndex(item.node.name, context);\n        }\n        const currentContext = context.currentContext;\n        if (util.isPromise(tensors)) {\n          promises.push((tensors as Promise<Tensor[]>).then(t => {\n            tensorMap[nodeName] = t;\n            context.currentContext = currentContext;\n            this.checkTensorForDisposal(\n                nodeName, item.node, tensorMap, context, tensorsToKeep,\n                outputNames, intermediateTensorConsumerCount);\n            this.processChildNodes(\n                item.node, stack, context, tensorMap, added, usedNodes);\n            return t;\n          }));\n        } else {\n tensorMap[nodeName] = tensors as Tensor[];\n          this.checkTensorForDisposal(\n              nodeName, item.node, tensorMap, context, tensorsToKeep,\n              outputNames, intermediateTensorConsumerCount);\n          this.processChildNodes(\n              item.node, stack, context, tensorMap, added, usedNodes);\n        }\n      } else {\n        this.processChildNodes(\n            item.node,\n stack, context, tensorMap, added, usedNodes);\n      }\n    }\n    return promises;\n  }\n\n  private processChildNodes(\n      node: Node, stack: NodeWithContexts[], context: ExecutionContext,\n      tensorMap: NamedTensorsMap, added: {[key: string]: boolean},\n      usedNodes: Set<string>) {\n node.children.forEach((childNode) => {\n      const [nodeName, ] = getNodeNameAndIndex(childNode.name, context);\n      if (added[nodeName] || !usedNodes.has(childNode.name)) {\n        return;\n      }\n      // Merge op can be pushed if any of its inputs has value.\n      if (childNode.op === 'Merge') {\n        if (childNode.inputNames.some(name => {\n              return !!getTensor(name, tensorMap, context);\n            })) {\n          added[nodeName] = true;\n          stack.push({contexts: context.currentContext, node: childNode});\n        }\n      } else  // Otherwise all inputs must to have value.\n          if (childNode.inputNames.every(name => {\n return\n !!getTensor(name, tensorMap, context);\n            })) {\n        added[nodeName] = true;\n stack.push({contexts: context.currentContext, node: childNode});\n      }\n    });\n  }\n\n  /**\n   * Releases the memory used by the weight tensors.\n   */\n  dispose() {\n    Object.keys(this.weightMap)\n        .forEach(\n key => this.weightMap[key].forEach(tensor => tensor.dispose()));\n  }\n\n  private checkInputShapeAndType(inputs: NamedTensorMap) {\n    Object.keys(inputs).forEach(name => {\n      const input = inputs[name];\n      const [nodeName, ] = parseNodeName(name);\n      const node = this.graph.nodes[nodeName];\n      if (node.attrParams['shape'] && node.attrParams['shape'].value) {\n        const shape = node.attrParams['shape'].value as number[];\n        const match = shape.length === input.shape.length &&\n            input.shape.every(\n                (dim, index) => shape[index] === -1 || shape[index] === dim);\n util.assert(\n            match,\n            () => `The shape of dict['${node.name}'] provided in ` +\n                `model.execute(dict) must be [${shape}], but was ` +\n                `[${input.shape}]`);\n      }\n      if (node.attrParams['dtype'] && node.attrParams['dtype'].value) {\n        util.assert(\n            input.dtype === node.attrParams['dtype'].value as string,\n            () => `The dtype of dict['${node.name}'] provided in ` +\n                `model.execute(dict) must be ` +\n                `${node.attrParams['dtype'].value}, but was ${input.dtype}`);\n      }\n    });\n  }\n\n  private mapInputs(inputs: NamedTensorMap) {\n    const result: NamedTensorMap = {};\n    for (const inputName in inputs) {\n      if (this._signature != null && this._signature.inputs != null &&\n this._signature.inputs[inputName] != null) {\n        const tensor = this._signature.inputs[inputName];\n result[tensor.name] = inputs[inputName];\n      } else {\n        result[inputName] = inputs[inputName];\n      }\n    }\n    return result;\n  }\n\n  private checkInputs(inputs: NamedTensorMap) {\n    const notInGraph = Object.keys(inputs).filter(name => {\n      const [nodeName] = parseNodeName(name);\n      return this.graph.nodes[nodeName] == null;\n    });\n    if (notInGraph.length > 0) {\n      throw new Error(\n          `The
```

dict provided in model.execute(dict) has ` +\n `keys: [${notInGraph}] that are not part of graph`);\n }\n }\n\n private mapOutputs(outputs: string[]) {\n return outputs.map(name => {\n if (this._signature != null && this._signature.outputs != null &&\n this._signature.outputs[name] != null) {\n const tensor = this._signature.outputs[name];\n return tensor.name;\n }\n return name;\n }, {});\n }\n\n private checkOutputs(outputs: string[]): void {\n outputs.forEach(name => {\n const [normalizedName] = parseNodeName(name);\n if (!this.graph.nodes[normalizedName]) {\n throw new Error(`The output '${name}' is not found in the graph`);\n }\n });\n }\n}\n","/**\n * @license\n * Copyright 2020 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\nimport {HashTableMap, NamedTensorMap} from '../data/types';\nimport {HashTable} from './hash_table';\n\n/**\n * Contains global resources of a model.\n */\nexport class ResourceManager {\n constructor(\n readonly hashTableNameToHandle: NamedTensorMap = {},\n readonly hashTableMap: HashTableMap = {}) {}\n\n /**\n * Register a `HashTable` in the resource manager.\n *\n * The `HashTable` can be retrieved by `resourceManager.getHashTableById`,\n * where id is the table handle tensor's id.\n *\n * @param name Op node name that creates the `HashTable`.\n * @param hashTable The `HashTable` to be added to resource manager.\n */\n addHashTable(name: string, hashTable: HashTable) {\n this.hashTableNameToHandle[name] = hashTable.handle;\n this.hashTableMap[hashTable.id] = hashTable;\n }\n\n /**\n * Get the table handle by node name.\n * @param name Op node name that creates the `HashTable`. This name is also\n * used in the inputs list of lookup and import `HashTable` ops.\n */\n getHashTableHandleByName(name: string) {\n return this.hashTableNameToHandle[name];\n }\n\n /**\n * Get the actual `HashTable` by its handle tensor's id.\n * @param id The id of the handle tensor.\n */\n getHashTableById(id: number): HashTable {\n return this.hashTableMap[id];\n }\n\n /**\n * Dispose `ResourceManager`, including its hashTables and tensors in them.\n */\n dispose() {\n for (const key in this.hashTableMap) {\n this.hashTableMap[key].clearAndClose();\n delete this.hashTableMap[key];\n }\n\n for (const name in this.hashTableNameToHandle) {\n this.hashTableNameToHandle[name].dispose();\n delete this.hashTableNameToHandle[name];\n }\n}\n","/**\n * @license\n * Copyright 2018 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========\n */\n\nimport {InferenceModel, io, ModelPredictConfig, NamedTensorMap, Tensor} from '@tensorflow/tfjs-core';\n\nimport * as tensorflow from '../data/compiled_api';\nimport {NamedTensorsMap, TensorInfo} from '../data/types';\nimport {OperationMapper} from '../operations/operation_mapper';\n\nimport {GraphExecutor} from './graph_executor';\nimport {ResourceManager} from './resource_manager';\n\nexport const TFHUB_SEARCH_PARAM = '?tfjs-format=file';\nexport const DEFAULT_MODEL_NAME = 'model.json';\n/**\n * A `tf.GraphModel` is a directed, acyclic graph built from a\n * SavedModel GraphDef and allows inference execution.\n *\n * A `tf.GraphModel` can only be created by loading from a model converted from\n * a [TensorFlow

SavedModel](https://www.tensorflow.org/guide/saved_model) using\n * the command line converter tool and loaded via `tf.loadGraphModel`.\n *\n * @doc {heading: 'Models', subheading: 'Classes'}\n */\nexport class GraphModel implements InferenceModel {\n private executor: GraphExecutor;\n private version = 'n/a';\n private handler: io.IOHandler;\n private artifacts: io.ModelArtifacts;\n private initializer: GraphExecutor;\n private resourceManager: ResourceManager;\n private signature: tensorflow.ISignatureDef;\n\n // Returns the version information for the tensorflow model GraphDef.\n get modelVersion(): string {\n return this.version;\n }\n\n get inputNodes(): string[] {\n return this.executor.inputNodes;\n }\n\n get outputNodes(): string[] {\n return this.executor.outputNodes;\n }\n\n get inputs(): TensorInfo[] {\n return this.executor.inputs;\n }\n\n get outputs(): TensorInfo[] {\n return this.executor.outputs;\n }\n\n get weights(): NamedTensorsMap {\n return this.executor.weightMap;\n }\n\n get metadata(): {} {\n return this.artifacts.userDefinedMetadata;\n }\n\n get modelSignature(): {} {\n return this.signature;\n }\n\n /**\n * @param modelUrl url for the model, or an `io.IOHandler`.\n * @param weightManifestUrl url for the weight file generated by\n * scripts/convert.py script.\n * @param requestOption options for Request, which allows to send credentials\n * and custom headers.\n * @param onProgress Optional, progress callback function, fired periodically\n * before the load is completed.\n */\n constructor(\n private modelUrl: string|io.IOHandler,\n private loadOptions: io.LoadOptions = {}) {\n if (loadOptions == null) {\n this.loadOptions = {};\n }\n this.resourceManager = new ResourceManager();\n }\n\n private findIOHandler() {\n const path = this.modelUrl;\n if ((path as io.IOHandler).load != null) {\n // Path is an IO Handler.\n this.handler = path as io.IOHandler;\n } else if (this.loadOptions.requestInit != null) {\n this.handler = io.browserHTTPRequest(path as string, this.loadOptions);\n } else {\n const handlers = io.getLoadHandlers(path as string, this.loadOptions);\n if (handlers.length === 0) {\n // For backward compatibility: if no load handler can be found,\n // assume it is a relative http path.\n handlers.push(io.browserHTTPRequest(path as string, this.loadOptions));\n } else if (handlers.length > 1) {\n throw new Error(\n `Found more than one (${handlers.length}) load handlers for ` +\n `URL '${[path]}'`);\n }\n this.handler = handlers[0];\n }\n }\n\n /**\n * Loads the model and weight files, construct the in memory weight map and\n * compile the inference graph.\n */\n async load(): Promise<boolean> {\n this.findIOHandler();\n if (this.handler.load == null) {\n throw new Error(\n 'Cannot proceed with model loading because the IOHandler provided ' +\n 'does not have the `load` method implemented.');\n }\n const artifacts = await this.handler.load();\n\n return this.loadSync(artifacts);\n }\n\n /**\n * Synchronously construct the in memory weight map and\n * compile the inference graph. Also initialize hashtable if any.\n *\n * @doc {heading: 'Models', subheading: 'Classes', ignoreCI: true}\n */\n loadSync(artifacts: io.ModelArtifacts) {\n this.artifacts = artifacts;\n const graph = this.artifacts.modelTopology as tensorflow.IGraphDef;\n\n let signature;\n if (this.artifacts.userDefinedMetadata != null &&\n this.artifacts.userDefinedMetadata.signature != null) {\n signature = // tslint:disable-next-line:no-any\n (this.artifacts.userDefinedMetadata as any).signature as\n tensorflow.ISignatureDef;\n } else {\n signature = this.artifacts.signature;\n }\n this.signature = signature;\n\n this.version = `${graph.versions.producer}.${graph.versions.minConsumer}`;\n const weightMap = \n io.decodeWeights(this.artifacts.weightData, this.artifacts.weightSpecs);\n this.executor = new GraphExecutor(\n OperationMapper.Instance.transformGraph(graph, this.signature));\n this.executor.weightMap = this.convertTensorMapToTensorsMap(weightMap);\n // Attach a model-level resourceManager to each executor to share resources,\n // such as `HashTable`.\n this.executor.resourceManager = this.resourceManager;\n\n if (artifacts.modelInitializer != null &&\n (artifacts.modelInitializer as tensorflow.IGraphDef).node != null) {\n const initializer = \n OperationMapper.Instance.transformGraph(artifacts.modelInitializer);\n this.initializer = new GraphExecutor(initializer);\n this.initializer.weightMap = this.executor.weightMap;\n // Attach a model-level resourceManager to the initializer, the\n // hashTables created from when executing the initializer will be stored\n // in the resourceManager.\n this.initializer.resourceManager = this.resourceManager;\n this.initializer.executeAsync({}, []);\n }\n\n return true;\n }\n\n /**\n * Save the configuration and/or weights of the GraphModel.\n *\n * An `IOHandler` is an object that has a `save` method of

the proper\n * signature defined. The `save` method manages the storing or\n * transmission of serialized data (\"artifacts\") that represent the\n * model's topology and weights onto or via a specific medium, such as\n * file downloads, local storage, IndexedDB in the web browser and HTTP\n * requests to a server. TensorFlow.js provides `IOHandler`\n * implementations for a number of frequently used saving mediums, such as\n * `tf.io.browserDownloads` and `tf.io.browserLocalStorage`. See `tf.io`\n * for more details.\n *\n * This method also allows you to refer to certain types of `IOHandler`s\n * as URL-like
string shortcuts, such as 'localstorage://' and\n * 'indexeddb://'.\n *\n * Example 1: Save `model`'s topology and weights to browser [local\n * storage](https://developer.mozilla.org/en-US/docs/Web/API/Window/localStorage);\n * then load it back.\n *\n * ```js\n * const modelUrl =\n * 'https://storage.googleapis.com/tfjs-models/savedmodel/mobilenet_v2_1.0_224/model.json';\n * const model = await tf.loadGraphModel(modelUrl);\n * const zeros = tf.zeros([1, 224, 224, 3]);\n * model.predict(zeros).print();\n *\n * const saveResults = await model.save('localstorage://my-model-1');\n *\n * const loadedModel = await tf.loadGraphModel('localstorage://my-model-1');\n * console.log('Prediction from loaded model:');\n * model.predict(zeros).print();\n * ```\n *\n * @param handlerOrURL An instance of `IOHandler` or a URL-like,\n * scheme-based string shortcut for `IOHandler`.\n * @param config Options for saving the model.\n * @returns A `Promise`
of `SaveResult`, which summarizes the result of\n * the saving, such as byte sizes of the saved artifacts for the model's\n * topology and weight values.\n *\n * @doc {heading: 'Models', subheading: 'Classes', ignoreCI: true}\n */\n async save(handlerOrURL: io.IOHandler|string, config?: io.SaveConfig):\n Promise<io.SaveResult> {\n if (typeof handlerOrURL === 'string') {\n const handlers = io.getSaveHandlers(handlerOrURL);\n if (handlers.length === 0) {\n throw new Error(\n `Cannot find any save handlers for URL '${handlerOrURL}'`);\n } else if (handlers.length > 1) {\n throw new Error(\n `Found more than one (${handlers.length}) save handlers for ` +\n `URL '${handlerOrURL}'`);\n }\n handlerOrURL = handlers[0];\n }\n if (handlerOrURL.save == null) {\n throw new Error(\n 'GraphModel.save() cannot proceed because the IOHandler ' +\n 'provided does not have the `save`
attribute defined.');\n }\n\n return handlerOrURL.save(this.artifacts);\n }\n\n /**\n * Execute the inference for the input tensors.\n *\n * @param input The input tensors, when there is single input for the model,\n * inputs param should be a `tf.Tensor`. For models with mutliple inputs,\n * inputs params should be in either `tf.Tensor`[] if the input order is\n * fixed, or otherwise NamedTensorMap format.\n *\n * For model with multiple inputs, we recommend you use NamedTensorMap as the\n * input type, if you use `tf.Tensor`[], the order of the array needs to\n * follow the\n * order of inputNodes array. @see {@link GraphModel.inputNodes}\n *\n * You can also feed any intermediate nodes using the NamedTensorMap as the\n * input type. For example, given the graph\n * InputNode => Intermediate => OutputNode,\n * you can execute the subgraph Intermediate => OutputNode by calling\n * model.execute('IntermediateNode' : tf.tensor(...));\n
*\n * This is useful for models that uses tf.dynamic_rnn, where the intermediate\n * state needs to be fed manually.\n *\n * For batch inference execution, the tensors for each input need to be\n * concatenated together. For example with mobilenet, the required input shape\n * is [1, 244, 244, 3], which represents the [batch, height, width, channel].\n * If we are provide a batched data of 100 images, the input tensor should be\n * in the shape of [100, 244, 244, 3].\n *\n * @param config Prediction configuration for specifying the batch size and\n * output node names. Currently the batch size option is ignored for graph\n * model.\n *\n * @returns Inference result tensors. The output would be single `tf.Tensor`\n * if model has single output node, otherwise Tensor[] or NamedTensorMap[]\n * will be returned for model with multiple outputs.\n *\n * @doc {heading: 'Models', subheading: 'Classes'}\n */\n predict(inputs: Tensor|Tensor[]|NamedTensorMap,
config?: ModelPredictConfig):\n Tensor|Tensor[]|NamedTensorMap {\n return this.execute(inputs, this.outputNodes);\n }\n\n private normalizeInputs(inputs: Tensor|Tensor[]|\n NamedTensorMap): NamedTensorMap {\n if (!(inputs instanceof Tensor) && !Array.isArray(inputs)) {\n // The input is already a NamedTensorMap.\n return inputs;\n }\n inputs = Array.isArray(inputs) ? inputs : [inputs];\n if (inputs.length !== this.inputNodes.length) {\n throw new Error(\n 'Input tensor count mismatch,' +\n

`the graph model has ${this.inputNodes.length} placeholders, ` +\n `while there are ${inputs.length} input tensors.`);\n }\n return this.inputNodes.reduce((map, inputName, i) => {\n map[inputName] = (inputs as Tensor[])[i];\n return map;\n }, {} as NamedTensorMap);\n }\n\n private normalizeOutputs(outputs: string|string[]): string[] {\n outputs = outputs || this.outputNodes;\n return !Array.isArray(outputs) ? [outputs] : outputs;\n }\n\n /**\n * Executes inference for the model for given input tensors.\n * @param inputs tensor, tensor array or tensor map of the inputs for the\n * model, keyed by the input node names.\n * @param outputs output node name from the Tensorflow model, if no\n * outputs are specified, the default outputs of the model would be used.\n * You can inspect intermediate nodes of the model by adding them to the\n * outputs array.\n *\n * @returns A single tensor if provided with a single output or no outputs\n * are provided and there is only one default output, otherwise return a\n * tensor array. The order of the tensor array is the same as the outputs\n * if provided, otherwise the order of outputNodes attribute of the model.\n *\n * @doc {heading: 'Models', subheading: 'Classes'}\n */\n execute(inputs: Tensor|Tensor[]|NamedTensorMap, outputs?: string|string[]):\n Tensor|Tensor[] {\n inputs = this.normalizeInputs(inputs);\n outputs = this.normalizeOutputs(outputs);\n const result = this.executor.execute(inputs, outputs);\n return result.length > 1 ? result : result[0];\n }\n /**\n * Executes inference for the model for given input tensors in async\n * fashion, use this method when your model contains control flow ops.\n * @param inputs tensor, tensor array or tensor map of the inputs for the\n * model, keyed by the input node names.\n * @param outputs output node name from the Tensorflow model, if no outputs\n * are specified, the default outputs of the model would be used. You can\n * inspect intermediate nodes of the model by adding them to the outputs\n * array.\n *\n * @returns A Promise of single tensor if provided with a single output or\n * no outputs are provided and there is only one default output, otherwise\n * return a tensor map.\n *\n * @doc {heading: 'Models', subheading: 'Classes'}\n */\n async executeAsync(\n inputs:\n Tensor|Tensor[]|NamedTensorMap,\n outputs?: string|string[]): Promise<Tensor|Tensor[]> {\n inputs = this.normalizeInputs(inputs);\n outputs = this.normalizeOutputs(outputs);\n const result = await this.executor.executeAsync(inputs, outputs);\n return result.length > 1 ? result : result[0];\n }\n\n private convertTensorMapToTensorsMap(map: NamedTensorMap): NamedTensorsMap {\n return Object.keys(map).reduce((newMap: NamedTensorsMap, key) => {\n newMap[key] = [map[key]];\n return newMap;\n }, {});\n }\n\n /**\n * Releases the memory used by the weight tensors and resourceManager.\n *\n * @doc {heading: 'Models', subheading: 'Classes'}\n */\n dispose() {\n this.executor.dispose();\n\n if (this.initializer) {\n this.initializer.dispose();\n }\n\n this.resourceManager.dispose();\n }\n}\n\n/**\n * Load a graph model given a URL to the model definition.\n *\n * Example of loading MobileNetV2 from a URL and making a prediction with a\n * zeros input:\n *\n * ```js\n * const modelUrl =\n * 'https://storage.googleapis.com/tfjs-models/savedmodel/mobilenet_v2_1.0_224/model.json';\n * const model = await tf.loadGraphModel(modelUrl);\n * const zeros = tf.zeros([1, 224, 224, 3]);\n * model.predict(zeros).print();\n * ```\n *\n * Example of loading MobileNetV2 from a TF Hub URL and making a prediction with\n * a zeros input:\n *\n * ```js\n * const modelUrl =\n * 'https://tfhub.dev/google/imagenet/mobilenet_v2_140_224/classification/2';\n * const model = await tf.loadGraphModel(modelUrl, {fromTFHub: true});\n * const zeros = tf.zeros([1, 224, 224, 3]);\n * model.predict(zeros).print();\n * ```\n * @param modelUrl The url or an `io.IOHandler` that loads the model.\n * @param options Options for the HTTP request, which allows to send credentials\n * and custom headers.\n *\n * @doc {heading: 'Models', subheading: 'Loading'}\n */\nexport async function loadGraphModel(\n modelUrl: string|io.IOHandler,\n options: io.LoadOptions = {}): Promise<GraphModel> {\n if (modelUrl == null) {\n throw new Error(\n 'modelUrl in loadGraphModel() cannot be null. Please provide a url ' +\n 'or an IOHandler that loads the model');\n }\n if (options == null) {\n options = {};\n }\n\n if (options.fromTFHub) {\n if ((modelUrl as io.IOHandler).load == null) {\n if (!(modelUrl as string).endsWith('/')) {\n modelUrl = (modelUrl as string) + '/';\n }\n modelUrl = `${modelUrl}${DEFAULT_MODEL_NAME}${TFHUB_SEARCH_PARAM}`;\n }\n }\n const model = new GraphModel(modelUrl, options);\n await model.load();\n return

model;\n}\n",null,null,null,null,null,null,null,null,null,null,null,null,null,null,null,null,null,null,"/**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except
in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n */\n\nimport Color from './color/Color';\nimport math from './color/math';\nimport interpret from './color/interpret';\n\nimport Controller from './controllers/Controller';\nimport BooleanController from './controllers/BooleanController';\nimport OptionController from './controllers/OptionController';\nimport StringController from './controllers/StringController';\nimport NumberController from './controllers/NumberController';\nimport NumberControllerBox from './controllers/NumberControllerBox';\nimport NumberControllerSlider from './controllers/NumberControllerSlider';\nimport FunctionController from './controllers/FunctionController';\nimport ColorController from './controllers/ColorController';\n\nimport domImport from './dom/dom';\nimport GUIImport from './gui/GUI';\n\nexport const color = {\n Color: Color,\n math: math,\n interpret: interpret\n};\n\nexport const controllers = {\n Controller: Controller,\n BooleanController: BooleanController,\n OptionController: OptionController,\n StringController: StringController,\n NumberController: NumberController,\n NumberControllerBox: NumberControllerBox,\n NumberControllerSlider: NumberControllerSlider,\n FunctionController: FunctionController,\n ColorController: ColorController\n};\n\nexport const dom = { dom: domImport };\n\nexport const gui = { GUI: GUIImport };\n\nexport const GUI = GUIImport;\n\nexport default {\n color,\n controllers,\n dom,\n gui,\n GUI\n};\n","/**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n */\n\nexport default function(color,
forceCSSHex) {\n const colorFormat = color.__state.conversionName.toString();\n\n const r = Math.round(color.r);\n const g = Math.round(color.g);\n const b = Math.round(color.b);\n const a = color.a;\n const h = Math.round(color.h);\n const s = color.s.toFixed(1);\n const v = color.v.toFixed(1);\n\n if (forceCSSHex || (colorFormat === 'THREE_CHAR_HEX') || (colorFormat === 'SIX_CHAR_HEX')) {\n let str = color.hex.toString(16);\n while (str.length < 6) {\n str = '0' + str;\n }\n return '#' + str;\n } else if (colorFormat === 'CSS_RGB') {\n return 'rgb(' + r + ',' + g + ',' + b + ')';\n } else if (colorFormat === 'CSS_RGBA') {\n return 'rgba(' + r + ',' + g + ',' + b + ',' + a + ')';\n } else if (colorFormat === 'HEX') {\n return '0x' + color.hex.toString(16);\n } else if (colorFormat === 'RGB_ARRAY') {\n return '[' + r + ',' + g + ',' + b + ']';\n } else if (colorFormat === 'RGBA_ARRAY') {\n return '[' + r + ',' + g + ',' + b + ',' + a + ']';\n } else if (colorFormat === 'RGB_OBJ') {\n return '{r:' + r + ',g:' + g + ',b:' + b + '}';\n } else if (colorFormat === 'RGBA_OBJ') {\n return '{r:' + r + ',g:' + g + ',b:' + b + ',a:' + a + '}';\n } else if (colorFormat === 'HSV_OBJ') {\n return '{h:' + h + ',s:' + s + ',v:' + v + '}';\n } else if (colorFormat === 'HSVA_OBJ') {\n return '{h:' + h + ',s:' + s + ',v:' + v + ',a:' + a + '}';\n }\n\n return 'unknown format';\n}\n","/**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n */\n\nconst ARR_EACH = Array.prototype.forEach;\nconst ARR_SLICE = Array.prototype.slice;\n\n/**\n * Band-aid methods for things that should be a lot easier in
JavaScript.\n * Implementation and structure inspired by underscore.js\n *
http://documentcloud.github.com/underscore/\n */\n\nconst Common = {\n BREAK: {},\n\n extend: function(target) {\n this.each(ARR_SLICE.call(arguments, 1), function(obj) {\n const keys = this.isObject(obj) ? Object.keys(obj) : [];\n keys.forEach(function(key) {\n if (!this.isUndefined(obj[key])) {\n target[key] = obj[key];\n }\n }.bind(this));\n }, this);\n\n return target;\n },\n\n defaults: function(target) {\n this.each(ARR_SLICE.call(arguments, 1), function(obj) {\n const keys = this.isObject(obj) ?

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Object.keys(obj) : [];\n      keys.forEach(function(key) {\n        if (this.isUndefined(target[key])) {\n          target[key] = obj[key];\n        }\n      }.bind(this));\n    }, this);\n\n    return target;\n  },\n\n  compose: function() {\n    const toCall = ARR_SLICE.call(arguments);\n    return function() {\n      let args = ARR_SLICE.call(arguments);\n      for (let i = toCall.length - 1; i >= 0; i--) {\n        args = [toCall[i].apply(this, args)];\n      }\n      return args[0];\n    };\n  },\n\n  each: function(obj, itr, scope) {\n    if (!obj) {\n      return;\n    }\n\n    if (ARR_EACH && obj.forEach && obj.forEach === ARR_EACH) {\n      obj.forEach(itr, scope);\n    } else if (obj.length === obj.length + 0) { // Is number but not NaN\n      let key;\n      let l;\n      for (key = 0, l = obj.length; key < l; key++) {\n        if (key in obj && itr.call(scope, obj[key], key) === this.BREAK) {\n          return;\n        }\n      }\n    } else {\n      for (const key in obj) {\n        if (itr.call(scope, obj[key], key) === this.BREAK) {\n          return;\n        }\n      }\n    }\n  },\n\n  defer: function(fnc) {\n    setTimeout(fnc, 0);\n  },\n\n  // if the function is called repeatedly, wait until threshold passes until we execute the function\n  debounce: function(func, threshold, callImmediately) {\n    let timeout;\n\n    return function() {\n      const obj = this;\n      const args = arguments;\n      function delayed() {\n        timeout = null;\n        if (!callImmediately) func.apply(obj, args);\n      }\n\n      const callNow = callImmediately || !timeout;\n\n      clearTimeout(timeout);\n      timeout = setTimeout(delayed, threshold);\n\n      if (callNow) {\n        func.apply(obj, args);\n      }\n    };\n  },\n\n  toArray: function(obj) {\n    if (obj.toArray) return obj.toArray();\n    return ARR_SLICE.call(obj);\n  },\n\n  isUndefined: function(obj) {\n    return obj === undefined;\n  },\n\n  isNull: function(obj) {\n    return obj === null;\n  },\n\n  isNaN: function(obj) {\n    return isNaN(obj);\n  },\n\n  isArray: Array.isArray || function(obj) {\n    return obj.constructor === Array;\n  },\n\n  isObject: function(obj) {\n    return obj === Object(obj);\n  },\n\n  isNumber: function(obj) {\n    return obj === obj + 0;\n  },\n\n  isString: function(obj) {\n    return obj === obj + '';\n  },\n\n  isBoolean: function(obj) {\n    return obj === false || obj === true;\n  },\n\n  isFunction: function(obj) {\n    return Object.prototype.toString.call(obj) === '[object Function]';\n  }\n\n};\n\nexport default Common;\n","/**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n */\n\nimport toString from './toString';\nimport common from '../utils/common';\n\nconst INTERPRETATIONS = [\n  // Strings\n  {\n    litmus: common.isString,\n    conversions: {\n      THREE_CHAR_HEX: {\n        read: function(original) {\n          const test = original.match(/^#([A-F0-9])([A-F0-9])([A-F0-9])$/i);\n          if (test === null) {\n            return false;\n          }\n\n          return {\n            space: 'HEX',\n            hex: parseInt(\n              '0x' +\n              test[1].toString() + test[1].toString() +\n              test[2].toString() + test[2].toString() +\n              test[3].toString() + test[3].toString(),\n              0)\n            };\n          },\n\n        write: toString\n      },\n\n      SIX_CHAR_HEX: {\n        read: function(original) {\n          const test = original.match(/^#([A-F0-9]{6})$/i);\n          if (test === null) {\n            return false;\n          }\n\n          return {\n            space: 'HEX',\n            hex: parseInt('0x' + test[1].toString(), 0)\n          };\n        },\n\n        write: toString\n      },\n\n      CSS_RGB: {\n        read: function(original) {\n          const test = original.match(/^rgb\\(\\s*(.+)\\s*,\\s*(.+)\\s*,\\s*(.+)\\s*\\)/);\n          if (test === null) {\n            return false;\n          }\n\n          return {\n            space: 'RGB',\n            r: parseFloat(test[1]),\n            g: parseFloat(test[2]),\n            b: parseFloat(test[3])\n          };\n        },\n\n        write: toString\n      },\n\n      CSS_RGBA: {\n        read: function(original) {\n          const test = original.match(/^rgba\\(\\s*(.+)\\s*,\\s*(.+)\\s*,\\s*(.+)\\s*,\\s*(.+)\\s*\\)/);\n          if (test === null) {\n            return false;\n          }\n\n          return {\n            space: 'RGB',\n            r: parseFloat(test[1]),\n            g: parseFloat(test[2]),\n            b: parseFloat(test[3]),\n            a: parseFloat(test[4])\n          };\n        },\n\n        write: toString\n      }\n    }\n  },\n\n  // Numbers\n  {\n    litmus: common.isNumber,\n\n    conversions: {\n\n      HEX: {\n        read: function(original) {\n          return {\n            space: 'HEX',\n            hex: original,\n            conversionName: 'HEX'\n          };\n        },\n\n        write: function(color) {\n          return color.hex;\n        }\n      }\n\n    }\n\n  },\n\n  // Arrays\n  {\n    litmus: common.isArray,\n    conversions: {\n      RGB_ARRAY: {\n        read: function(original) {\n          if (original.length !== 3) {\n            return false;\n          }\n\n          return {\n
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space: 'RGB',\n r: original[0],\n g: original[1],\n b: original[2]\n };\n },\n\n write: function(color) {\n return [color.r, color.g, color.b];\n }\n },\n\n RGBA_ARRAY: {\n read: function(original) {\n if (original.length !== 4) return false;\n return {\n space: 'RGB',\n r: original[0],\n g: original[1],\n b: original[2],\n a: original[3]\n };\n },\n\n write: function(color) {\n return [color.r, color.g, color.b, color.a];\n }\n }\n }\n },\n\n // Objects\n {\n litmus: common.isObject,\n conversions: {\n\n RGBA_OBJ: {\n read: function(original) {\n if (common.isNumber(original.r) &&\n common.isNumber(original.g) &&\n common.isNumber(original.b) &&\n common.isNumber(original.a)) {\n return {\n space: 'RGB',\n r: original.r,\n g: original.g,\n b: original.b,\n a: original.a\n };\n }\n return false;\n },\n\n write: function(color) {\n return {\n r: color.r,\n g: color.g,\n b: color.b,\n a: color.a\n };\n }\n },\n\n RGB_OBJ: {\n read: function(original) {\n if (common.isNumber(original.r) &&\n common.isNumber(original.g) &&\n common.isNumber(original.b)) {\n return {\n space: 'RGB',\n r: original.r,\n g: original.g,\n b: original.b\n };\n }\n return false;\n },\n\n write: function(color) {\n return {\n r: color.r,\n g: color.g,\n b: color.b\n };\n }\n },\n\n HSVA_OBJ: {\n read: function(original) {\n if (common.isNumber(original.h) &&\n common.isNumber(original.s) &&\n common.isNumber(original.v) &&\n common.isNumber(original.a)) {\n return {\n space: 'HSV',\n h: original.h,\n s: original.s,\n v: original.v,\n a: original.a\n };\n }\n return false;\n },\n\n write: function(color) {\n return {\n h: color.h,\n s: color.s,\n v: color.v,\n a: color.a\n };\n }\n },\n\n HSV_OBJ: {\n read: function(original) {\n if (common.isNumber(original.h) &&\n common.isNumber(original.s) &&\n common.isNumber(original.v)) {\n return {\n space: 'HSV',\n h: original.h,\n s: original.s,\n v: original.v\n };\n }\n return false;\n },\n\n write: function(color) {\n return {\n h: color.h,\n s: color.s,\n v: color.v\n };\n }\n }\n }\n ];\n\nlet result;\nlet toReturn;\n\nconst interpret = function() {\n toReturn = false;\n\n const original = arguments.length > 1 ? common.toArray(arguments) : arguments[0];\n common.each(INTERPRETATIONS, function(family) {\n if (family.litmus(original)) {\n common.each(family.conversions, function(conversion, conversionName) {\n result = conversion.read(original);\n\n if (toReturn === false && result !== false) {\n toReturn = result;\n result.conversionName = conversionName;\n result.conversion = conversion;\n return common.BREAK;\n }\n });\n\n return common.BREAK;\n }\n });\n\n return toReturn;\n};\n\nexport default interpret;\n","/**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n */\n\nlet tmpComponent;\n\nconst ColorMath = {\n hsv_to_rgb: function(h, s, v) {\n const hi = Math.floor(h / 60) % 6;\n\n const f = h / 60 - Math.floor(h / 60);\n const p = v * (1.0 - s);\n const q = v * (1.0 - (f * s));\n const t = v * (1.0 - ((1.0 - f) * s));\n\n const c = [\n [v, t, p],\n [q, v, p],\n [p, v, t],\n [p, q, v],\n [t, p, v],\n [v, p, q]\n ][hi];\n\n return {\n r: c[0] * 255,\n g: c[1] * 255,\n b: c[2] * 255\n };\n },\n\n rgb_to_hsv: function(r, g, b) {\n const min = Math.min(r, g, b);\n const max = Math.max(r, g, b);\n const delta = max - min;\n let h;\n let s;\n\n if (max !== 0) {\n s = delta / max;\n } else {\n return {\n h: NaN,\n s: 0,\n v: 0\n };\n }\n\n if (r === max) {\n h = (g - b) / delta;\n } else if (g === max) {\n h = 2 + (b - r) / delta;\n } else {\n h = 4 + (r - g) / delta;\n }\n h /= 6;\n if (h < 0) {\n h += 1;\n }\n\n return {\n h: h * 360,\n s: s,\n v: max / 255\n };\n },\n\n rgb_to_hex: function(r, g, b) {\n let hex = this.hex_with_component(0, 2, r);\n hex = this.hex_with_component(hex, 1, g);\n hex = this.hex_with_component(hex, 0, b);\n return hex;\n },\n\n component_from_hex: function(hex, componentIndex) {\n return (hex >> (componentIndex * 8)) & 0xFF;\n
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},\n\n hex_with_component:
 function(hex, componentIndex, value) {\n   return value << (tmpComponent = componentIndex * 8) | (hex &
~(0xFF << tmpComponent));\n }\n};\n\nexport default ColorMath;\n","/**\n * dat-gui JavaScript Controller
Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n *
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compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n */\n\nimport interpret from './interpret';\nimport math from
'./math';\nimport colorToString from './toString';\nimport common from '../utils/common';\n\nclass Color {\n
constructor() {\n   this.__state = interpret.apply(this, arguments);\n\n   if (this.__state === false) {\n   throw new
Error('Failed to interpret color arguments');\n   }\n\n   this.__state.a = this.__state.a || 1;\n }\n\n toString() {\n
return colorToString(this);\n
  }\n\n toHexString() {\n   return colorToString(this, true);\n }\n\n toOriginal() {\n   return
this.__state.conversion.write(this);\n }\n}\n\nfunction defineRGBComponent(target, component,
componentHexIndex) {\n Object.defineProperty(target, component, {\n   get: function() {\n   if
(this.__state.space === 'RGB') {\n   return this.__state[component];\n   }\n\n   Color.recalculateRGB(this,
component, componentHexIndex);\n\n   return this.__state[component];\n   },\n\n   set: function(v) {\n   if
(this.__state.space !== 'RGB') {\n   Color.recalculateRGB(this, component, componentHexIndex);\n
this.__state.space = 'RGB';\n   }\n\n   this.__state[component] = v;\n   }\n });\n}\n\nfunction
defineHSVComponent(target, component) {\n Object.defineProperty(target, component, {\n   get: function() {\n
if (this.__state.space === 'HSV') {\n   return this.__state[component];\n   }\n\n
Color.recalculateHSV(this);\n\n   return
 this.__state[component];\n   },\n\n   set: function(v) {\n   if (this.__state.space !== 'HSV') {\n
Color.recalculateHSV(this);\n   this.__state.space = 'HSV';\n   }\n\n   this.__state[component] = v;\n   }\n
});\n}\n\n\nColor.recalculateRGB = function(color, component, componentHexIndex) {\n if (color.__state.space
=== 'HEX') {\n   color.__state[component] = math.component_from_hex(color.__state.hex,
componentHexIndex);\n } else if (color.__state.space === 'HSV') {\n   common.extend(color.__state,
math.hsv_to_rgb(color.__state.h, color.__state.s, color.__state.v));\n } else {\n   throw new Error('Corrupted color
state');\n }\n};\n\nColor.recalculateHSV = function(color) {\n const result = math.rgb_to_hsv(color.r, color.g,
color.b);\n\n common.extend(color.__state,\n   {\n   s: result.s,\n   v: result.v\n   }\n);\n\n if
(!common.isNaN(result.h)) {\n   color.__state.h = result.h;\n } else if (common.isUndefined(color.__state.h)) {\n
color.__state.h
 = 0;\n }\n};\n\nColor.COMPONENTS = ['r', 'g', 'b', 'h', 's', 'v', 'hex', 'a'];\n\ndefineRGBComponent(Color.prototype,
'r', 2);\ndefineRGBComponent(Color.prototype, 'g', 1);\ndefineRGBComponent(Color.prototype, 'b',
0);\n\ndefineHSVComponent(Color.prototype, 'h');\ndefineHSVComponent(Color.prototype,
's');\ndefineHSVComponent(Color.prototype, 'v');\n\nObject.defineProperty(Color.prototype, 'a', {\n get: function()
{\n   return this.__state.a;\n },\n\n set: function(v) {\n   this.__state.a = v;\n
}\n});\n\nObject.defineProperty(Color.prototype, 'hex', {\n get: function() {\n   if (!this.__state.space !== 'HEX')
{\n   this.__state.hex = math.rgb_to_hex(this.r, this.g, this.b);\n   }\n\n   return this.__state.hex;\n },\n\n set:
function(v) {\n   this.__state.space = 'HEX';\n   this.__state.hex = v;\n }\n});\n\nexport default Color;\n","/**\n *
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use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n */\n\n/**\n * @class An \"abstract\" class that represents a given
property of an object.\n *\n * @param {Object} object The object to be manipulated\n * @param {string} property
The name of the property to be manipulated\n */\nclass Controller {\n constructor(object, property) {\n
this.initialValue = object[property];\n\n   /**\n   * Those who extend this class will put their DOM elements in
here.\n   * @type {DOMElement}\n   */\n   this.domElement = document.createElement('div');\n\n   /**\n   *
The object to manipulate\n   * @type {Object}\n   */\n   this.object = object;\n\n   /**\n   * The name of the

property to manipulate\n * @type {String}\n */\n this.property = property;\n\n /**\n * The function to be called on change.\n * @type {Function}\n * @ignore\n */\n this.__onChange = undefined;\n\n /**\n * The function to be called on finishing change.\n * @type {Function}\n * @ignore\n */\n this.__onFinishChange = undefined;\n }\n\n /**\n * Specify that a function fire every time someone changes the value with\n * this Controller.\n *\n * @param {Function} fnc This function will be called whenever the value\n * is modified via this Controller.\n * @returns {Controller} this\n */\n onChange(fnc) {\n this.__onChange = fnc;\n return this;\n }\n\n /**\n * Specify that a function fire every time someone \"finishes\" changing\n * the value wih this Controller. Useful for values that change\n * incrementally like numbers or strings.\n *\n * @param {Function} fnc This function will be called whenever\n * someone \"finishes\" changing the value via this Controller.\n * @returns {Controller} this\n */\n onFinishChange(fnc) {\n this.__onFinishChange = fnc;\n return this;\n }\n\n /**\n * Change the value of <code>object[property]</code>\n *\n * @param {Object} newValue The new value of <code>object[property]</code>\n */\n setValue(newValue) {\n this.object[this.property] = newValue;\n if (this.__onChange) {\n this.__onChange.call(this, newValue);\n }\n\n this.updateDisplay();\n return this;\n }\n\n /**\n * Gets the value of <code>object[property]</code>\n *\n * @returns {Object} The current value of <code>object[property]</code>\n */\n getValue() {\n return this.object[this.property];\n }\n\n /**\n * Refreshes the visual display of a Controller in order to keep sync\n * with the object's current value.\n * @returns {Controller} this\n */\n updateDisplay() {\n return this;\n }\n\n /**\n * @returns {Boolean} true if the value has deviated from initialValue\n */\n isModified() {\n return this.initialValue !== this.getValue();\n }\n}\n\nexport default Controller;\n","/**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n */\n\nimport common from '../utils/common';\n\nconst EVENT_MAP = {\n HTMLEvents: ['change'],\n MouseEvents: ['click', 'mousemove', 'mousedown', 'mouseup', 'mouseover'],\n KeyboardEvents: ['keydown']\n};\n\nconst EVENT_MAP_INV = {};\ncommon.each(EVENT_MAP, function(v, k) {\n common.each(v, function(e) {\n EVENT_MAP_INV[e] = k;\n });\n});\n\nconst CSS_VALUE_PIXELS = /(\\d+(\\.\\d+)?)px/;\n\nfunction cssValueToPixels(val) {\n if (val === '0' || common.isUndefined(val)) {\n return 0;\n }\n\n const match = val.match(CSS_VALUE_PIXELS);\n\n if (!common.isNull(match)) {\n return parseFloat(match[1]);\n }\n\n // TODO ...ems? %?\n\n return 0;\n}\n\n/**\n * @namespace\n * @member dat.dom\n */\nconst dom = {\n\n /**\n *\n * @param elem\n * @param selectable\n */\n makeSelectable: function(elem, selectable) {\n if (elem === undefined || elem.style === undefined) return;\n\n elem.onselectstart = selectable ? function() {\n return false;\n } : function() {\n };\n\n elem.style.MozUserSelect = selectable ? 'auto' : 'none';\n elem.style.KhtmlUserSelect = selectable ? 'auto' : 'none';\n elem.unselectable = selectable ? 'on' : 'off';\n },\n\n /**\n *\n * @param elem\n * @param horizontal\n * @param vert\n */\n makeFullscreen: function(elem, hor, vert) {\n let vertical = vert;\n let horizontal = hor;\n\n if (common.isUndefined(horizontal)) {\n horizontal = true;\n }\n\n if (common.isUndefined(vertical)) {\n vertical = true;\n }\n\n elem.style.position = 'absolute';\n\n if (horizontal) {\n elem.style.left = 0;\n elem.style.right = 0;\n }\n if (vertical) {\n elem.style.top = 0;\n elem.style.bottom = 0;\n }\n },\n\n /**\n *\n * @param elem\n * @param eventType\n * @param params\n */\n fakeEvent: function(elem, eventType, pars, aux) {\n const params = pars || {};\n const className = EVENT_MAP_INV[eventType];\n if (!className) {\n throw new Error('Event type ' + eventType + ' not supported.');\n }\n const evt = document.createEvent(className);\n switch (className) {\n case 'MouseEvents':\n {\n const clientX = params.x || params.clientX || 0;\n const clientY = params.y || params.clientY || 0;\n evt.initMouseEvent(eventType, params.bubbles || false,\n params.cancelable || true, window, params.clickCount || 1,\n 0, // screen X\n 0, // screen Y\n clientX, // client X\n clientY, // client

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Y\n false, false, false, false, 0, null);\n break;\n }\n case 'KeyboardEvents':\n {\n const init = evt.initKeyboardEvent || evt.initKeyEvent; // webkit || moz\n common.defaults(params, {\n cancelable: true,\n ctrlKey: false,\n altKey: false,\n shiftKey: false,\n metaKey: false,\n keyCode: undefined,\n charCode: undefined\n });\n init(eventType, params.bubbles || false,\n params.cancelable, window,\n params.ctrlKey, params.altKey,\n params.shiftKey, params.metaKey,\n params.keyCode, params.charCode);\n break;\n }\n default:\n {\n evt.initEvent(eventType, params.bubbles || false, params.cancelable || true);\n break;\n }\n }\n common.defaults(evt, aux);\n elem.dispatchEvent(evt);\n },\n\n /**\n *\n * @param elem\n * @param event\n\n * @param func\n * @param bool\n */\n bind: function(elem, event, func, newBool) {\n const bool = newBool || false;\n if (elem.addEventListener) {\n elem.addEventListener(event, func, bool);\n } else if (elem.attachEvent) {\n elem.attachEvent('on' + event, func);\n }\n return dom;\n },\n\n /**\n *\n * @param elem\n * @param event\n * @param func\n * @param bool\n */\n unbind: function(elem, event, func, newBool) {\n const bool = newBool || false;\n if (elem.removeEventListener) {\n elem.removeEventListener(event, func, bool);\n } else if (elem.detachEvent) {\n elem.detachEvent('on' + event, func);\n }\n return dom;\n },\n\n /**\n *\n * @param elem\n * @param className\n */\n addClass: function(elem, className) {\n if (elem.className === undefined) {\n elem.className = className;\n } else if (elem.className !== className) {\n const classes = elem.className.split(/ +/);\n if (classes.indexOf(className)
 === -1) {\n classes.push(className);\n elem.className = classes.join(' ').replace(/^\\s+/, '').replace(/\\s+$/, '');\n }\n }\n return dom;\n },\n\n /**\n *\n * @param elem\n * @param className\n */\n removeClass: function(elem, className) {\n if (className) {\n if (elem.className === className) {\n elem.removeAttribute('class');\n } else {\n const classes = elem.className.split(/ +/);\n const index = classes.indexOf(className);\n if (index !== -1) {\n classes.splice(index, 1);\n elem.className = classes.join(' ');\n }\n }\n } else {\n elem.className = undefined;\n }\n return dom;\n },\n\n hasClass: function(elem, className) {\n return new RegExp('(?:^|\\\\s+)' + className + '(?:\\\\s+|$)').test(elem.className) || false;\n },\n\n /**\n *\n * @param elem\n */\n getWidth: function(elem) {\n const style = getComputedStyle(elem);\n\n
 return cssValueToPixels(style['border-left-width']) +\n cssValueToPixels(style['border-right-width']) +\n cssValueToPixels(style['padding-left']) +\n cssValueToPixels(style['padding-right']) +\n cssValueToPixels(style.width);\n },\n\n /**\n *\n * @param elem\n */\n getHeight: function(elem) {\n const style = getComputedStyle(elem);\n\n return cssValueToPixels(style['border-top-width']) +\n cssValueToPixels(style['border-bottom-width']) +\n cssValueToPixels(style['padding-top']) +\n cssValueToPixels(style['padding-bottom']) +\n cssValueToPixels(style.height);\n },\n\n /**\n *\n * @param el\n */\n getOffset: function(el) {\n let elem = el;\n const offset = { left: 0, top: 0 };\n if (elem.offsetParent) {\n do {\n offset.left += elem.offsetLeft;\n offset.top += elem.offsetTop;\n elem = elem.offsetParent;\n } while (elem);\n }\n return offset;\n },\n\n //
http://stackoverflow.com/posts/2684561/revisions\n
 /**\n *\n * @param elem\n */\n isActive: function(elem) {\n return elem === document.activeElement && (elem.type || elem.href);\n }\n\n};\n\nexport default dom;\n","/**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n */\n\nimport Controller from './Controller';\nimport dom from '../dom/dom';\n\n/**\n * @class Provides a checkbox input to alter the boolean property of an object.\n *\n * @extends dat.controllers.Controller\n *\n * @param {Object} object The object to be manipulated\n * @param {string} property The name of the property to be manipulated\n */\nclass BooleanController extends Controller {\n constructor(object,
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property) {\n super(object, property);\n\n const _this = this;\n this.__prev = this.getValue();\n\n this.__checkbox = document.createElement('input');\n this.__checkbox.setAttribute('type', 'checkbox');\n\n function onChange() {\n   _this.setValue(!_this.__prev);\n }\n\n dom.bind(this.__checkbox, 'change', onChange, false);\n\n this.domElement.appendChild(this.__checkbox);\n\n // Match original value\n this.updateDisplay();\n }\n\n setValue(v) {\n const toReturn = super.setValue(v);\n if (this.__onFinishChange) {\n   this.__onFinishChange.call(this, this.getValue());\n }\n this.__prev = this.getValue();\n return toReturn;\n }\n\n updateDisplay() {\n if (this.getValue() === true) {\n   this.__checkbox.setAttribute('checked', 'checked');\n   this.__checkbox.checked = true;\n   this.__prev = true;\n } else {\n   this.__checkbox.checked = false;\n   this.__prev = false;\n }\n\n return super.updateDisplay();\n }\n}\n\nexport default BooleanController;\n","/**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n */\n\nimport Controller from './Controller';\nimport dom from '../dom/dom';\nimport common from '../utils/common';\n\n/**\n * @class Provides a select input to alter the property of an object, using a\n * list of accepted values.\n *\n * @extends dat.controllers.Controller\n *\n * @param {Object} object The object to be manipulated\n * @param {string} property The name of the property to be manipulated\n * @param {Object|string[]} options A map of labels to acceptable values, or\n * a list of acceptable string values.\n */\nclass OptionController extends Controller\n {\n constructor(object, property, opts) {\n super(object, property);\n\n let options = opts;\n\n const _this = this;\n\n /**\n   * The drop down menu\n   * @ignore\n   */\n this.__select = document.createElement('select');\n\n if (common.isArray(options)) {\n   const map = {};\n   common.each(options, function(element) {\n   map[element] = element;\n   });\n   options = map;\n }\n\n common.each(options, function(value, key) {\n   const opt = document.createElement('option');\n   opt.innerHTML = key;\n   opt.setAttribute('value', value);\n   _this.__select.appendChild(opt);\n });\n\n // Acknowledge original value\n this.updateDisplay();\n\n dom.bind(this.__select, 'change', function() {\n   const desiredValue = this.options[this.selectedIndex].value;\n   _this.setValue(desiredValue);\n });\n\n this.domElement.appendChild(this.__select);\n }\n\n setValue(v) {\n const toReturn = super.setValue(v);\n\n if (this.__onFinishChange) {\n   this.__onFinishChange.call(this, this.getValue());\n }\n return toReturn;\n }\n\n updateDisplay() {\n if (dom.isActive(this.__select)) return this; // prevent number from updating if user is trying to manually update\n this.__select.value = this.getValue();\n return super.updateDisplay();\n }\n}\n\nexport default OptionController;\n","/**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n */\n\nimport Controller from './Controller';\nimport dom from '../dom/dom';\n\n/**\n * @class Provides a text input to alter the string property of an object.\n *\n * @extends dat.controllers.Controller\n *\n * @param {Object} object The object to be manipulated\n * @param {string} property The name of the property to be manipulated\n */\nclass StringController extends Controller {\n constructor(object, property) {\n super(object, property);\n\n const _this = this;\n\n function onChange() {\n   _this.setValue(_this.__input.value);\n }\n\n function onBlur() {\n   if (_this.__onFinishChange) {\n   _this.__onFinishChange.call(_this, _this.getValue());\n   }\n }\n\n this.__input = document.createElement('input');\n this.__input.setAttribute('type', 'text');\n\n dom.bind(this.__input, 'keyup', onChange);\n dom.bind(this.__input, 'change', onChange);\n dom.bind(this.__input, 'blur', onBlur);\n dom.bind(this.__input, 'keydown', function(e) {\n   if (e.keyCode === 13) {\n   this.blur();\n   }\n });\n\n this.updateDisplay();\n\n this.domElement.appendChild(this.__input);\n }\n\n updateDisplay() {\n // Stops the caret from moving on account of:\n // keyup -> setValue -> updateDisplay\n if (!dom.isActive(this.__input)) {\n   this.__input.value = this.getValue();\n }\n return super.updateDisplay();\n }\n}\n\nexport default StringController;\n","/**\n * dat-

gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n */\n\nimport Controller from './Controller';\nimport common from '../utils/common';\n\nfunction numDecimals(x) {\n const _x = x.toString();\n if (_x.indexOf('.') > -1) {\n   return _x.length - _x.indexOf('.') - 1;\n }\n\n return 0;\n}\n\n/**\n * @class Represents a given property of an object that is a number.\n *\n * @extends dat.controllers.Controller\n *\n * @param {Object} object
 The object to be manipulated\n * @param {string} property The name of the property to be manipulated\n * @param {Object} [params] Optional parameters\n * @param {Number} [params.min] Minimum allowed value\n * @param {Number} [params.max] Maximum allowed value\n * @param {Number} [params.step] Increment by which to change value\n */\nclass NumberController extends Controller {\n constructor(object, property, params) {\n   super(object, property);\n\n   const _params = params || {};\n\n   this.__min = _params.min;\n   this.__max = _params.max;\n   this.__step = _params.step;\n\n   if (common.isUndefined(this.__step)) {\n   if (this.initialValue === 0) {\n   this.__impliedStep = 1; // What are we, psychics?\n   } else {\n   // Hey Doug, check this out.\n
    this.__impliedStep = Math.pow(10, Math.floor(Math.log(Math.abs(this.initialValue)) / Math.LN10)) / 10;\n
  }\n   } else {\n   this.__impliedStep = this.__step;\n   }\n\n   this.__precision = numDecimals(this.__impliedStep);\n
  }\n\n setValue(v) {\n   let _v = v;\n\n   if (this.__min !== undefined && _v < this.__min) {\n   _v = this.__min;\n   } else if (this.__max !== undefined && _v > this.__max) {\n   _v = this.__max;\n   }\n\n   if (this.__step !== undefined && _v % this.__step !== 0) {\n   _v = Math.round(_v / this.__step) * this.__step;\n
  }\n\n   return super.setValue(_v);\n }\n\n /**\n   * Specify a minimum value for <code>object[property]</code>.\n
   *\n   * @param {Number} minValue The minimum value for\n   * <code>object[property]</code>\n   * @returns {dat.controllers.NumberController} this\n   */\n min(minValue) {\n   this.__min = minValue;\n   return this;\n
  }\n\n /**\n   * Specify a maximum value for <code>object[property]</code>.\n   *\n   * @param {Number} maxValue The maximum value for\n   * <code>object[property]</code>\n   * @returns {dat.controllers.NumberController} this\n   */\n max(maxValue) {\n   this.__max = maxValue;\n   return
   this;\n }\n\n /**\n   * Specify a step value that dat.controllers.NumberController\n   * increments by.\n   *\n   * @param {Number} stepValue The step value for\n   * dat.controllers.NumberController\n   * @default if minimum and maximum specified increment is 1% of the\n   * difference otherwise stepValue is 1\n   * @returns {dat.controllers.NumberController} this\n   */\n step(stepValue) {\n   this.__step = stepValue;\n   this.__impliedStep = stepValue;\n   this.__precision = numDecimals(stepValue);\n   return this;\n }\n}\n\nexport default NumberController;\n","/**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n */\n\nimport NumberController from
 './NumberController';\nimport dom from '../dom/dom';\nimport common from '../utils/common';\n\nfunction roundToDecimal(value, decimals) {\n const tenTo = Math.pow(10, decimals);\n return Math.round(value * tenTo) / tenTo;\n}\n\n/**\n * @class Represents a given property of an object that is a number and\n * provides an input element with which to manipulate it.\n *\n * @extends dat.controllers.Controller\n * @extends dat.controllers.NumberController\n *\n * @param {Object} object The object to be manipulated\n * @param {string} property The name of the property to be manipulated\n * @param {Object} [params] Optional parameters\n * @param {Number} [params.min] Minimum allowed value\n * @param {Number} [params.max] Maximum allowed value\n * @param {Number} [params.step] Increment by which to change value\n */\nclass NumberControllerBox extends NumberController {\n constructor(object, property, params) {\n   super(object, property, params);\n\n   this.__truncationSuspended = false;\n\n
    const _this = this;\n\n   /**\n   * {Number} Previous mouse y position\n   * @ignore\n   */\n   let prevY;\n\n   function onChange() {\n   const attempted = parseFloat(_this.__input.value);\n   if (!common.isNaN(attempted)) {\n   _this.setValue(attempted);\n   }\n   }\n\n   function onFinish() {\n   if (_this.__onFinishChange) {\n

_this.__onFinishChange.call(_this, _this.getValue());\n }\n }\n\n function onBlur() {\n onFinish();\n }\n\n function onMouseDrag(e) {\n const diff = prevY - e.clientY;\n _this.setValue(_this.getValue() + diff * _this.__impliedStep);\n\n prevY = e.clientY;\n }\n\n function onMouseUp() {\n dom.unbind(window, 'mousemove', onMouseDrag);\n dom.unbind(window, 'mouseup', onMouseUp);\n onFinish();\n }\n\n function onMouseDown(e) {\n dom.bind(window, 'mousemove', onMouseDrag);\n dom.bind(window, 'mouseup', onMouseUp);\n prevY = e.clientY;\n }\n\n this.__input = document.createElement('input');\n this.__input.setAttribute('type', 'text');\n\n // Makes it so manually specified values are not truncated.\n\n dom.bind(this.__input, 'change', onChange);\n dom.bind(this.__input, 'blur', onBlur);\n dom.bind(this.__input, 'mousedown', onMouseDown);\n dom.bind(this.__input, 'keydown', function(e) {\n // When pressing enter, you can be as precise as you want.\n if (e.keyCode === 13) {\n _this.__truncationSuspended = true;\n this.blur();\n _this.__truncationSuspended = false;\n onFinish();\n }\n });\n\n this.updateDisplay();\n\n this.domElement.appendChild(this.__input);\n }\n\n updateDisplay() {\n this.__input.value = this.__truncationSuspended ? this.getValue() : roundToDecimal(this.getValue(), this.__precision);\n return super.updateDisplay();\n }\n}\n\nexport default NumberControllerBox;\n","/**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n */\n\nimport NumberController from './NumberController';\nimport dom from '../dom/dom';\n\nfunction map(v, i1, i2, o1, o2) {\n return o1 + (o2 - o1) * ((v - i1) / (i2 - i1));\n}\n\n/**\n * @class Represents a given property of an object that is a number, contains\n * a minimum and maximum, and provides a slider element with which to\n * manipulate it. It should be noted that the slider element is made up of\n * <code><div></code> tags, not the html5\n * <code><slider></code> element.\n *\n * @extends dat.controllers.Controller\n * @extends dat.controllers.NumberController\n *\n * @param {Object} object The object to be manipulated\n * @param {string} property The name of the property to be manipulated\n * @param {Number} minValue Minimum allowed value\n * @param {Number} maxValue Maximum allowed value\n * @param {Number} stepValue Increment by which to change value\n */\nclass NumberControllerSlider extends NumberController {\n constructor(object, property, min, max, step) {\n super(object, property, { min: min, max: max, step: step });\n\n const _this = this;\n\n this.__background = document.createElement('div');\n this.__foreground = document.createElement('div');\n\n dom.bind(this.__background, 'mousedown', onMouseDown);\n dom.bind(this.__background, 'touchstart', onTouchStart);\n\n dom.addClass(this.__background, 'slider');\n dom.addClass(this.__foreground, 'slider-fg');\n\n function onMouseDown(e) {\n document.activeElement.blur();\n\n dom.bind(window, 'mousemove', onMouseDrag);\n dom.bind(window, 'mouseup', onMouseUp);\n\n onMouseDrag(e);\n }\n\n function onMouseDrag(e) {\n e.preventDefault();\n\n const bgRect = _this.__background.getBoundingClientRect();\n\n _this.setValue(\n map(e.clientX, bgRect.left, bgRect.right, _this.__min, _this.__max)\n);\n\n return false;\n }\n\n function onMouseUp() {\n dom.unbind(window, 'mousemove', onMouseDrag);\n dom.unbind(window, 'mouseup', onMouseUp);\n if (_this.__onFinishChange) {\n _this.__onFinishChange.call(_this, _this.getValue());\n }\n }\n\n function onTouchStart(e) {\n if (e.touches.length !== 1) { return; }\n dom.bind(window, 'touchmove', onTouchMove);\n dom.bind(window, 'touchend', onTouchEnd);\n onTouchMove(e);\n }\n\n function onTouchMove(e) {\n const clientX = e.touches[0].clientX;\n const bgRect = _this.__background.getBoundingClientRect();\n\n _this.setValue(\n map(clientX, bgRect.left, bgRect.right, _this.__min, _this.__max)\n);\n }\n\n function onTouchEnd() {\n dom.unbind(window, 'touchmove', onTouchMove);\n dom.unbind(window, 'touchend', onTouchEnd);\n if (_this.__onFinishChange) {\n _this.__onFinishChange.call(_this, _this.getValue());\n }\n }\n\n this.updateDisplay();\n\n this.__background.appendChild(this.__foreground);\n this.domElement.appendChild(this.__background);\n }\n\n updateDisplay() {\n const pct = (this.getValue() -

this.__min) / (this.__max - this.__min);\n   this.__foreground.style.width = pct * 100 + '%';\n   return super.updateDisplay();\n }\n}\n\nexport default NumberControllerSlider;\n","/**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n */\n\nimport Controller from './Controller';\nimport dom from '../dom/dom';\n\n/**\n * @class Provides a GUI interface to fire a specified method, a property of an object.\n *\n * @extends dat.controllers.Controller\n *\n * @param {Object} object The object to be manipulated\n * @param {string} property The name of the property to be manipulated\n */\nclass FunctionController extends Controller {\n constructor(object, property, text) {\n   super(object, property);\n\n   const _this = this;\n\n   this.__button = document.createElement('div');\n   this.__button.innerHTML = text === undefined ? 'Fire' : text;\n\n   dom.bind(this.__button, 'click', function(e) {\n   e.preventDefault();\n   _this.fire();\n   return false;\n   });\n\n   dom.addClass(this.__button, 'button');\n\n   this.domElement.appendChild(this.__button);\n }\n\n fire() {\n   if (this.__onChange) {\n   this.__onChange.call(this);\n   }\n   this.getValue().call(this.object);\n   if (this.__onFinishChange) {\n   this.__onFinishChange.call(this, this.getValue());\n   }\n }\n}\n\nexport default FunctionController;\n","/**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n */\n\nimport Controller from './Controller';\nimport dom from '../dom/dom';\nimport Color from '../color/Color';\nimport interpret from '../color/interpret';\nimport common from '../utils/common';\n\n/**\n * @class Represents a given property of an object that is a color.\n * @param {Object} object\n * @param {string} property\n */\nclass ColorController extends Controller {\n constructor(object, property) {\n   super(object, property);\n\n   this.__color = new Color(this.getValue());\n   this.__temp = new Color(0);\n\n   const _this = this;\n\n   this.domElement = document.createElement('div');\n\n   dom.makeSelectable(this.domElement, false);\n\n   this.__selector = document.createElement('div');\n   this.__selector.className = 'selector';\n\n   this.__saturation_field = document.createElement('div');\n   this.__saturation_field.className = 'saturation-field';\n\n   this.__field_knob = document.createElement('div');\n   this.__field_knob.className = 'field-knob';\n   this.__field_knob_border = '2px solid ';\n\n   this.__hue_knob = document.createElement('div');\n   this.__hue_knob.className = 'hue-knob';\n\n   this.__hue_field = document.createElement('div');\n   this.__hue_field.className = 'hue-field';\n\n   this.__input = document.createElement('input');\n   this.__input.type = 'text';\n   this.__input_textShadow = '0 1px 1px ';\n\n   dom.bind(this.__input, 'keydown', function(e) {\n   if (e.keyCode === 13) { // on enter\n   onBlur.call(this);\n   }\n   });\n\n   dom.bind(this.__input, 'blur', onBlur);\n\n   dom.bind(this.__selector, 'mousedown', function(/* e */) {\n   dom\n   .addClass(this, 'drag')\n   .bind(window, 'mouseup', function(/* e */) {\n   dom.removeClass(_this.__selector, 'drag');\n   });\n   });\n\n   dom.bind(this.__selector, 'touchstart', function(/* e */) {\n   dom\n   .addClass(this, 'drag')\n   .bind(window, 'touchend', function(/* e */) {\n   dom.removeClass(_this.__selector, 'drag');\n   });\n   });\n\n   const valueField = document.createElement('div');\n\n   common.extend(this.__selector.style, {\n   width: '122px',\n   height: '102px',\n   padding: '3px',\n   backgroundColor: '#222',\n   boxShadow: '0px 1px 3px rgba(0,0,0,0.3)'\n   });\n\n   common.extend(this.__field_knob.style, {\n   position: 'absolute',\n   width: '12px',\n   height: '12px',\n   border: this.__field_knob_border + (this.__color.v < 0.5 ? '#fff' : '#000'),\n   boxShadow: '0px 1px 3px rgba(0,0,0,0.5)',\n   borderRadius: '12px',\n   zIndex: 1\n   });\n\n   common.extend(this.__hue_knob.style, {\n   position: 'absolute',\n   width: '15px',\n   height: '2px',\n   borderRight: '4px solid #fff',\n   zIndex: 1\n   });\n\n   common.extend(this.__saturation_field.style, {\n   width: '100px',\n   height: '100px',\n   border: '1px solid #555',\n   marginRight: '3px',\n   display: 'inline-block',\n   cursor: 'pointer'\n   });\n\n   common.extend(valueField.style, {\n   width: '100%',\n   height: '100%',\n   background: 'none'\n   });\n\n   linearGradient(valueField, 'top', 'rgba(0,0,0,0)', '#000');\n\n

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common.extend(this.__hue_field.style, {\n      width: '15px',\n      height: '100px',\n      border: '1px solid #555',\n
cursor: 'ns-resize',\n      position: 'absolute',\n      top: '3px',\n      right: '3px'\n    });\n\n
hueGradient(this.__hue_field);\n\n    common.extend(this.__input.style,
 {\n      outline: 'none',\n//      width: '120px',\n      textAlign: 'center',\n//      padding: '4px',\n//      marginBottom:
'6px',\n      color: '#fff',\n      border: 0,\n      fontWeight: 'bold',\n      textShadow: this.__input_textShadow +
'rgba(0,0,0,0.7)'\n    });\n\n    dom.bind(this.__saturation_field, 'mousedown', fieldDown);\n
dom.bind(this.__saturation_field, 'touchstart', fieldDown);\n\n    dom.bind(this.__field_knob, 'mousedown',
fieldDown);\n    dom.bind(this.__field_knob, 'touchstart', fieldDown);\n\n    dom.bind(this.__hue_field,
'mousedown', fieldDownH);\n    dom.bind(this.__hue_field, 'touchstart', fieldDownH);\n\n    function fieldDown(e)
{\n      setSV(e);\n      dom.bind(window, 'mousemove', setSV);\n      dom.bind(window, 'touchmove', setSV);\n
dom.bind(window, 'mouseup', fieldUpSV);\n      dom.bind(window, 'touchend', fieldUpSV);\n    }\n\n    function
fieldDownH(e) {\n      setH(e);\n      dom.bind(window, 'mousemove', setH);\n
    dom.bind(window, 'touchmove', setH);\n      dom.bind(window, 'mouseup', fieldUpH);\n      dom.bind(window,
'touchend', fieldUpH);\n    }\n\n    function fieldUpSV() {\n      dom.unbind(window, 'mousemove', setSV);\n
dom.unbind(window, 'touchmove', setSV);\n      dom.unbind(window, 'mouseup', fieldUpSV);\n
dom.unbind(window, 'touchend', fieldUpSV);\n      onFinish();\n    }\n\n    function fieldUpH() {\n
dom.unbind(window, 'mousemove', setH);\n      dom.unbind(window, 'touchmove', setH);\n      dom.unbind(window,
'mouseup', fieldUpH);\n      dom.unbind(window, 'touchend', fieldUpH);\n      onFinish();\n    }\n\n    function
onBlur() {\n      const i = interpret(this.value);\n      if (i !== false) {\n        _this.__color.__state = i;\n
_this.setValue(_this.__color.toOriginal());\n      } else {\n        this.value = _this.__color.toString();\n      }\n    }\n\n
function onFinish() {\n      if (_this.__onFinishChange) {\n        _this.__onFinishChange.call(_this,
 _this.__color.toOriginal());\n      }\n    }\n\n    this.__saturation_field.appendChild(valueField);\n
this.__selector.appendChild(this.__field_knob);\n    this.__selector.appendChild(this.__saturation_field);\n
this.__selector.appendChild(this.__hue_field);\n    this.__hue_field.appendChild(this.__hue_knob);\n\n
this.domElement.appendChild(this.__input);\n    this.domElement.appendChild(this.__selector);\n\n
this.updateDisplay();\n\n    function setSV(e) {\n      if (e.type.indexOf('touch') === -1) { e.preventDefault(); }\n\n
const fieldRect = _this.__saturation_field.getBoundingClientRect();\n      const { clientX, clientY } = (e.touches &&
e.touches[0]) || e;\n      let s = (clientX - fieldRect.left) / (fieldRect.right - fieldRect.left);\n      let v = 1 - (clientY -
fieldRect.top) / (fieldRect.bottom - fieldRect.top);\n\n      if (v > 1) {\n        v = 1;\n      } else if (v < 0) {\n        v =
0;\n      }\n\n      if (s > 1) {\n        s = 1;\n      } else
 if (s < 0) {\n        s = 0;\n      }\n\n      _this.__color.v = v;\n      _this.__color.s = s;\n\n
_this.setValue(_this.__color.toOriginal());\n\n\n      return false;\n    }\n\n    function setH(e) {\n      if
(e.type.indexOf('touch') === -1) { e.preventDefault(); }\n\n      const fieldRect =
_this.__hue_field.getBoundingClientRect();\n      const { clientY } = (e.touches && e.touches[0]) || e;\n      let h = 1
- (clientY - fieldRect.top) / (fieldRect.bottom - fieldRect.top);\n\n      if (h > 1) {\n        h = 1;\n      } else if (h < 0)
{\n        h = 0;\n      }\n\n      _this.__color.h = h * 360;\n\n      _this.setValue(_this.__color.toOriginal());\n\n
return false;\n    }\n  }\n\n  updateDisplay() {\n    const i = interpret(this.getValue());\n\n    if (i !== false) {\n      let
mismatch = false;\n\n      // Check for mismatch on the interpreted value.\n\n
common.each(Color.COMPONENTS, function(component) {\n        if (!common.isUndefined(i[component]) &&
!common.isUndefined(this.__color.__state[component])
 &&\n            i[component] !== this.__color.__state[component]) {\n          mismatch = true;\n          return {}; //
break\n        }\n      }, this);\n\n      // If nothing diverges, we keep our previous values\n      // for statefulness,
otherwise we recalculate fresh\n      if (mismatch) {\n        common.extend(this.__color.__state, i);\n      }\n    }\n\n
common.extend(this.__temp.__state, this.__color.__state);\n\n    this.__temp.a = 1;\n\n    const flip = (this.__color.v
< 0.5 || this.__color.s > 0.5) ? 255 : 0;\n    const _flip = 255 - flip;\n\n    common.extend(this.__field_knob.style, {\n
  marginLeft: 100 * this.__color.s - 7 + 'px',\n      marginTop: 100 * (1 - this.__color.v) - 7 + 'px',\n
backgroundColor: this.__temp.toHexString(),\n      border: this.__field_knob_border + 'rgb(' + flip + ',' + flip + ',' +
flip + ')'\n    });\n\n    this.__hue_knob.style.marginTop = (1 - this.__color.h / 360) * 100 + 'px';\n\n    this.__temp.s
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= 1;\n this.__temp.v = 1;\n\n linearGradient(this.__saturation_field, 'left', '#fff', this.__temp.toHexString());\n\n this.__input.value = this.__color.toString();\n\n common.extend(this.__input.style, {\n backgroundColor: this.__color.toHexString(),\n color: 'rgb(' + flip + ',' + flip + ',' + flip + ')',\n textShadow: this.__input_textShadow + 'rgba(' + _flip + ',' + _flip + ',' + _flip + ',.7)'\n });\n }\n}\n\nconst vendors = ['-moz-', '-o-', '-webkit-', '-ms-', ''];\n\nfunction linearGradient(elem, x, a, b) {\n elem.style.background = '';\n common.each(vendors, function(vendor) {\n elem.style.cssText += 'background: ' + vendor + 'linear-gradient(' + x + ', ' + a + ' 0%, ' + b + ' 100%); ';\n });\n}\n\nfunction hueGradient(elem) {\n elem.style.background = '';\n elem.style.cssText += 'background: -moz-linear-gradient(top, #ff0000 0%, #ff00ff 17%, #0000ff 34%, #00ffff 50%, #00ff00 67%, #ffff00 84%, #ff0000 100%);';\n elem.style.cssText
 += 'background: -webkit-linear-gradient(top, #ff0000 0%,#ff00ff 17%,#0000ff 34%,#00ffff 50%,#00ff00 67%,#ffff00 84%,#ff0000 100%);';\n elem.style.cssText += 'background: -o-linear-gradient(top, #ff0000 0%,#ff00ff 17%,#0000ff 34%,#00ffff 50%,#00ff00 67%,#ffff00 84%,#ff0000 100%);';\n elem.style.cssText += 'background: -ms-linear-gradient(top, #ff0000 0%,#ff00ff 17%,#0000ff 34%,#00ffff 50%,#00ff00 67%,#ffff00 84%,#ff0000 100%);';\n elem.style.cssText += 'background: linear-gradient(top, #ff0000 0%,#ff00ff 17%,#0000ff 34%,#00ffff 50%,#00ff00 67%,#ffff00 84%,#ff0000 100%);';\n}\n\nexport default ColorController;\n","/**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n *
http://www.apache.org/licenses/LICENSE-2.0\n
 */\n\nconst css = {\n load: function(url, indoc) {\n const doc = indoc || document;\n const link = doc.createElement('link');\n link.type = 'text/css';\n link.rel = 'stylesheet';\n link.href = url;\n doc.getElementsByTagName('head')[0].appendChild(link);\n },\n\n inject: function(cssContent, indoc) {\n const doc = indoc || document;\n const injected = document.createElement('style');\n injected.type = 'text/css';\n injected.innerHTML = cssContent;\n const head = doc.getElementsByTagName('head')[0];\n try {\n head.appendChild(injected);\n } catch (e) { // Unable to inject CSS, probably because of a Content Security Policy\n }\n }\n};\n\nexport default css;\n","const saveDialogContents = `<div id=\"dg-save\" class=\"dg dialogue\">\n\n Here's the new load parameter for your <code>GUI</code>'s constructor:\n\n <textarea id=\"dg-new-constructor\"></textarea>\n\n <div id=\"dg-save-locally\">\n\n <input id=\"dg-local-storage\"
 type=\"checkbox\"/> Automatically save\n values to <code>localStorage</code> on exit.\n\n <div id=\"dg-local-explain\">The values saved to <code>localStorage</code> will\n override those passed to <code>dat.GUI</code>'s constructor. This makes it\n easier to work incrementally, but <code>localStorage</code> is fragile,\n and your friends may not see the same values you do.\n\n \n\n \n\n `;\n\nexport default saveDialogContents;\n","/**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n
 */\n\nimport OptionController from './OptionController';\nimport NumberControllerBox from './NumberControllerBox';\nimport NumberControllerSlider
 from './NumberControllerSlider';\nimport StringController from './StringController';\nimport FunctionController from './FunctionController';\nimport BooleanController from './BooleanController';\nimport common from '../utils/common';\n\nconst ControllerFactory = function(object, property) {\n const initialValue = object[property];\n\n // Providing options?\n if (common.isArray(arguments[2]) || common.isObject(arguments[2])) {\n return new OptionController(object, property, arguments[2]);\n }\n\n // Providing a map?\n if (common.isNumber(initialValue)) {\n // Has min and max? (slider)\n if (common.isNumber(arguments[2]) && common.isNumber(arguments[3])) {\n // has step?\n if (common.isNumber(arguments[4])) {\n return new NumberControllerSlider(object, property,\n arguments[2], arguments[3], arguments[4]);\n }\n\n return new NumberControllerSlider(object, property, arguments[2], arguments[3]);\n }\n\n // number

box\n if (common.isNumber(arguments[4])) { // has step\n   return new NumberControllerBox(object, property,\n   { min: arguments[2], max: arguments[3], step: arguments[4] });\n }\n return new NumberControllerBox(object, property, { min: arguments[2], max: arguments[3] });\n }\n\n if (common.isString(initialValue)) {\n return new StringController(object, property);\n }\n\n if (common.isFunction(initialValue)) {\n return new FunctionController(object, property, '');\n }\n\n if (common.isBoolean(initialValue)) {\n return new BooleanController(object, property);\n }\n\n return null;\n};\n\nexport default ControllerFactory;\n","/**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the
 License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n */\n\nfunction requestAnimationFrame(callback) {\n setTimeout(callback, 1000 / 60);\n}\n\nexport default window.requestAnimationFrame ||\n window.webkitRequestAnimationFrame ||\n window.mozRequestAnimationFrame ||\n window.oRequestAnimationFrame ||\n window.msRequestAnimationFrame ||\n requestAnimationFrame;\n","/**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n */\n\nimport dom from '../dom/dom';\nimport common from '../utils/common';\n\nclass CenteredDiv {\n constructor() {\n this.backgroundElement = document.createElement('div');\n common.extend(this.backgroundElement.style,
 {\n   backgroundColor: 'rgba(0,0,0,0.8)',\n   top: 0,\n   left: 0,\n   display: 'none',\n   zIndex: '1000',\n   opacity: 0,\n   WebkitTransition: 'opacity 0.2s linear',\n   transition: 'opacity 0.2s linear'\n });\n\n dom.makeFullscreen(this.backgroundElement);\n this.backgroundElement.style.position = 'fixed';\n\n this.domElement = document.createElement('div');\n common.extend(this.domElement.style, {\n   position: 'fixed',\n   display: 'none',\n   zIndex: '1001',\n   opacity: 0,\n   WebkitTransition: '-webkit-transform 0.2s ease-out, opacity 0.2s linear',\n   transition: 'transform 0.2s ease-out, opacity 0.2s linear'\n });\n\n\n document.body.appendChild(this.backgroundElement);\n document.body.appendChild(this.domElement);\n\n const _this = this;\n dom.bind(this.backgroundElement, 'click', function() {\n   _this.hide();\n });\n }\n\n show() {\n const _this = this;\n\n this.backgroundElement.style.display
 = 'block';\n\n this.domElement.style.display = 'block';\n this.domElement.style.opacity = 0;\n// this.domElement.style.top = '52%';\n this.domElement.style.webkitTransform = 'scale(1.1)';\n\n this.layout();\n\n common.defer(function() {\n   _this.backgroundElement.style.opacity = 1;\n   _this.domElement.style.opacity = 1;\n   _this.domElement.style.webkitTransform = 'scale(1)';\n });\n }\n\n /**\n * Hide centered div\n */\n hide() {\n const _this = this;\n\n const hide = function() {\n   _this.domElement.style.display = 'none';\n   _this.backgroundElement.style.display = 'none';\n\n   dom.unbind(_this.domElement, 'webkitTransitionEnd', hide);\n   dom.unbind(_this.domElement, 'transitionend', hide);\n   dom.unbind(_this.domElement, 'oTransitionEnd', hide);\n };\n\n dom.bind(this.domElement, 'webkitTransitionEnd', hide);\n dom.bind(this.domElement, 'transitionend', hide);\n dom.bind(this.domElement, 'oTransitionEnd', hide);\n\n this.backgroundElement.style.opacity = 0;\n// this.domElement.style.top = '48%';\n this.domElement.style.opacity = 0;\n this.domElement.style.webkitTransform = 'scale(1.1)';\n }\n\n layout() {\n this.domElement.style.left = window.innerWidth / 2 - dom.getWidth(this.domElement) / 2 + 'px';\n this.domElement.style.top = window.innerHeight / 2 - dom.getHeight(this.domElement) / 2 + 'px';\n }\n}\n\nexport default CenteredDiv;\n","/**\n * dat-gui JavaScript Controller Library\n * http://code.google.com/p/dat-gui\n *\n * Copyright 2011 Data Arts Team, Google Creative Lab\n *\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n */\n\nimport css from '../utils/css';\nimport saveDialogueContents from './saveDialogue.html';\nimport ControllerFactory from

'../controllers/ControllerFactory';\nimport
Controller from '../controllers/Controller';\nimport BooleanController from
'../controllers/BooleanController';\nimport FunctionController from '../controllers/FunctionController';\nimport
NumberControllerBox from '../controllers/NumberControllerBox';\nimport NumberControllerSlider from
'../controllers/NumberControllerSlider';\nimport ColorController from '../controllers/ColorController';\nimport
requestAnimationFrame from '../utils/requestAnimationFrame';\nimport CenteredDiv from
'../dom/CenteredDiv';\nimport dom from '../dom/dom';\nimport common from '../utils/common';\n\nimport
styleSheet from './style.scss'; // CSS to embed in build\n\ncss.inject(styleSheet);\n\n/** @ignore Outer-most
className for GUI's */\nconst CSS_NAMESPACE = 'dg';\n\nconst HIDE_KEY_CODE = 72;\n\n/** @ignore The
only value shared between the JS and SCSS. Use caution. */\nconst CLOSE_BUTTON_HEIGHT = 20;\n\nconst
DEFAULT_DEFAULT_PRESET_NAME = 'Default';\n\nconst SUPPORTS_LOCAL_STORAGE =
(function() {\n try {\n   return !!window.localStorage;\n } catch (e) {\n   return false;\n }\n}());\n\nlet
SAVE_DIALOGUE;\n\n/** @ignore Have we yet to create an autoPlace GUI? */\nlet autoPlaceVirgin =
true;\n\n/** @ignore Fixed position div that auto place GUI's go inside */\nlet autoPlaceContainer;\n\n/** @ignore
Are we hiding the GUI's ? */\nlet hide = false;\n\n/** @private GUI's which should be hidden */\nconst
hideableGuis = [];\n\n/**\n * @class A lightweight controller library for JavaScript. It allows you to easily\n *
manipulate variables and fire functions on the fly.\n *\n * @typicalname gui\n *\n * @example\n * // Creating a
GUI with options.\n * var gui = new dat.GUI({name: 'My GUI'});\n *\n * @example\n * // Creating a GUI and a
subfolder.\n * var gui = new dat.GUI();\n * var folder1 = gui.addFolder('Flow Field');\n *\n * @param {Object}
[params]\n * @param {String} [params.name] The name of this GUI.\n * @param {Object} [params.load] JSON
object representing the
saved state of\n * this GUI.\n * @param {dat.gui.GUI} [params.parent] The GUI I'm nested in.\n * @param
{Boolean} [params.autoPlace=true]\n * @param {Boolean} [params.hideable=true] If true, GUI is shown/hidden by
<kbd>h</kbd> keypress.\n * @param {Boolean} [params.closed=false] If true, starts closed\n * @param {Boolean}
[params.closeOnTop=false] If true, close/open button shows on top of the GUI\n */\nconst GUI = function(pars) {\n
const _this = this;\n\n let params = pars || {};\n\n /**\n   * Outermost DOM Element\n   * @type {DOMElement}\n
*/\n this.domElement = document.createElement('div');\n this.__ul = document.createElement('ul');\n
this.domElement.appendChild(this.__ul);\n\n dom.addClass(this.domElement, CSS_NAMESPACE);\n\n /**\n   *
Nested GUI's by name\n   * @ignore\n   */\n this.__folders = {};\n\n this.__controllers = [];\n\n /**\n   * List of
objects I'm remembering for save, only used in top level GUI\n   * @ignore\n   */\n this.__rememberedObjects =
[];\n\n
  /**\n   * Maps the index of remembered objects to a map of controllers, only used\n   * in top level GUI.\n   *\n   *
@private\n   * @ignore\n   *\n   * @example\n   * [\n   * {\n   *   propertyName: Controller,\n   *
anotherPropertyName: Controller\n   * },\n   * {\n   *   propertyName: Controller\n   * }\n   *]\n   */\n
this.__rememberedObjectIndecesToControllers = [];\n\n this.__listening = [];\n\n // Default parameters\n params =
common.defaults(params, {\n   closeOnTop: false,\n   autoPlace: true,\n   width: GUI.DEFAULT_WIDTH\n
});\n\n params = common.defaults(params, {\n   resizable: params.autoPlace,\n   hideable: params.autoPlace\n
});\n\n if (!common.isUndefined(params.load)) {\n   // Explicit preset\n   if (params.preset) {\n
params.load.preset = params.preset;\n   }\n } else {\n   params.load = { preset:
DEFAULT_DEFAULT_PRESET_NAME };\n }\n\n if (common.isUndefined(params.parent) &&
params.hideable) {\n   hideableGuis.push(this);\n
  }\n\n // Only root level GUI's are resizable.\n params.resizable = common.isUndefined(params.parent) &&
params.resizable;\n\n if (params.autoPlace && common.isUndefined(params.scrollable)) {\n   params.scrollable =
true;\n }\n//   params.scrollable = common.isUndefined(params.parent) && params.scrollable === true;\n\n // Not
part of params because I don't want people passing this in via\n // constructor. Should be a 'remembered' value.\n
let useLocalStorage =\n   SUPPORTS_LOCAL_STORAGE &&\n
localStorage.getItem(getLocalStorageHash(this, 'isLocal')) === 'true';\n\n let saveToLocalStorage;\n let
titleRow;\n\n Object.defineProperties(this,\n   /** @lends GUI.prototype */\n   {\n   /**\n   * The parent

<code>GUI</code>\n * @type dat.gui.GUI\n */\n parent: {\n get: function() {\n return params.parent;\n }\n },\n\n scrollable: {\n get: function() {\n return params.scrollable;\n }\n

},\n\n /**\n * Handles <code>GUI</code>'s element placement for you\n * @type Boolean\n */\n autoPlace: {\n get: function() {\n return params.autoPlace;\n }\n },\n\n /**\n * Handles <code>GUI</code>'s position of open/close button\n * @type Boolean\n */\n closeOnTop: {\n get: function() {\n return params.closeOnTop;\n }\n },\n\n /**\n * The identifier for a set of saved values\n * @type String\n */\n preset: {\n get: function() {\n if (_this.parent) {\n return _this.getRoot().preset;\n }\n\n return params.load.preset;\n },\n\n set: function(v) {\n if (_this.parent) {\n _this.getRoot().preset = v;\n } else {\n params.load.preset = v;\n }\n setPresetSelectIndex(this);\n _this.revert();\n }\n },\n\n /**\n
* The width of <code>GUI</code> element\n * @type Number\n */\n width: {\n get: function() {\n return params.width;\n },\n set: function(v) {\n params.width = v;\n setWidth(_this, v);\n }\n },\n\n /**\n * The name of <code>GUI</code>. Used for folders. i.e\n * a folder's name\n * @type String\n */\n name: {\n get: function() {\n return params.name;\n },\n set: function(v) {\n // TODO Check for collisions among sibling folders\n params.name = v;\n if (titleRow) {\n titleRow.innerHTML = params.name;\n }\n }\n },\n\n /**\n * Whether the <code>GUI</code> is collapsed or not\n * @type Boolean\n */\n closed: {\n get: function() {\n return params.closed;\n },\n set: function(v) {\n params.closed = v;\n if (params.closed) {\n dom.addClass(_this.__ul, GUI.CLASS_CLOSED);\n } else {\n dom.removeClass(_this.__ul, GUI.CLASS_CLOSED);\n }\n // For browsers that aren't going to respect the CSS transition,\n // Lets just check our height against the window height right off\n // the bat.\n this.onResize();\n\n if (_this.__closeButton) {\n _this.__closeButton.innerHTML = v ? GUI.TEXT_OPEN : GUI.TEXT_CLOSED;\n }\n }\n },\n\n /**\n * Contains all presets\n * @type Object\n */\n load: {\n get: function() {\n return params.load;\n }\n },\n\n /**\n
* Determines whether or not to use localStorage as the means for\n * <code>remember</code>ing\n * @type Boolean\n */\n useLocalStorage: {\n\n get: function() {\n return useLocalStorage;\n
},\n set: function(bool) {\n if (SUPPORTS_LOCAL_STORAGE) {\n useLocalStorage = bool;\n if (bool) {\n dom.bind(window, 'unload', saveToLocalStorage);\n } else {\n dom.unbind(window, 'unload', saveToLocalStorage);\n }\n localStorage.setItem(getLocalStorageHash(_this, 'isLocal'), bool);\n }\n }\n }\n });\n\n // Are we a root level GUI?\n if (common.isUndefined(params.parent)) {\n this.closed = params.closed || false;\n\n dom.addClass(this.domElement, GUI.CLASS_MAIN);\n dom.makeSelectable(this.domElement, false);\n\n // Are we supposed to be loading locally?\n if (SUPPORTS_LOCAL_STORAGE) {\n if (useLocalStorage) {\n _this.useLocalStorage = true;\n\n const savedGui = localStorage.getItem(getLocalStorageHash(this, 'gui'));\n\n if (savedGui) {\n params.load = JSON.parse(savedGui);\n }\n }\n }\n\n this.__closeButton = document.createElement('div');\n this.__closeButton.innerHTML = GUI.TEXT_CLOSED;\n dom.addClass(this.__closeButton, GUI.CLASS_CLOSE_BUTTON);\n if (params.closeOnTop) {\n dom.addClass(this.__closeButton, GUI.CLASS_CLOSE_TOP);\n this.domElement.insertBefore(this.__closeButton, this.domElement.childNodes[0]);\n } else {\n dom.addClass(this.__closeButton, GUI.CLASS_CLOSE_BOTTOM);\n this.domElement.appendChild(this.__closeButton);\n }\n\n dom.bind(this.__closeButton, 'click', function() {\n _this.closed = !_this.closed;\n });\n // Oh, you're a nested GUI!\n } else {\n if (params.closed === undefined) {\n params.closed = true;\n }\n\n const titleRowName = document.createTextNode(params.name);\n dom.addClass(titleRowName, 'controller-name');\n\n titleRow = addRow(_this, titleRowName);\n\n const onClickTitle = function(e) {\n e.preventDefault();\n _this.closed = !_this.closed;\n return

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 false;\n    };\n\n    dom.addClass(this.__ul, GUI.CLASS_CLOSED);\n\n    dom.addClass(titleRow, 'title');\n
dom.bind(titleRow, 'click', onClickTitle);\n\n    if (!params.closed) {\n      this.closed = false;\n    }\n  }\n\n  if
(params.autoPlace) {\n    if (common.isUndefined(params.parent)) {\n      if (autoPlaceVirgin) {\n
autoPlaceContainer = document.createElement('div');\n        dom.addClass(autoPlaceContainer,
CSS_NAMESPACE);\n        dom.addClass(autoPlaceContainer, GUI.CLASS_AUTO_PLACE_CONTAINER);\n
  document.body.appendChild(autoPlaceContainer);\n        autoPlaceVirgin = false;\n      }\n\n      // Put it in the dom
for you.\n      autoPlaceContainer.appendChild(this.domElement);\n\n      // Apply the auto styles\n
dom.addClass(this.domElement, GUI.CLASS_AUTO_PLACE);\n    }\n\n\n    // Make it not elastic.\n    if
(!this.parent) {\n      setWidth(_this, params.width);\n    }\n  }\n\n  this.__resizeHandler = function() {\n
_this.onResizeDebounced();\n
  };\n\n  dom.bind(window, 'resize', this.__resizeHandler);\n  dom.bind(this.__ul, 'webkitTransitionEnd',
this.__resizeHandler);\n  dom.bind(this.__ul, 'transitionend', this.__resizeHandler);\n  dom.bind(this.__ul,
'oTransitionEnd', this.__resizeHandler);\n  this.onResize();\n\n  if (params.resizable) {\n    addResizeHandle(this);\n
}\n\n  saveToLocalStorage = function() {\n    if (SUPPORTS_LOCAL_STORAGE &&
localStorage.getItem(getLocalStorageHash(_this, 'isLocal')) === 'true') {\n
localStorage.setItem(getLocalStorageHash(_this, 'gui'), JSON.stringify(_this.getSaveObject()));\n    }\n  };\n\n  //
expose this method publicly\n  this.saveToLocalStorageIfPossible = saveToLocalStorage;\n\n  function resetWidth()
{\n    const root = _this.getRoot();\n    root.width += 1;\n    common.defer(function() {\n      root.width -= 1;\n
});\n  }\n\n  if (!params.parent) {\n    resetWidth();\n  }\n};\n\nGUI.toggleHide = function() {\n  hide = !hide;\n
common.each(hideableGuis, function(gui)
 {\n    gui.domElement.style.display = hide ? 'none' : '';\n  });\n};\n\nGUI.CLASS_AUTO_PLACE =
'a';\nGUI.CLASS_AUTO_PLACE_CONTAINER = 'ac';\nGUI.CLASS_MAIN =
'main';\nGUI.CLASS_CONTROLLER_ROW = 'cr';\nGUI.CLASS_TOO_TALL = 'taller-than-
window';\nGUI.CLASS_CLOSED = 'closed';\nGUI.CLASS_CLOSE_BUTTON = 'close-
button';\nGUI.CLASS_CLOSE_TOP = 'close-top';\nGUI.CLASS_CLOSE_BOTTOM = 'close-
bottom';\nGUI.CLASS_DRAG = 'drag';\n\nGUI.DEFAULT_WIDTH = 245;\nGUI.TEXT_CLOSED = 'Close
Controls';\nGUI.TEXT_OPEN = 'Open Controls';\n\nGUI._keydownHandler = function(e) {\n  if
(document.activeElement.type !== 'text' &&\n    (e.which === HIDE_KEY_CODE || e.keyCode ===
HIDE_KEY_CODE)) {\n    GUI.toggleHide();\n  }\n};\ndom.bind(window, 'keydown', GUI._keydownHandler,
false);\n\ncommon.extend(\n  GUI.prototype,\n\n  /** @lends GUI.prototype */\n  {\n\n    /**\n     * Adds a new
{@link Controller} to the GUI. The type of controller created\n     * is inferred from the initial value of
<code>object[property]</code>.
 For\n     * color properties, see {@link addColor}.\n     *\n     * @param {Object} object The object to be
manipulated\n     * @param {String} property The name of the property to be manipulated\n     * @param
{Number} [min] Minimum allowed value\n     * @param {Number} [max] Maximum allowed value\n     * @param
{Number} [step] Increment by which to change value\n     * @returns {Controller} The controller that was added to
the GUI.\n     * @instance\n     *\n     * @example\n     * // Add a string controller.\n     * var person = {name:
'Sam'};\n     * gui.add(person, 'name');\n     *\n     * @example\n     * // Add a number controller slider.\n     * var
person = {age: 45};\n     * gui.add(person, 'age', 0, 100);\n     */\n    add: function(object, property) {\n      return
add(\n        this,\n        object,\n        property,\n        {\n          factoryArgs: Array.prototype.slice.call(arguments, 2)\n
        }\n      );\n    },\n\n    /**\n     * Adds a new color controller
 to the GUI.\n     *\n     * @param object\n     * @param property\n     * @returns {Controller} The controller that
was added to the GUI.\n     * @instance\n     *\n     * @example\n     * var palette = {\n     *   color1: '#FF0000', //
CSS string\n     *   color2: [ 0, 128, 255 ], // RGB array\n     *   color3: [ 0, 128, 255, 0.3 ], // RGB with alpha\n     *
color4: { h: 350, s: 0.9, v: 0.3 } // Hue, saturation, value\n     * };\n     * gui.addColor(palette, 'color1');\n     *
gui.addColor(palette, 'color2');\n     * gui.addColor(palette, 'color3');\n     * gui.addColor(palette, 'color4');\n     */\n
addColor: function(object, property) {\n      return add(\n        this,\n        object,\n        property,\n        {\n
color: true\n        }\n      );\n    },\n\n    /**\n     * Removes the given controller from the GUI.\n     * @param
```

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{Controller} controller\n     * @instance\n     */\n    remove: function(controller) {\n      // TODO listening?\n
this.__ul.removeChild(controller.__li);\n
    this.__controllers.splice(this.__controllers.indexOf(controller), 1);\n      const _this = this;\n
common.defer(function() {\n        _this.onResize();\n      });\n    },\n\n    /**\n     * Removes the root GUI from the
document and unbinds all event listeners.\n     * For subfolders, use `gui.removeFolder(folder)` instead.\n     *
@instance\n     */\n    destroy: function() {\n      if (this.parent) {\n        throw new Error(\n          'Only the root GUI
should be removed with .destroy(). ' +\n          'For subfolders, use gui.removeFolder(folder) instead.'\n        );\n
}\n\n      if (this.autoPlace) {\n        autoPlaceContainer.removeChild(this.domElement);\n      }\n\n      const _this =
this;\n      common.each(this.__folders, function(subfolder) {\n        _this.removeFolder(subfolder);\n      });\n\n
dom.unbind(window, 'keydown', GUI._keydownHandler, false);\n\n      removeListeners(this);\n    },\n\n    /**\n     *
Creates
 a new subfolder GUI instance.\n     * @param name\n     * @returns {dat.gui.GUI} The new folder.\n     * @throws
{Error} if this GUI already has a folder by the specified\n     * name\n     * @instance\n     */\n    addFolder:
function(name) {\n      // We have to prevent collisions on names in order to have a key\n      // by which to
remember saved values\n      if (this.__folders[name] !== undefined) {\n        throw new Error('You already have a
folder in this GUI by the' +\n          ' name \"' + name + '\"');\n      }\n\n      const newGuiParams = { name: name,
parent: this };\n\n      // We need to pass down the autoPlace trait so that we can\n      // attach event listeners to
open/close folder actions to\n      // ensure that a scrollbar appears if the window is too short.\n
newGuiParams.autoPlace = this.autoPlace;\n\n      // Do we have saved appearance data for this folder?\n      if
(this.load && // Anything loaded?\n          this.load.folders && // Was my parent a dead-end?\n
        this.load.folders[name]) { // Did daddy remember me?\n        // Start me closed if I was closed\n
newGuiParams.closed = this.load.folders[name].closed;\n\n        // Pass down the loaded data\n
newGuiParams.load = this.load.folders[name];\n      }\n\n      const gui = new GUI(newGuiParams);\n
this.__folders[name] = gui;\n\n      const li = addRow(this, gui.domElement);\n      dom.addClass(li, 'folder');\n
return gui;\n    },\n\n    /**\n     * Removes a subfolder GUI instance.\n     * @param {dat.gui.GUI} folder The
folder to remove.\n     * @instance\n     */\n    removeFolder: function(folder) {\n
this.__ul.removeChild(folder.domElement.parentElement);\n\n      delete this.__folders[folder.name];\n\n      // Do
we have saved appearance data for this folder?\n      if (this.load && // Anything loaded?\n          this.load.folders &&
// Was my parent a dead-end?\n          this.load.folders[folder.name]) {\n        delete this.load.folders[folder.name];\n
    }\n\n      removeListeners(folder);\n\n      const _this = this;\n\n      common.each(folder.__folders,
function(subfolder) {\n        folder.removeFolder(subfolder);\n      });\n\n      common.defer(function() {\n
_this.onResize();\n      });\n    },\n\n    /**\n     * Opens the GUI.\n     */\n    open: function() {\n      this.closed =
false;\n    },\n\n    /**\n     * Closes the GUI.\n     */\n    close: function() {\n      this.closed = true;\n    },\n\n    /**\n
* Hides the GUI.\n     */\n    hide: function() {\n      this.domElement.style.display = 'none';\n    },\n\n    /**\n     *
Shows the GUI.\n     */\n    show: function() {\n      this.domElement.style.display = '';\n    },\n\n\n    onResize:
function() {\n      // we debounce this function to prevent performance issues when rotating on tablet/mobile\n
const root = this.getRoot();\n      if (root.scrollable) {\n        const top = dom.getOffset(root.__ul).top;\n        let h =
0;\n\n        common.each(root.__ul.childNodes,
 function(node) {\n          if (!(root.autoPlace && node === root.__save_row)) {\n            h +=
dom.getHeight(node);\n          }\n        });\n\n        if (window.innerHeight - top - CLOSE_BUTTON_HEIGHT < h)
{\n          dom.addClass(root.domElement, GUI.CLASS_TOO_TALL);\n          root.__ul.style.height =
window.innerHeight - top - CLOSE_BUTTON_HEIGHT + 'px';\n        } else {\n
dom.removeClass(root.domElement, GUI.CLASS_TOO_TALL);\n          root.__ul.style.height = 'auto';\n        }\n
}\n\n      if (root.__resize_handle) {\n        common.defer(function() {\n          root.__resize_handle.style.height =
root.__ul.offsetHeight + 'px';\n        });\n      }\n\n      if (root.__closeButton) {\n        root.__closeButton.style.width
= root.width + 'px';\n      }\n    },\n\n    onResizeDebounced: common.debounce(function() { this.onResize(); },
50),\n\n    /**\n     * Mark objects for saving. The order of these objects cannot change as\n
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 * the GUI grows. When remembering new objects, append them to the end\n * of the list.\n *\n * @param {...Object} objects\n * @throws {Error} if not called on a top level GUI.\n * @instance\n * @ignore\n */\n remember: function() {\n if (common.isUndefined(SAVE_DIALOGUE)) {\n SAVE_DIALOGUE = new CenteredDiv();\n SAVE_DIALOGUE.domElement.innerHTML = saveDialogueContents;\n }\n\n if (this.parent) {\n throw new Error('You can only call remember on a top level GUI.');\n }\n\n const _this = this;\n\n common.each(Array.prototype.slice.call(arguments), function(object) {\n if (_this.__rememberedObjects.length === 0) {\n addSaveMenu(_this);\n }\n if (_this.__rememberedObjects.indexOf(object) === -1) {\n _this.__rememberedObjects.push(object);\n }\n });\n\n if (this.autoPlace) {\n // Set save row width\n setWidth(this, this.width);\n }\n },\n\n /**\n * @returns {dat.gui.GUI} the topmost parent GUI of a nested GUI.\n * @instance\n */\n getRoot: function() {\n let gui = this;\n while (gui.parent) {\n gui = gui.parent;\n }\n return gui;\n },\n\n /**\n * @returns {Object} a JSON object representing the current state of\n * this GUI as well as its remembered properties.\n * @instance\n */\n getSaveObject: function() {\n const toReturn = this.load;\n toReturn.closed = this.closed;\n\n // Am I remembering any values?\n if (this.__rememberedObjects.length > 0) {\n toReturn.preset = this.preset;\n\n if (!toReturn.remembered) {\n toReturn.remembered = {};\n }\n\n toReturn.remembered[this.preset] = getCurrentPreset(this);\n }\n\n toReturn.folders = {};\n common.each(this.__folders, function(element, key) {\n toReturn.folders[key] = element.getSaveObject();\n });\n\n return toReturn;\n },\n\n save: function() {\n if (!this.load.remembered) {\n this.load.remembered = {};\n }\n\n this.load.remembered[this.preset] = getCurrentPreset(this);\n markPresetModified(this, false);\n this.saveToLocalStorageIfPossible();\n },\n\n saveAs: function(presetName) {\n if (!this.load.remembered) {\n // Retain default values upon first save\n this.load.remembered = {};\n this.load.remembered[DEFAULT_DEFAULT_PRESET_NAME] = getCurrentPreset(this, true);\n }\n\n this.load.remembered[presetName] = getCurrentPreset(this);\n this.preset = presetName;\n addPresetOption(this, presetName, true);\n this.saveToLocalStorageIfPossible();\n },\n\n revert: function(gui) {\n common.each(this.__controllers, function(controller) {\n // Make revert work on Default.\n if (!this.getRoot().load.remembered) {\n controller.setValue(controller.initialValue);\n } else {\n recallSavedValue(gui || this.getRoot(), controller);\n }\n\n // fire onFinishChange callback\n if (controller.__onFinishChange) {\n controller.__onFinishChange.call(controller, controller.getValue());\n }\n }, this);\n\n common.each(this.__folders, function(folder) {\n folder.revert(folder);\n });\n\n if (!gui) {\n markPresetModified(this.getRoot(), false);\n }\n },\n\n listen: function(controller) {\n const init = this.__listening.length === 0;\n this.__listening.push(controller);\n if (init) {\n updateDisplays(this.__listening);\n }\n },\n\n updateDisplay: function() {\n common.each(this.__controllers, function(controller) {\n controller.updateDisplay();\n });\n common.each(this.__folders, function(folder) {\n folder.updateDisplay();\n });\n }\n });\n\n/**\n * Add a row to the end of the GUI or before another row.\n *\n * @param gui\n * @param [newDom] If specified, inserts the dom content in the new row\n * @param [liBefore] If specified, places the new row before another row\n *\n * @ignore\n */\nfunction addRow(gui, newDom, liBefore) {\n const li = document.createElement('li');\n if (newDom) {\n li.appendChild(newDom);\n }\n\n if (liBefore) {\n gui.__ul.insertBefore(li, liBefore);\n } else {\n gui.__ul.appendChild(li);\n }\n gui.onResize();\n return li;\n}\n\nfunction removeListeners(gui) {\n dom.unbind(window, 'resize', gui.__resizeHandler);\n\n if (gui.saveToLocalStorageIfPossible) {\n dom.unbind(window, 'unload', gui.saveToLocalStorageIfPossible);\n }\n}\n\nfunction markPresetModified(gui, modified) {\n const opt = gui.__preset_select[gui.__preset_select.selectedIndex];\n\n if (modified) {\n opt.innerHTML = opt.value + '*';\n } else {\n opt.innerHTML = opt.value;\n }\n}\n\nfunction augmentController(gui, li, controller) {\n controller.__li = li;\n controller.__gui
 = gui;\n\n common.extend(controller, /** @lends Controller.prototype */ {\n /**\n * @param {Array|Object} options\n * @return {Controller}\n */\n options: function(options) {\n if (arguments.length > 1) {\n
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const nextSibling = controller.__li.nextElementSibling;\n controller.remove();\n\n return add(\n gui,\n controller.object,\n controller.property,\n {\n before: nextSibling,\n factoryArgs: [common.toArray(arguments)]\n }\n );\n }\n\n if (common.isArray(options) || common.isObject(options)) {\n const nextSibling = controller.__li.nextElementSibling;\n controller.remove();\n\n return add(\n gui,\n controller.object,\n controller.property,\n {\n before: nextSibling,\n factoryArgs: [options]\n }\n );\n }\n },\n\n /**\n * Sets the name of the
 controller.\n * @param {string} name\n * @return {Controller}\n */\n name: function(name) {\n controller.__li.firstElementChild.firstElementChild.innerHTML = name;\n return controller;\n },\n\n /**\n * Sets controller to listen for changes on its underlying object.\n * @return {Controller}\n */\n listen: function() {\n controller.__gui.listen(controller);\n return controller;\n },\n\n /**\n * Removes the controller from its parent GUI.\n * @return {Controller}\n */\n remove: function() {\n controller.__gui.remove(controller);\n return controller;\n }\n });\n\n // All sliders should be accompanied by a box.\n if (controller instanceof NumberControllerSlider) {\n const box = new NumberControllerBox(controller.object, controller.property,\n { min: controller.__min, max: controller.__max, step: controller.__step });\n\n common.each(['updateDisplay', 'onChange', 'onFinishChange', 'step',
 'min', 'max'], function(method) {\n const pc = controller[method];\n const pb = box[method];\n controller[method] = box[method] = function() {\n const args = Array.prototype.slice.call(arguments);\n pb.apply(box, args);\n return pc.apply(controller, args);\n };\n });\n\n dom.addClass(li, 'has-slider');\n controller.domElement.insertBefore(box.domElement, controller.domElement.firstElementChild);\n } else if (controller instanceof NumberControllerBox) {\n const r = function(returned) {\n // Have we defined both boundaries?\n if (common.isNumber(controller.__min) && common.isNumber(controller.__max)) {\n // Well, then lets just replace this with a slider.\n\n // lets remember if the old controller had a specific name or was listening\n const oldName = controller.__li.firstElementChild.firstElementChild.innerHTML;\n const wasListening = controller.__gui.__listening.indexOf(controller) > -1;\n\n controller.remove();\n const newController = add(\n gui,\n controller.object,\n controller.property,\n {\n before: controller.__li.nextElementSibling,\n factoryArgs: [controller.__min, controller.__max, controller.__step]\n });\n\n newController.name(oldName);\n if (wasListening) newController.listen();\n\n return newController;\n }\n\n return returned;\n };\n\n controller.min = common.compose(r, controller.min);\n controller.max = common.compose(r, controller.max);\n } else if (controller instanceof BooleanController) {\n dom.bind(li, 'click', function() {\n dom.fakeEvent(controller.__checkbox, 'click');\n });\n\n dom.bind(controller.__checkbox, 'click', function(e) {\n e.stopPropagation(); // Prevents double-toggle\n });\n } else if (controller instanceof FunctionController) {\n dom.bind(li, 'click', function() {\n dom.fakeEvent(controller.__button,
 'click');\n });\n\n dom.bind(li, 'mouseover', function() {\n dom.addClass(controller.__button, 'hover');\n });\n\n dom.bind(li, 'mouseout', function() {\n dom.removeClass(controller.__button, 'hover');\n });\n } else if (controller instanceof ColorController) {\n dom.addClass(li, 'color');\n controller.updateDisplay = common.compose(function(val) {\n li.style.borderLeftColor = controller.__color.toString();\n return val;\n }, controller.updateDisplay);\n\n controller.updateDisplay();\n }\n\n controller.setValue = common.compose(function(val) {\n if (gui.getRoot().__preset_select && controller.isModified()) {\n markPresetModified(gui.getRoot(), true);\n }\n\n return val;\n }, controller.setValue);\n}\n\nfunction recallSavedValue(gui, controller) {\n // Find the topmost GUI, that's where remembered objects live.\n const root = gui.getRoot();\n\n // Does the object we're controlling match anything we've
 been told to\n // remember?\n const matchedIndex = root.__rememberedObjects.indexOf(controller.object);\n\n // Why yes, it does!\n if (matchedIndex !== -1) {\n // Let me fetch a map of controllers for thcommon.isObject.\n let controllerMap = root.__rememberedObjectIndecesToControllers[matchedIndex];\n\n // Ohp, I believe this is the first controller we've created for this\n // object. Lets make the map fresh.\n if (controllerMap === undefined) {\n controllerMap = {};\n root.__rememberedObjectIndecesToControllers[matchedIndex] =\n
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controllerMap;\n    }\n\n    // Keep track of this controller\n    controllerMap[controller.property] = controller;\n\n
// Okay, now have we saved any values for this controller?\n    if (root.load && root.load.remembered) {\n      const
presetMap = root.load.remembered;\n\n      // Which preset are we trying to load?\n      let preset;\n\n      if
(presetMap[gui.preset]) {\n        preset = presetMap[gui.preset];\n
 } else if (presetMap[DEFAULT_DEFAULT_PRESET_NAME]) {\n        // Uhh, you can have the default
instead?\n        preset = presetMap[DEFAULT_DEFAULT_PRESET_NAME];\n      } else {\n        // Nada.\n
return;\n      }\n\n      // Did the loaded object remember thcommon.isObject? &&  Did we remember this particular
property?\n      if (preset[matchedIndex] && preset[matchedIndex][controller.property] !== undefined) {\n        //
We did remember something for this guy ...\n        const value = preset[matchedIndex][controller.property];\n\n
// And that's what it is.\n        controller.initialValue = value;\n        controller.setValue(value);\n      }\n    }\n
}\n}\n\nfunction add(gui, object, property, params) {\n  if (object[property] === undefined) {\n    throw new
Error(`Object \"${object}\" has no property \"${property}\"`);\n  }\n\n  let controller;\n\n  if (params.color) {\n
controller = new ColorController(object, property);\n  } else {\n    const factoryArgs = [object,
 property].concat(params.factoryArgs);\n    controller = ControllerFactory.apply(gui, factoryArgs);\n  }\n\n  if
(params.before instanceof Controller) {\n    params.before = params.before.__li;\n  }\n\n  recallSavedValue(gui,
controller);\n\n  dom.addClass(controller.domElement, 'c');\n\n  const name = document.createElement('span');\n
dom.addClass(name, 'property-name');\n  name.innerHTML = controller.property;\n\n  const container =
document.createElement('div');\n  container.appendChild(name);\n
container.appendChild(controller.domElement);\n\n  const li = addRow(gui, container, params.before);\n\n
dom.addClass(li, GUI.CLASS_CONTROLLER_ROW);\n  if (controller instanceof ColorController) {\n
dom.addClass(li, 'color');\n  } else {\n    dom.addClass(li, typeof controller.getValue());\n  }\n\n
augmentController(gui, li, controller);\n\n  gui.__controllers.push(controller);\n\n  return controller;\n}\n\nfunction
getLocalStorageHash(gui, key) {\n  // TODO how does this deal with
 multiple GUI's?\n  return document.location.href + '.' + key;\n}\n\nfunction addPresetOption(gui, name,
setSelected) {\n  const opt = document.createElement('option');\n  opt.innerHTML = name;\n  opt.value = name;\n
gui.__preset_select.appendChild(opt);\n  if (setSelected) {\n    gui.__preset_select.selectedIndex =
gui.__preset_select.length - 1;\n  }\n}\n\nfunction showHideExplain(gui, explain) {\n  explain.style.display =
gui.useLocalStorage ? 'block' : 'none';\n}\n\nfunction addSaveMenu(gui) {\n  const div = gui.__save_row =
document.createElement('li');\n\n  dom.addClass(gui.domElement, 'has-save');\n\n  gui.__ul.insertBefore(div,
gui.__ul.firstChild);\n\n  dom.addClass(div, 'save-row');\n\n  const gears = document.createElement('span');\n
gears.innerHTML = ' ';\n  dom.addClass(gears, 'button gears');\n\n  // TODO replace with
FunctionController\n  const button = document.createElement('span');\n  button.innerHTML = 'Save';\n
dom.addClass(button, 'button');\n  dom.addClass(button,
 'save');\n\n  const button2 = document.createElement('span');\n  button2.innerHTML = 'New';\n
dom.addClass(button2, 'button');\n  dom.addClass(button2, 'save-as');\n\n  const button3 =
document.createElement('span');\n  button3.innerHTML = 'Revert';\n  dom.addClass(button3, 'button');\n
dom.addClass(button3, 'revert');\n\n  const select = gui.__preset_select = document.createElement('select');\n\n  if
(gui.load && gui.load.remembered) {\n    common.each(gui.load.remembered, function(value, key) {\n
addPresetOption(gui, key, key === gui.preset);\n    });\n  } else {\n    addPresetOption(gui,
DEFAULT_DEFAULT_PRESET_NAME, false);\n  }\n\n  dom.bind(select, 'change', function() {\n    for (let index
= 0; index < gui.__preset_select.length; index++) {\n      gui.__preset_select[index].innerHTML =
gui.__preset_select[index].value;\n    }\n\n    gui.preset = this.value;\n  });\n\n  div.appendChild(select);\n
div.appendChild(gears);\n  div.appendChild(button);\n  div.appendChild(button2);\n
  div.appendChild(button3);\n\n  if (SUPPORTS_LOCAL_STORAGE) {\n    const explain =
document.getElementById('dg-local-explain');\n    const localStorageCheckBox = document.getElementById('dg-
local-storage');\n    const saveLocally = document.getElementById('dg-save-locally');\n\n
saveLocally.style.display = 'block';\n\n    if (localStorage.getItem(getLocalStorageHash(gui, 'isLocal')) === 'true')
{\n      localStorageCheckBox.setAttribute('checked', 'checked');\n    }\n\n    showHideExplain(gui, explain);\n\n    //
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TODO: Use a boolean controller, fool!\n dom.bind(localStorageCheckBox, 'change', function() {\n gui.useLocalStorage = !gui.useLocalStorage;\n showHideExplain(gui, explain);\n });\n }\n\n const newConstructorTextArea = document.getElementById('dg-new-constructor');\n\n dom.bind(newConstructorTextArea, 'keydown', function(e) {\n if (e.metaKey && (e.which === 67 || e.keyCode === 67)) {\n SAVE_DIALOGUE.hide();\n }\n });\n\n dom.bind(gears, 'click', function() {\n newConstructorTextArea.innerHTML = JSON.stringify(gui.getSaveObject(), undefined, 2);\n SAVE_DIALOGUE.show();\n newConstructorTextArea.focus();\n newConstructorTextArea.select();\n });\n\n dom.bind(button, 'click', function() {\n gui.save();\n });\n\n dom.bind(button2, 'click', function() {\n const presetName = prompt('Enter a new preset name.');\n if (presetName) {\n gui.saveAs(presetName);\n }\n });\n\n dom.bind(button3, 'click', function() {\n gui.revert();\n });\n\n // div.appendChild(button2);\n}\n\nfunction addResizeHandle(gui) {\n let pmouseX;\n\n gui.__resize_handle = document.createElement('div');\n\n common.extend(gui.__resize_handle.style, {\n\n width: '6px',\n marginLeft: '-3px',\n height: '200px',\n cursor: 'ew-resize',\n position: 'absolute'\n // border: '1px solid blue'\n\n });\n\n function drag(e) {\n e.preventDefault();\n\n gui.width += pmouseX - e.clientX;\n gui.onResize();\n pmouseX = e.clientX;\n\n return false;\n }\n\n function dragStop() {\n dom.removeClass(gui.__closeButton, GUI.CLASS_DRAG);\n dom.unbind(window, 'mousemove', drag);\n dom.unbind(window, 'mouseup', dragStop);\n }\n\n function dragStart(e) {\n e.preventDefault();\n\n pmouseX = e.clientX;\n\n dom.addClass(gui.__closeButton, GUI.CLASS_DRAG);\n dom.bind(window, 'mousemove', drag);\n dom.bind(window, 'mouseup', dragStop);\n\n return false;\n }\n\n dom.bind(gui.__resize_handle, 'mousedown', dragStart);\n dom.bind(gui.__closeButton, 'mousedown', dragStart);\n\n gui.domElement.insertBefore(gui.__resize_handle, gui.domElement.firstElementChild);\n}\n\nfunction setWidth(gui, w) {\n gui.domElement.style.width = w + 'px';\n // Auto placed save-rows are position fixed, so we have to\n // set the width manually if we want it to bleed to the edge\n if (gui.__save_row && gui.autoPlace) {\n gui.__save_row.style.width = w + 'px';\n }\n if (gui.__closeButton) {\n gui.__closeButton.style.width = w + 'px';\n }\n}\n\nfunction getCurrentPreset(gui, useInitialValues) {\n const toReturn = {};\n\n // For each object I'm remembering\n common.each(gui.__rememberedObjects, function(val, index) {\n const savedValues = {};\n\n // The controllers I've made for thcommon.isObject by property\n const controllerMap =\n gui.__rememberedObjectIndecesToControllers[index];\n\n // Remember each value for each property\n common.each(controllerMap, function(controller, property) {\n savedValues[property] = useInitialValues ? controller.initialValue : controller.getValue();\n });\n\n // Save the values for thcommon.isObject\n toReturn[index] = savedValues;\n });\n\n return toReturn;\n}\n\nfunction setPresetSelectIndex(gui) {\n for (let index = 0; index < gui.__preset_select.length; index++) {\n if (gui.__preset_select[index].value === gui.preset) {\n gui.__preset_select.selectedIndex = index;\n }\n }\n}\n\nfunction updateDisplays(controllerArray) {\n if (controllerArray.length !== 0) {\n requestAnimationFrame.call(window, function() {\n updateDisplays(controllerArray);\n });\n }\n\n common.each(controllerArray, function(c) {\n c.updateDisplay();\n });\n}\n\nexport default GUI;\n","// stats.js - http://github.com/mrdoob/stats.js\n(function(f,e){\"object\"===typeof exports&&\"undefined\"!==typeof module?module.exports=e():\"function\"===typeof define&&define.amd?define(e):f.Stats=e()})(this,function(){var f=function(){function e(a){c.appendChild(a.dom);return a}function u(a){for(var d=0;d<c.children.length;d++)c.children[d].style.display=d===a?\"block\":\"none\";l=a}var l=0,c=document.createElement(\"div\");c.style.cssText=\"position:fixed;top:0;left:0;cursor:pointer;opacity:0.9;z-index:10000\";c.addEventListener(\"click\",function(a){a.preventDefault();\nu(++l%c.children.length)},!1);var k=(performance||Date).now(),g=k,a=0,r=e(new f.Panel(\"FPS\",\"#0ff\",\"#002\")),h=e(new f.Panel(\"MS\",\"#0f0\",\"#020\"));if(self.performance&&self.performance.memory)var t=e(new f.Panel(\"MB\",\"#f08\",\"#201\"));u(0);return{REVISION:16,dom:c,addPanel:e,showPanel:u,begin:function(){k=(performance||Date).now()},end:function(){a++;var c=(performance||Date).now();h.update(c-k,200);if(c>g+1E3&&(r.update(1E3*a/(c-g),100),g=c,a=0,t)){var d=performance.memory;t.update(d.usedJSHeapSize/\n1048576,d.jsHeapSizeLimit/1048576)}return

c},update:function(){k=this.end()},domElement:c,setMode:u}};f.Panel=function(e,f,l){var c=Infinity,k=0,g=Math.round,a=g(window.devicePixelRatio||1),r=80*a,h=48*a,t=3*a,v=2*a,d=3*a,m=15*a,n=74*a,p=30*a,q=document.createElement(\"canvas\");q.width=r;q.height=h;q.style.cssText=\"width:80px;height:48px\";var b=q.getContext(\"2d\");b.font=\"bold \"+9*a+\"px Helvetica,Arial,sans-serif\";b.textBaseline=\"top\";b.fillStyle=l;b.fillRect(0,0,r,h);b.fillStyle=f;b.fillText(e,t,v);\nb.fillRect(d,m,n,p);b.fillStyle=l;b.globalAlpha=.9;b.fillRect(d,m,n,p);return{dom:q,update:function(h,w){c=Math.min(c,h);k=Math.max(k,h);b.fillStyle=l;b.globalAlpha=1;b.fillRect(0,0,r,m);b.fillStyle=f;b.fillText(g(h)+\" \"+e+\" (\"+g(c)+\"-\"+g(k)+\")\",t,v);b.drawImage(q,d+a,m,n-a,p,d,m,n-a,p);b.fillRect(d+n-a,m,a,p);b.fillStyle=l;b.globalAlpha=.9;b.fillRect(d+n-a,m,a,g((1-h/w)*p))}}};return f});\n","/**\n * @license\n * Copyright 2019 Google LLC. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * http://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *\n ==*/\nimport*as tf from\"@tensorflow/tfjs-core\";import{util,tidy,div,sub,buffer,Tensor,browser,pad3d,scalar,concat,tensor2d,tensor}from\"@tensorflow/tfjs-core\";import{loadGraphModel}from\"@tensorflow/tfjs-converter\";var VALID_OUTPUT_STRIDES=[8,16,32];function assertValidOutputStride(e){util.assert(\"number\"==typeof e,function(){return\"outputStride is not a number\"}),util.assert(VALID_OUTPUT_STRIDES.indexOf(e)>=0,function(){return\"outputStride of \"+e+\" is invalid. It must be either 8, 16, or 32\"})}function assertValidResolution(e,t){util.assert(\"number\"==typeof e,function(){return\"resolution is not a number\"}),util.assert((e-1)%t==0,function(){return\"resolution of \"+e+\" is invalid for output stride \"+t+\".\"})}function toFloatIfInt(e){return tidy(function(){return\"int32\"===e.dtype&&(e=e.toFloat()),e=div(e,127.5),sub(e,1)})}var MobileNet=function(){function e(e,t){this.model=e;var r=this.model.inputs[0].shape;util.assert(-1===r[1]&&-1===r[2],function(){return\"Input shape [\"+r[1]+\", \"+r[2]+\"] must both be -1\"}),this.outputStride=t}return e.prototype.predict=function(e){var t=this;return tidy(function(){var r=toFloatIfInt(e).expandDims(0),n=t.model.predict(r),o=n[0],i=n[1],s=n[2],a=n[3];return{heatmapScores:i.squeeze().sigmoid(),offsets:o.squeeze(),displacementFwd:s.squeeze(),displacementBwd:a.squeeze()}})},e.prototype.dispose=function(){this.model.dispose()},e}();function half(e){return Math.floor(e/2)}var MaxHeap=function(){function e(e,t){this.priorityQueue=new Array(e),this.numberOfElements=-1,this.getElementValue=t}return e.prototype.enqueue=function(e){this.priorityQueue[++this.numberOfElements]=e,this.swim(this.numberOfElements)},e.prototype.dequeue=function(){var e=this.priorityQueue[0];return this.exchange(0,this.numberOfElements--),this.sink(0),this.priorityQueue[this.numberOfElements+1]=null,e},e.prototype.empty=function(){return-1===this.numberOfElements},e.prototype.size=function(){return this.numberOfElements+1},e.prototype.all=function(){return this.priorityQueue.slice(0,this.numberOfElements+1)},e.prototype.max=function(){return this.priorityQueue[0]},e.prototype.swim=function(e){for(;e>0&&this.less(half(e),e);)this.exchange(e,half(e)),e=half(e)},e.prototype.sink=function(e){for(;2*e<=this.numberOfElements;){var t=2*e;if(t<this.numberOfElements&&this.less(t,t+1)&&t++,!this.less(e,t))break;this.exchange(e,t),e=t}},e.prototype.getValueAt=function(e){return this.getElementValue(this.priorityQueue[e])},e.prototype.less=function(e,t){return this.getValueAt(e)<this.getValueAt(t)},e.prototype.exchange=function(e,t){var r=this.priorityQueue[e];this.priorityQueue[e]=this.priorityQueue[t],this.priorityQueue[t]=r},e}();function scoreIsMaximumInLocalWindow(e,t,r,n,o,i){for(var s=i.shape,a=s[0],u=s[1],l=!0,f=Math.max(r-

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o,0),c=Math.min(r+o+1,a),d=f;d<c;++d){for(var p=Math.max(n-
o,0),h=Math.min(n+o+1,u),m=p;m<h;++m)if(i.get(d,m,e)>t){l=!1;break}if(!l)break}return
 l}function buildPartWithScoreQueue(e,t,r){for(var n=r.shape,o=n[0],i=n[1],s=n[2],a=new
MaxHeap(o*i*s,function(e){return e.score}),u=0;u<o;++u)for(var l=0;l<i;++l)for(var f=0;f<s;++f){var
c=r.get(u,l,f);c<e||scoreIsMaximumInLocalWindow(f,c,u,l,t,r)&&a.enqueue({score:c,part:{heatmapY:u,heatmapX:l,
id:f}})}return a}var
partNames=[\"nose\",\"leftEye\",\"rightEye\",\"leftEar\",\"rightEar\",\"leftShoulder\",\"rightShoulder\",\"leftElbow\",
\"rightElbow\",\"leftWrist\",\"rightWrist\",\"leftHip\",\"rightHip\",\"leftKnee\",\"rightKnee\",\"leftAnkle\",\"rightAn
kle\"],NUM_KEYPOINTS=partNames.length,partIds=partNames.reduce(function(e,t,r){return
e[t]=r,e},{}),connectedPartNames=[[\"leftHip\",\"leftShoulder\"],[\"leftElbow\",\"leftShoulder\"],[\"leftElbow\",\"lef
tWrist\"],[\"leftHip\",\"leftKnee\"],[\"leftKnee\",\"leftAnkle\"],[\"rightHip\",\"rightShoulder\"],[\"rightElbow\",\"righ
tShoulder\"],[\"rightElbow\",\"rightWrist\"],[\"rightHip\",\"rightKnee\"],[\"rightKnee\",\"rightAnkle\"],[\"leftShould
er\",\"rightShoulder\"],[\"leftHip\",\"rightHip\"]],poseChain=[[\"nose\",\"leftEye\"],[\"leftEye\",\"leftEar\"],[\"nose\",
\"rightEye\"],[\"rightEye\",\"rightEar\"],[\"nose\",\"leftShoulder\"],[\"leftShoulder\",\"leftElbow\"],[\"leftElbow\",\"l
eftWrist\"],[\"leftShoulder\",\"leftHip\"],[\"leftHip\",\"leftKnee\"],[\"leftKnee\",\"leftAnkle\"],[\"nose\",\"rightShould
er\"],[\"rightShoulder\",\"rightElbow\"],[\"rightElbow\",\"rightWrist\"],[\"rightShoulder\",\"rightHip\"],[\"rightHip\",
\"rightKnee\"],[\"rightKnee\",\"rightAnkle\"]],connectedPartIndices=connectedPartNames.map(function(e){var
t=e[0],r=e[1];return[partIds[t],partIds[r]]}),partChannels=[\"left_face\",\"right_face\",\"right_upper_leg_front\",\"rig
ht_lower_leg_back\",\"right_upper_leg_back\",\"left_lower_leg_front\",\"left_upper_leg_front\",\"left_upper_leg_ba
ck\",\"left_lower_leg_back\",\"right_feet\",\"right_lower_leg_front\",\"left_feet\",\"torso_front\",\"torso_back\",\"rig
ht_upper_arm_front\",\"right_upper_arm_back\",\"right_lower_arm_back\",\"left_lower_arm_front\",\"left_upper_ar
m_front\",\"left_upper_arm_back\",\"left_lower_arm_back\",\"right_hand\",\"right_lower_arm_front\",\"left_hand\"]
;function
 getOffsetPoint(e,t,r,n){return{y:n.get(e,t,r),x:n.get(e,t,r+NUM_KEYPOINTS)}}function getImageCoords(e,t,r){var
n=getOffsetPoint(e.heatmapY,e.heatmapX,e.id,r),o=n.y,i=n.x;return{x:e.heatmapX*t+i,y:e.heatmapY*t+o}}functio
n clamp(e,t,r){return e<t?t:e>r?r:e}function squaredDistance(e,t,r,n){var o=r-e,i=n-t;return o*o+i*i}function
addVectors(e,t){return{x:e.x+t.x,y:e.y+t.y}}var parentChildrenTuples=poseChain.map(function(e){var
t=e[0],r=e[1];return[partIds[t],partIds[r]]}),parentToChildEdges=parentChildrenTuples.map(function(e){return
e[1]}),childToParentEdges=parentChildrenTuples.map(function(e){return e[0]});function
getDisplacement(e,t,r){var n=r.shape[2]/2;return{y:r.get(t.y,t.x,e),x:r.get(t.y,t.x,n+e)}}function
getStridedIndexNearPoint(e,t,r,n){return{y:clamp(Math.round(e.y/t),0,r-1),x:clamp(Math.round(e.x/t),0,n-
1)}}function
 traverseToTargetKeypoint(e,t,r,n,o,i,s,a){void 0===a&&(a=2);for(var
u=n.shape,l=u[0],f=u[1],c=getDisplacement(e,getStridedIndexNearPoint(t.position,i,l,f),s),d=addVectors(t.position,c
),p=0;p<a;p++){var
h=getStridedIndexNearPoint(d,i,l,f),m=getOffsetPoint(h.y,h.x,r,o);d=addVectors({x:h.x*i,y:h.y*i},{x:m.x,y:m.y})}
var g=getStridedIndexNearPoint(d,i,l,f),_=n.get(g.y,g.x,r);return{position:d,part:partNames[r],score:_}}function
decodePose(e,t,r,n,o,i){var s=t.shape[2],a=parentToChildEdges.length,u=new
Array(s),l=e.part,f=e.score,c=getImageCoords(l,n,r);u[l.id]={score:f,part:partNames[l.id],position:c};for(var d=a-
1;d>=0;--d){var
p=parentToChildEdges[d],h=childToParentEdges[d];u[p]&&!u[h]&&(u[h]=traverseToTargetKeypoint(d,u[p],h,t,r,n
,i))}for(d=0;d<a;++d){p=childToParentEdges[d],h=parentToChildEdges[d];u[p]&&!u[h]&&(u[h]=traverseToTarge
tKeypoint(d,u[p],h,t,r,n,o))}return u}function withinNmsRadiusOfCorrespondingPoint(e,t,r,n){var o=r.x,i=r.y;return
 e.some(function(e){var r=e.keypoints[n].position;return squaredDistance(i,o,r.y,r.x)<=t})}function
getInstanceScore(e,t,r){return r.reduce(function(r,n,o){var i=n.position,s=n.score;return
withinNmsRadiusOfCorrespondingPoint(e,t,i,o)||(r+=s),r},0)/r.length}var kLocalMaximumRadius=1;function
decodeMultiplePoses(e,t,r,n,o,i,s,a){void 0===s&&(s=.5),void 0===a&&(a=20);for(var
u=[],l=buildPartWithScoreQueue(s,kLocalMaximumRadius,e),f=a*a;u.length<i&&!l.empty();){var
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c=l.dequeue();if(!withinNmsRadiusOfCorrespondingPoint(u,f,getImageCoords(c.part,o,t),c.part.id)){var
d=decodePose(c,e,t,o,r,n),p=getInstanceScore(u,f,d);u.push({keypoints:d,score:p})}}return u}var
__assign=function(){return(__assign=Object.assign||function(e){for(var t,r=1,n=arguments.length;r<n;r++)for(var o
in t=arguments[r])Object.prototype.hasOwnProperty.call(t,o)&&(e[o]=t[o]);return
e}).apply(this,arguments)};function __awaiter(e,t,r,n){return new(r||(r=Promise))(function(o,i){function
s(e){try{u(n.next(e))}catch(e){i(e)}}function
 a(e){try{u(n.throw(e))}catch(e){i(e)}}function u(e){e.done?o(e.value):new
r(function(t){t(e.value)}).then(s,a)}u((n=n.apply(e,t||[])).next())})}function __generator(e,t){var
r,n,o,i,s={label:0,sent:function(){if(1&o[0])throw o[1];return o[1]},trys:[],ops:[]};return
i={next:a(0),throw:a(1),return:a(2)},\"function\"==typeof Symbol&&(i[Symbol.iterator]=function(){return
this}),i;function a(i){return function(a){return function(i){if(r)throw new TypeError(\"Generator is already
executing.\");for(;s;)try{if(r=1,n&&(o=2&i[0]?n.return:i[0]?n.throw||((o=n.return)&&o.call(n),0):n.next)&&!(o=o.c
all(n,i[1])).done)return o;switch(n=0,o&&(i=[2&i[0],o.value]),i[0]){case 0:case 1:o=i;break;case 4:return
s.label++,{value:i[1],done:!1};case 5:s.label++,n=i[1],i=[0];continue;case
7:i=s.ops.pop(),s.trys.pop();continue;default:if(!(o=(o=s.trys).length>0&&o[o.length-
1])&&(6===i[0]||2===i[0])){s=0;continue}if(3===i[0]&&(!o||i[1]>o[0]&&i[1]<o[3])){s.label=i[1];break}if(6===i[
0]&&s.label<o[1]){s.label=o[1],o=i;break}if(o&&s.label<o[2]){s.label=o[2],s.ops.push(i);break}o[2]&&s.ops.pop(
),s.trys.pop();continue}i=t.call(e,s)}catch(e){i=[6,e],n=0}finally{r=o=0}if(5&i[0])throw
 i[1];return{value:i[0]?i[1]:void 0,done:!0}}([i,a])}}}function eitherPointDoesntMeetConfidence(e,t,r){return
e<r||t<r}function getAdjacentKeyPoints(e,t){return connectedPartIndices.reduce(function(r,n){var
o=n[0],i=n[1];return eitherPointDoesntMeetConfidence(e[o].score,e[i].score,t)?r:(r.push([e[o],e[i]]),r)},[])}var
NEGATIVE_INFINITY=Number.NEGATIVE_INFINITY,POSITIVE_INFINITY=Number.POSITIVE_INFINITY
;function getBoundingBox(e){return e.reduce(function(e,t){var
r=e.maxX,n=e.maxY,o=e.minX,i=e.minY,s=t.position,a=s.x,u=s.y;return{maxX:Math.max(r,a),maxY:Math.max(n,
u),minX:Math.min(o,a),minY:Math.min(i,u)}},{maxX:NEGATIVE_INFINITY,maxY:NEGATIVE_INFINITY,min
X:POSITIVE_INFINITY,minY:POSITIVE_INFINITY})}function getBoundingBoxPoints(e){var
t=getBoundingBox(e),r=t.minX,n=t.minY,o=t.maxX,i=t.maxY;return[{x:r,y:n},{x:o,y:n},{x:o,y:i},{x:r,y:i}]}functi
on
 toTensorBuffer(e,t){return void 0===t&&(t=\"float32\"),__awaiter(this,void 0,void 0,function(){var r;return
__generator(this,function(n){switch(n.label){case 0:return[4,e.data()];case 1:return
r=n.sent(),[2,buffer(e.shape,t,r)]}})})}function toTensorBuffers3D(e){return __awaiter(this,void 0,void
0,function(){return __generator(this,function(t){return[2,Promise.all(e.map(function(e){return
toTensorBuffer(e,\"float32\")}))]})})}function scalePose(e,t,r,n,o){return void 0===n&&(n=0),void
0===o&&(o=0),{score:e.score,keypoints:e.keypoints.map(function(e){var
i=e.score,s=e.part,a=e.position;return{score:i,part:s,position:{x:a.x*r+o,y:a.y*t+n}}})}}function
scalePoses(e,t,r,n,o){return void 0===n&&(n=0),void
0===o&&(o=0),1===r&&1===t&&0===n&&0===o?e:e.map(function(e){return scalePose(e,t,r,n,o)})}function
flipPoseHorizontal(e,t){return{score:e.score,keypoints:e.keypoints.map(function(e){var
r=e.score,n=e.part,o=e.position;return{score:r,part:n,position:{x:t-1-o.x,y:o.y}}})}}function
 flipPosesHorizontal(e,t){return t<=0?e:e.map(function(e){return flipPoseHorizontal(e,t)})}function
getInputTensorDimensions(e){return e instanceof Tensor?[e.shape[0],e.shape[1]]:[e.height,e.width]}function
toInputTensor(e){return e instanceof Tensor?e:browser.fromPixels(e)}function padAndResizeTo(e,t){var
r=t[0],n=t[1],o=getInputTensorDimensions(e),i=o[0],s=o[1],a=n/r,u=[0,0,0,0],l=u[0],f=u[1],c=u[2],d=u[3];return
s/i<a?(l=0,f=0,c=Math.round(.5*(a*i-s)),d=Math.round(.5*(a*i-s))):(l=Math.round(.5*(1/a*s-
i)),f=Math.round(.5*(1/a*s-i)),c=0,d=0),{resized:tidy(function(){var
t=toInputTensor(e);return(t=pad3d(t,[[l,f],[c,d],[0,0]])).resizeBilinear([r,n])}),padding:{top:l,left:c,right:d,bottom:f}
}}function scaleAndFlipPoses(e,t,r,n,o){var
i=t[0],s=t[1],a=r[0],u=r[1],l=scalePoses(e,(i+n.top+n.bottom)/a,(s+n.left+n.right)/u,-n.top,-n.left);return
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o?flipPosesHorizontal(l,s):l}function mod(e,t){return tidy(function(){var r=e.div(scalar(t,\"int32\"));return e.sub(r.mul(scalar(t,\"int32\")))})}function argmax2d(e){var t=e.shape,r=t[0],n=t[1],o=t[2];return tidy(function(){var t=e.reshape([r*n,o]).argMax(0),i=t.div(scalar(n,\"int32\")).expandDims(1),s=mod(t,n).expandDims(1);return concat([i,s],1)})}function getPointsConfidence(e,t){for(var r=t.shape[0],n=new Float32Array(r),o=0;o<r;o++){var i=t.get(o,0),s=t.get(o,1);n[o]=e.get(i,s,o)}return n}function getOffsetPoint$1(e,t,r,n){return{y:n.get(e,t,r),x:n.get(e,t,r+NUM_KEYPOINTS)}}function getOffsetVectors(e,t){for(var r=[],n=0;n<NUM_KEYPOINTS;n++){var o=getOffsetPoint$1(e.get(n,0).valueOf(),e.get(n,1).valueOf(),n,t),i=o.x,s=o.y;r.push(s),r.push(i)}return tensor2d(r,[NUM_KEYPOINTS,2])}function getOffsetPoints(e,t,r){return tidy(function(){var n=getOffsetVectors(e,r);return e.toTensor().mul(scalar(t,\"int32\")).toFloat().add(n)})}function decodeSinglePose(e,t,r){return __awaiter(this,void 0,void 0,function(){var n,o,i,s,a,u,l,f,c,d;return __generator(this,function(p){switch(p.label){case 0:return n=0,o=argmax2d(e),[4,Promise.all([toTensorBuffer(e),toTensorBuffer(t),toTensorBuffer(o,\"int32\")])];case 1:return i=p.sent(),s=i[0],a=i[1],u=i[2],[4,toTensorBuffer(l=getOffsetPoints(u,r,a))];case 2:return f=p.sent(),c=Array.from(getPointsConfidence(s,u)),d=c.map(function(e,t){return n+=e,{position:{y:f.get(t,0),x:f.get(t,1)},part:partNames[t],score:e}}),o.dispose(),l.dispose(),[2,{keypoints:d,score:n/d.length}]}})})}var MOBILENET_BASE_URL=\"https://storage.googleapis.com/tfjs-models/savedmodel/posenet/mobilenet/\",RESNET50_BASE_URL=\"https://storage.googleapis.com/tfjs-models/savedmodel/posenet/resnet50/\";function resNet50Checkpoint(e,t){var r=\"model-stride\"+e+\".json\";return 4==t?RESNET50_BASE_URL+\"float/\"+r:RESNET50_BASE_URL+\"quant\"+t+\"/\"+r}function mobileNetCheckpoint(e,t,r){var n={1:\"100\",.75:\"075\",.5:\"050\"},o=\"model-stride\"+e+\".json\";return 4==r?MOBILENET_BASE_URL+\"float/\"+n[t]+\"/\"+o:MOBILENET_BASE_URL+\"quant\"+r+\"/\"+n[t]+\"/\"+o}function toFloatIfInt$1(e){return tidy(function(){\"int32\"===e.dtype&&(e=e.toFloat());var t=tensor([-123.15,-115.9,-103.06]);return e.add(t)})}var ResNet=function(){function e(e,t){this.model=e;var r=this.model.inputs[0].shape;util.assert(-1===r[1]&&-1===r[2],function(){return\"Input shape [\"+r[1]+\", \"+r[2]+\"] must both be equal to or -1\"}),this.outputStride=t}return e.prototype.predict=function(e){var t=this;return tidy(function(){var r=toFloatIfInt$1(e).expandDims(0),n=t.model.predict(r),o=n[0],i=n[1],s=n[2];return{heatmapScores:n[3].squeeze().sigmoid(),offsets:s.squeeze(),displacementFwd:o.squeeze(),displacementBwd:i.squeeze()}})},e.prototype.dispose=function(){this.model.dispose()},e}(),MOBILENET_V1_CONFIG={architecture:\"MobileNetV1\",outputStride:16,multiplier:.75,inputResolution:257},VALID_ARCHITECTURE=[\"MobileNetV1\",\"ResNet50\"],VALID_STRIDE={MobileNetV1:[8,16,32],ResNet50:[32,16]},VALID_INPUT_RESOLUTION=[161,193,257,289,321,353,385,417,449,481,513,801],VALID_MULTIPLIER={MobileNetV1:[.5,.75,1],ResNet50:[1]},VALID_QUANT_BYTES=[1,2,4];function validateModelConfig(e){if(null==(e=e||MOBILENET_V1_CONFIG).architecture&&(e.architecture=\"MobileNetV1\"),VALID_ARCHITECTURE.indexOf(e.architecture)<0)throw new Error(\"Invalid architecture \"+e.architecture+\". Should be one of \"+VALID_ARCHITECTURE);if(null==e.inputResolution&&(e.inputResolution=257),VALID_INPUT_RESOLUTION.indexOf(e.inputResolution)<0)throw new Error(\"Invalid inputResolution \"+e.inputResolution+\". Should be one of \"+VALID_INPUT_RESOLUTION);if(null==e.outputStride&&(e.outputStride=16),VALID_STRIDE[e.architecture].indexOf(e.outputStride)<0)throw new Error(\"Invalid outputStride \"+e.outputStride+\". Should be one of \"+VALID_STRIDE[e.architecture]+\" for architecutre \"+e.architecture+\".\");if(null==e.multiplier&&(e.multiplier=1),VALID_MULTIPLIER[e.architecture].indexOf(e.multiplier)<0)throw new Error(\"Invalid multiplier \"+e.multiplier+\". Should be one of \"+VALID_MULTIPLIER[e.architecture]+\" for architecutre \"+e.architecture+\".\");if(null==e.quantBytes&&(e.quantBytes=4),VALID_QUANT_BYTES.indexOf(e.quantByte

s)<0)throw
new Error(\"Invalid quantBytes \"+e.quantBytes+\". Should be one of \"+VALID_QUANT_BYTES+\" for architecutre \"+e.architecture+\".\");return e}var SINGLE_PERSON_INFERENCE_CONFIG={flipHorizontal:!1},MULTI_PERSON_INFERENCE_CONFIG={flipHorizontal:!1,maxDetections:5,scoreThreshold:.5,nmsRadius:20};function validateMultiPersonInputConfig(e){var t=e.maxDetections,r=e.scoreThreshold,n=e.nmsRadius;if(t<=0)throw new Error(\"Invalid maxDetections \"+t+\". Should be > 0\");if(r<0||r>1)throw new Error(\"Invalid scoreThreshold \"+r+\". Should be in range [0.0, 1.0]\");if(n<=0)throw new Error(\"Invalid nmsRadius \"+n+\".\")}var PoseNet=function(){function e(e,t){this.baseModel=e,this.inputResolution=t}return e.prototype.estimateMultiplePoses=function(e,t){return void 0===t&&(t=MULTI_PERSON_INFERENCE_CONFIG),__awaiter(this,void 0,void 0,function(){var r,n,o,i,s,a,u,l,f,c,d,p,h,m,g,_,I,E,v,N,y;return
__generator(this,function(T){switch(T.label){case 0:return
r=__assign({},MULTI_PERSON_INFERENCE_CONFIG,t),validateMultiPersonInputConfig(t),n=this.baseModel.outputStride,o=this.inputResolution,assertValidOutputStride(n),assertValidResolution(this.inputResolution,n),i=getInputTensorDimensions(e),s=i[0],a=i[1],u=padAndResizeTo(e,[o,o]),l=u.resized,f=u.padding,c=this.baseModel.predict(l),d=c.heatmapScores,p=c.offsets,h=c.displacementFwd,m=c.displacementBwd,[4,toTensorBuffers3D([d,p,h,m])];case 1:return
g=T.sent(),_=g[0],I=g[1],E=g[2],v=g[3],[4,decodeMultiplePoses(_,I,E,v,n,r.maxDetections,r.scoreThreshold,r.nmsRadius)];case 2:return
N=T.sent(),y=scaleAndFlipPoses(N,[s,a],[o,o],f,r.flipHorizontal),d.dispose(),p.dispose(),h.dispose(),m.dispose(),l.dispose(),[2,y]}})})},e.prototype.estimateSinglePose=function(e,t){return void 0===t&&(t=SINGLE_PERSON_INFERENCE_CONFIG),__awaiter(this,void 0,void 0,function(){var r,n,o,i,s,a,u,l,f,c,d,p,h,m,g,_;return __generator(this,function(I){switch(I.label){case
0:return
r=__assign({},SINGLE_PERSON_INFERENCE_CONFIG,t),n=this.baseModel.outputStride,o=this.inputResolution,assertValidOutputStride(n),assertValidResolution(o,n),i=getInputTensorDimensions(e),s=i[0],a=i[1],u=padAndResizeTo(e,[o,o]),l=u.resized,f=u.padding,c=this.baseModel.predict(l),d=c.heatmapScores,p=c.offsets,h=c.displacementFwd,m=c.displacementBwd,[4,decodeSinglePose(d,p,n)];case 1:return
g=I.sent(),_=scaleAndFlipPoses([g],[s,a],[o,o],f,r.flipHorizontal),d.dispose(),p.dispose(),h.dispose(),m.dispose(),l.dispose(),[2,_[0]]}})})},e.prototype.estimatePoses=function(e,t){return __awaiter(this,void 0,void 0,function(){return __generator(this,function(r){switch(r.label){case 0:return\"single-person\"!=t.decodingMethod?[3,2]:[4,this.estimateSinglePose(e,t)];case 1:return[2,[r.sent()]];case 2:return[2,this.estimateMultiplePoses(e,t)]}})})},e.prototype.dispose=function(){this.baseModel.dispose()},e}();function loadMobileNet(e){return __awaiter(this,void 0,void 0,function(){var t,r,n,o,i,s;return __generator(this,function(a){switch(a.label){case
0:if(t=e.outputStride,r=e.quantBytes,n=e.multiplier,null==tf)throw new Error(\"Cannot find TensorFlow.js. If you are using a <script> tag, please also include @tensorflow/tfjs on the page before using this\\n model.\");return
o=mobileNetCheckpoint(t,n,r),[4,loadGraphModel(e.modelUrl||o)];case 1:return i=a.sent(),s=new MobileNet(i,t),[2,new PoseNet(s,e.inputResolution)]}})})}function loadResNet(e){return __awaiter(this,void 0,void 0,function(){var t,r,n,o,i;return __generator(this,function(s){switch(s.label){case
0:if(t=e.outputStride,r=e.quantBytes,null==tf)throw new Error(\"Cannot find TensorFlow.js. If you are using a <script> tag, please also include @tensorflow/tfjs on the page before using this\\n model.\");return
n=resNet50Checkpoint(t,r),[4,loadGraphModel(e.modelUrl||n)];case 1:return o=s.sent(),i=new ResNet(o,t),[2,new PoseNet(i,e.inputResolution)]}})})}function load(e){return void 0===e&&(e=MOBILENET_V1_CONFIG),__awaiter(this,void
0,void 0,function(){return
__generator(this,function(t){return\"ResNet50\"===(e=validateModelConfig(e)).architecture?[2,loadResNet(e)]:\"MobileNetV1\"===e.architecture?[2,loadMobileNet(e)]:[2,null]})})}export{decodeMultiplePoses,decodeSinglePose,

MobileNet,partChannels,partIds,partNames,poseChain,load,PoseNet,VALID_INPUT_RESOLUTION,getAdjacentKeyPoints,getBoundingBox,getBoundingBoxPoints,scalePose};\n","/**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * https://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==\n */\nimport * as posenet from '@tensorflow-models/posenet';\nimport * as tf from '@tensorflow/tfjs-core';\n\nconst COLOR = 'aqua';\nconst BOUNDING_BOX_COLOR = 'red';\nconst LINE_WIDTH = 2;\n\nexport const TRY_RESNET_BUTTON_NAME = 'tryResNetButton';\nexport const TRY_RESNET_BUTTON_TEXT = '[New] Try ResNet50';\nconst TRY_RESNET_BUTTON_TEXT_CSS = 'width:100%;text-decoration:underline;';\nconst TRY_RESNET_BUTTON_BACKGROUND_CSS = 'background:#e61d5f;';\n\nfunction isAndroid() {\n return /Android/i.test(navigator.userAgent);\n}\n\nfunction isiOS() {\n return /iPhone|iPad|iPod/i.test(navigator.userAgent);\n}\n\nexport function isMobile() {\n return isAndroid() || isiOS();\n}\n\nfunction setDatGuiPropertyCss(propertyText, liCssString, spanCssString = '') {\n var spans = document.getElementsByClassName('property-name');\n for (var i = 0; i < spans.length; i++) {\n   var text = spans[i].textContent || spans[i].innerText;\n   if (text == propertyText) {\n   spans[i].parentNode.parentNode.style = liCssString;\n   if (spanCssString !== '') {\n   spans[i].style = spanCssString;\n   }\n   }\n }\n}\n\nexport function updateTryResNetButtonDatGuiCss() {\n setDatGuiPropertyCss(\n   TRY_RESNET_BUTTON_TEXT, TRY_RESNET_BUTTON_BACKGROUND_CSS,\n   TRY_RESNET_BUTTON_TEXT_CSS);\n}\n\n/**\n * Toggles between the loading UI and the main canvas UI.\n */\nexport function toggleLoadingUI(\n   showLoadingUI, loadingDivId = 'loading', mainDivId = 'main') {\n if (showLoadingUI) {\n   document.getElementById(loadingDivId).style.display = 'block';\n   document.getElementById(mainDivId).style.display = 'none';\n } else {\n   document.getElementById(loadingDivId).style.display = 'none';\n   document.getElementById(mainDivId).style.display = 'block';\n }\n}\n\nexport function drawPoint(ctx, y, x, r, color) {\n ctx.beginPath();\n ctx.arc(x, y, r, 0, 2 * Math.PI);\n ctx.fillStyle = color;\n ctx.fill();\n}\n\n/**\n * Draws a line on a canvas, i.e. a joint\n */\nexport function drawSegment([ay, ax], [by, bx], color, scale, ctx) {\n ctx.beginPath();\n ctx.moveTo(ax * scale, ay * scale);\n ctx.lineTo(bx * scale, by * scale);\n ctx.lineWidth = LINE_WIDTH;\n ctx.strokeStyle = color;\n ctx.stroke();\n}\n\n/**\n * Draws a pose skeleton by looking up all adjacent keypoints/joints\n */\nexport function drawSkeleton(keypoints, minConfidence, ctx, scale = 1) {\n const adjacentKeyPoints =\n   posenet.getAdjacentKeyPoints(keypoints, minConfidence);\n\n function toTuple({y, x}) {\n   return [y, x];\n }\n\n adjacentKeyPoints.forEach((keypoints) => {\n   drawSegment(\n   toTuple(keypoints[0].position), toTuple(keypoints[1].position), COLOR,\n   scale, ctx);\n });\n}\n\n/**\n * Draw pose keypoints onto a canvas\n */\nexport function drawKeypoints(keypoints, minConfidence, ctx, scale = 1) {\n for (let i = 0; i < keypoints.length; i++) {\n   const keypoint = keypoints[i];\n\n   if (keypoint.score < minConfidence) {\n   continue;\n   }\n\n   const {y, x} = keypoint.position;\n   drawPoint(ctx, y * scale, x * scale, 3, COLOR);\n }\n}\n\n/**\n * Draw the bounding box of a pose. For example, for a whole person standing\n * in an image, the bounding box will begin at the nose and extend to one of\n * ankles\n */\nexport function drawBoundingBox(keypoints, ctx) {\n const boundingBox = posenet.getBoundingBox(keypoints);\n\n ctx.rect(\n   boundingBox.minX, boundingBox.minY, boundingBox.maxX - boundingBox.minX,\n   boundingBox.maxY - boundingBox.minY);\n\n ctx.strokeStyle = boundingBoxColor;\n ctx.stroke();\n}\n\n/**\n * Converts an array of pixel data into an ImageData object\n */\nexport async function renderToCanvas(a, ctx) {\n const [height, width] = a.shape;\n const imageData = new

ImageData(width, height);\n\n const data = await a.data();\n\n
  for (let i = 0; i < height * width; ++i) {\n   const j = i * 4;\n   const k = i * 3;\n\n   imageData.data[j + 0] = data[k + 0];\n   imageData.data[j + 1] = data[k + 1];\n   imageData.data[j + 2] = data[k + 2];\n   imageData.data[j + 3] = 255;\n }\n\n ctx.putImageData(imageData, 0, 0);\n}\n\n/**\n * Draw an image on a canvas\n */\nexport function renderImageToCanvas(image, size, canvas) {\n canvas.width = size[0];\n canvas.height = size[1];\n const ctx = canvas.getContext('2d');\n\n ctx.drawImage(image, 0, 0);\n}\n\n/**\n * Draw heatmap values, one of the model outputs, on to the canvas\n * Read our blog post for a description of PoseNet's heatmap outputs\n * https://medium.com/tensorflow/real-time-human-pose-estimation-in-the-browser-with-tensorflow-js-7dd0bc881cd5\n */\nexport function drawHeatMapValues(heatMapValues, outputStride, canvas) {\n const ctx = canvas.getContext('2d');\n const radius = 5;\n const scaledValues = heatMapValues.mul(tf.scalar(outputStride, 'int32'));\n\n drawPoints(ctx, scaledValues, radius, COLOR);\n}\n\n/**\n * Used by the drawHeatMapValues method to draw heatmap points on to\n * the canvas\n */\nfunction drawPoints(ctx, points, radius, color) {\n const data = points.buffer().values;\n\n for (let i = 0; i < data.length; i += 2) {\n   const pointY = data[i];\n   const pointX = data[i + 1];\n\n   if (pointX !== 0 && pointY !== 0) {\n   ctx.beginPath();\n   ctx.arc(pointX, pointY, radius, 0, 2 * Math.PI);\n   ctx.fillStyle = color;\n   ctx.fill();\n   }\n }\n}\n\n/**\n * Draw offset vector values, one of the model outputs, on to the canvas\n * Read our blog post for a description of PoseNet's offset vector outputs\n * https://medium.com/tensorflow/real-time-human-pose-estimation-in-the-browser-with-tensorflow-js-7dd0bc881cd5\n */\nexport function drawOffsetVectors(\n   heatMapValues, offsets, outputStride, scale = 1, ctx) {\n const offsetPoints =\n   posenet.singlePose.getOffsetPoints(heatMapValues,
 outputStride, offsets);\n\n const heatmapData = heatMapValues.buffer().values;\n const offsetPointsData = offsetPoints.buffer().values;\n\n for (let i = 0; i < heatmapData.length; i += 2) {\n   const heatmapY = heatmapData[i] * outputStride;\n   const heatmapX = heatmapData[i + 1] * outputStride;\n   const offsetPointY = offsetPointsData[i];\n   const offsetPointX = offsetPointsData[i + 1];\n\n   drawSegment(\n   [heatmapY, heatmapX], [offsetPointY, offsetPointX], COLOR, scale, ctx);\n }\n}\n","/**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * https://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS
 OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n *
==\n */\n// color schemes generated using d3-scale-chromatic:\n// https://github.com/d3/d3-scale-chromatic\n\nexport const rainbow = [\n [110, 64, 170], [143, 61, 178], [178, 60, 178], [210, 62, 167],\n [238, 67, 149], [255, 78, 125], [255, 94, 99], [255, 115, 75],\n [255, 140, 56], [239, 167, 47], [217, 194, 49], [194, 219, 64],\n [175, 240, 91], [135, 245, 87], [96, 247, 96], [64, 243, 115],\n [40, 234, 141], [28, 219, 169], [26, 199, 194], [33, 176, 213],\n [47, 150, 224], [65, 125, 224], [84, 101, 214], [99, 81, 195]\n];\n\nexport const warm = [\n [110, 64, 170], [106, 72, 183], [100, 81, 196], [92, 91, 206],\n [84, 101, 214], [75, 113, 221], [66, 125, 224], [56, 138, 226],\n [48, 150, 224], [40, 163, 220], [33, 176, 214], [29, 188, 205],\n
  [26, 199, 194], [26, 210, 182], [28, 219, 169], [33, 227, 155],\n [41, 234, 141], [51, 240, 128], [64, 243, 116], [79, 246, 105],\n [96, 247, 97], [115, 246, 91], [134, 245, 88], [155, 243, 88]\n];\n\nexport const spectral = [\n [158, 1, 66], [181, 26, 71], [202, 50, 74], [219, 73, 74],\n [232, 94, 73], [242, 117, 75], [248, 142, 83], [251, 167, 96],\n [253, 190, 112], [254, 210, 129], [254, 227, 149], [254, 240, 166],\n [251, 248, 176], [243, 249, 172], [231, 245, 163], [213, 238, 159],\n [190, 229, 160], [164, 218, 163], [137, 207, 165], [110, 192, 168],\n [86, 173, 174], [70, 150, 179], [67, 127, 180], [77, 103, 173]\n];\n","/**\n * @license\n * Copyright 2019 Google Inc. All Rights Reserved.\n * Licensed under the Apache License, Version 2.0 (the \"License\");\n * you may not use this file except in compliance with the License.\n * You may obtain a copy of the License at\n *\n * https://www.apache.org/licenses/LICENSE-2.0\n *\n * Unless required by applicable

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 law or agreed to in writing, software\n * distributed under the License is distributed on an \"AS IS\" BASIS,\n * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.\n * See the License for the specific language governing permissions and\n * limitations under the License.\n * ==========================================================================\n */\nimport '@tensorflow/tfjs-backend-webgl';\nimport * as bodyPix from '@tensorflow-models/body-pix';\nimport dat from 'dat.gui';\nimport Stats from 'stats.js';\n\nimport {drawKeypoints, drawSkeleton, toggleLoadingUI, TRY_RESNET_BUTTON_NAME, TRY_RESNET_BUTTON_TEXT, updateTryResNetButtonDatGuiCss} from './demo_util';\nimport * as partColorScales from './part_color_scales';\n\n\nconst stats = new Stats();\n\nconst state = {\n  video: null,\n  stream: null,\n  net: null,\n  videoConstraints: {},\n  // Triggers the TensorFlow model to reload\n changingArchitecture: false,\n  changingMultiplier: false,\n  changingStride: false,\n  changingResolution: false,\n  changingQuantBytes: false,\n};\n\nfunction isAndroid() {\n  return /Android/i.test(navigator.userAgent);\n}\n\nfunction isiOS() {\n  return /iPhone|iPad|iPod/i.test(navigator.userAgent);\n}\n\nfunction isMobile() {\n  return isAndroid() || isiOS();\n}\n\nasync function getVideoInputs() {\n  if (!navigator.mediaDevices || !navigator.mediaDevices.enumerateDevices) {\n    console.log('enumerateDevices() not supported.');\n    return [];\n  }\n\n  const devices = await navigator.mediaDevices.enumerateDevices();\n\n  const videoDevices = devices.filter(device => device.kind === 'videoinput');\n\n  return videoDevices;\n}\n\nfunction stopExistingVideoCapture() {\n  if (state.video && state.video.srcObject) {\n state.video.srcObject.getTracks().forEach(track => {\n    track.stop();\n  })\n  state.video.srcObject = null;\n }\n}\n\nasync function getDeviceIdForLabel(cameraLabel) {\n  const videoInputs = await getVideoInputs();\n\n  for (let i = 0; i < videoInputs.length; i++) {\n    const videoInput = videoInputs[i];\n    if (videoInput.label === cameraLabel) {\n      return videoInput.deviceId;\n    }\n  }\n\n  return null;\n}\n\n// on mobile, facing mode is the preferred way to select a camera.\n// Here we use the camera label to determine if its the environment or\n// user facing camera\nfunction getFacingMode(cameraLabel) {\n  if (!cameraLabel) {\n    return 'user';\n  }\n  if (cameraLabel.toLowerCase().includes('back')) {\n    return 'environment';\n  } else {\n    return 'user';\n  }\n}\n\nasync function getConstraints(cameraLabel) {\n  let deviceId;\n  let facingMode;\n\n  if (cameraLabel) {\n deviceId = await getDeviceIdForLabel(cameraLabel);\n    // on mobile, use the facing mode based on the camera.\n facingMode = isMobile() ? getFacingMode(cameraLabel) : null;\n  };\n  return {deviceId, facingMode};\n}\n\n/**\n * Loads a the camera to be used in the demo\n *\n */\nasync function setupCamera(cameraLabel) {\n  if (!navigator.mediaDevices || !navigator.mediaDevices.getUserMedia) {\n    throw new Error(\n      'Browser API navigator.mediaDevices.getUserMedia not available');\n  }\n\n  const videoElement = document.getElementById('video');\n\n  stopExistingVideoCapture();\n\n  const videoConstraints = await getConstraints(cameraLabel);\n\n  const stream = await navigator.mediaDevices.getUserMedia(\n      {'audio': false, 'video': videoConstraints});\n  videoElement.srcObject = stream;\n\n  return new Promise((resolve) => {\n videoElement.onloadedmetadata = () => {\n    videoElement.width = videoElement.videoWidth;\n videoElement.height = videoElement.videoHeight;\n    resolve(videoElement);\n  };\n  });\n}\n\nasync function loadVideo(cameraLabel) {\n  try {\n    state.video = await setupCamera(cameraLabel);\n  } catch (e) {\n    let info = document.getElementById('info');\n    info.textContent = 'this browser does not support video capture,' +\n      'or this device does not have a camera';\n    info.style.display = 'block';\n    throw e;\n  }\n\n  state.video.play();\n}\n\nconst defaultQuantBytes = 2;\n\nconst defaultMobileNetMultiplier = isMobile() ? 0.50 : 0.75;\nconst defaultMobileNetStride = 16;\nconst defaultMobileNetInternalResolution = 'medium';\n\nconst defaultResNetMultiplier = 1.0;\nconst defaultResNetStride = 16;\nconst defaultResNetInternalResolution = 'low';\n\nconst guiState = {\n  algorithm: 'multi-person-instance',\n  estimate: 'partmap',\n  camera: null,\n flipHorizontal: true,\n  input: {\n    architecture: 'MobileNetV1',\n    outputStride: 16,\n    internalResolution: 'low',\n    multiplier: 0.50,\n    quantBytes: 2\n  },\n  multiPersonDecoding: {\n    maxDetections: 5,\n    scoreThreshold: 0.3,\n    nmsRadius: 20,\n    numKeypointForMatching: 17,\n    refineSteps: 10\n  },\n  segmentation: {\n
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segmentationThreshold: 0.7,\n    effect: 'mask',\n    maskBackground: true,\n    opacity: 0.7,\n
backgroundBlurAmount: 3,\n    maskBlurAmount:
 0,\n    edgeBlurAmount: 3\n  },\n  partMap: {\n    colorScale: 'rainbow',\n    effect: 'partMap',\n
segmentationThreshold: 0.5,\n    opacity: 0.9,\n    blurBodyPartAmount: 3,\n    bodyPartEdgeBlurAmount: 3,\n  },\n
showFps: !isMobile()\n};\n\nfunction toCameraOptions(cameras) {\n  const result = {default: null};\n\n
cameras.forEach(camera => {\n    result[camera.label] = camera.label;\n  })\n\n  return result;\n}\n\n/**\n * Sets up
dat.gui controller on the top-right of the window\n */\nfunction setupGui(cameras) {\n  const gui = new
dat.GUI({width: 300});\n\n  let architectureController = null;\n  guiState[TRY_RESNET_BUTTON_NAME] =
function() {\n    architectureController.setValue('ResNet50')\n  };\n  gui.add(guiState,
TRY_RESNET_BUTTON_NAME).name(TRY_RESNET_BUTTON_TEXT);\n
updateTryResNetButtonDatGuiCss();\n\n  gui.add(guiState, 'camera', toCameraOptions(cameras))\n
.onChange(async function(cameraLabel) {\n        state.changingCamera = true;\n\n        await
loadVideo(cameraLabel);\n\n
        state.changingCamera = false;\n      });\n\n  gui.add(guiState, 'flipHorizontal');\n\n  // There are two algorithms
'person' and 'multi-person-instance'.\n  // The 'person' algorithm returns one single segmentation mask (or body\n  //
part map) for all people in the image. The 'multi-person-instance'\n  // algorithm returns an array of segmentation
mask (or body part map).\n  // Each element in the array corresponding to one of the people. In other\n  // words,
'multi-person-instance' algorithm does instance-level person\n  // segmentation and body part segmentation for every
person in the image.\n  const algorithmController =\n      gui.add(guiState, 'algorithm', ['person', 'multi-person-
instance']);\n\n  // Architecture: there are a few BodyPix models varying in size and\n  // accuracy.\n  // The input
parameters have the most effect on accuracy and speed of the\n  // network\n  let input = gui.addFolder('Input');\n\n
// Updates outputStride\n  // Output
 stride:  Internally, this parameter affects the height and width\n  // of the layers in the neural network. The lower the
value of the output\n  // stride the higher the accuracy but slower the speed, the higher the\n  // value the faster the
speed but lower the accuracy.\n  let outputStrideController = null;\n  function updateGuiOutputStride(outputStride,
outputStrideArray) {\n    if (outputStrideController) {\n      outputStrideController.remove();\n    }\n
guiState.input.outputStride = outputStride;\n    outputStrideController =\n        input.add(guiState.input,
'outputStride', outputStrideArray);\n    outputStrideController.onChange(function(outputStride) {\n
state.changingStride = true;\n      guiState.input.outputStride = +outputStride;\n    });\n  }\n\n  // Updates internal
resolution\n  // Internal resolution:  Internally, this parameter affects the height and\n  // width of the layers in the
neural network. The higher the value of the\n  // internal resolution the
 better the accuracy but slower the speed.\n  let internalResolutionController = null;\n  function
updateGuiInternalResolution(\n      internalResolution,\n      internalResolutionArray,\n  ) {\n    if
(internalResolutionController) {\n      internalResolutionController.remove();\n    }\n
guiState.input.internalResolution = internalResolution;\n    internalResolutionController = input.add(\n
guiState.input, 'internalResolution', internalResolutionArray);\n
internalResolutionController.onChange(function(internalResolution) {\n      guiState.input.internalResolution =
internalResolution;\n    });\n  }\n\n  // Updates depth multiplier\n  // Multiplier: this parameter affects the number of
feature map channels\n  // in the MobileNet. The higher the value, the higher the accuracy but\n  // slower the speed,
the lower the value the faster the speed but lower\n  // the accuracy.\n  let multiplierController = null;\n  function
updateGuiMultiplier(multiplier, multiplierArray) {\n
    if (multiplierController) {\n      multiplierController.remove();\n    }\n    guiState.input.multiplier = multiplier;\n
multiplierController =\n        input.add(guiState.input, 'multiplier', multiplierArray);\n
multiplierController.onChange(function(multiplier) {\n      state.changingMultiplier = true;\n
guiState.input.multiplier = +multiplier;\n    });\n  }\n\n  // updates quantBytes\n  // QuantBytes: this parameter
affects weight quantization in the ResNet50\n  // model. The available options are 1 byte, 2 bytes, and 4 bytes. The\n
// higher the value, the larger the model size and thus the longer the\n  // loading time, the lower the value, the
shorter the loading time but\n  // lower the accuracy.\n  let quantBytesController = null;\n  function
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updateGuiQuantBytes(quantBytes, quantBytesArray) {\n    if (quantBytesController) {\n
quantBytesController.remove();\n    }\n    guiState.quantBytes = +quantBytes;\n    guiState.input.quantBytes =
+quantBytes;\n    quantBytesController
 =\n        input.add(guiState.input, 'quantBytes', quantBytesArray);\n
quantBytesController.onChange(function(quantBytes) {\n      state.changingQuantBytes = true;\n
guiState.input.quantBytes = +quantBytes;\n    });\n  }\n\n  function updateGuiInputSection() {\n    if
(guiState.input.architecture === 'MobileNetV1') {\n      updateGuiInternalResolution(\n
defaultMobileNetInternalResolution,\n          ['low', 'medium', 'high', 'full']);\n
updateGuiOutputStride(defaultMobileNetStride, [8, 16]);\n      updateGuiMultiplier(defaultMobileNetMultiplier,
[0.50, 0.75, 1.0])\n    } else {  // guiState.input.architecture === \"ResNet50\"\n      updateGuiInternalResolution(\n
    defaultResNetInternalResolution, ['low', 'medium', 'high', 'full']);\n
updateGuiOutputStride(defaultResNetStride, [32, 16]);\n      updateGuiMultiplier(defaultResNetMultiplier, [1.0]);\n
  }\n    updateGuiQuantBytes(defaultQuantBytes, [1, 2, 4]);\n  }\n\n  // Architecture:
 there are a few PoseNet models varying in size and\n  // accuracy. 1.01 is the largest, but will be the slowest. 0.50 is
the\n  // fastest, but least accurate.\n  architectureController =\n      input.add(guiState.input, 'architecture',
['ResNet50', 'MobileNetV1']);\n  guiState.architecture = guiState.input.architecture;\n
architectureController.onChange(function(architecture) {\n    // if architecture is ResNet50, then show ResNet50
options\n    state.changingArchitecture = true;\n    guiState.input.architecture = architecture;\n
updateGuiInputSection();\n  });\n\n  updateGuiInputSection();\n  input.open()\n\n  const estimateController =\n
gui.add(guiState, 'estimate', ['segmentation', 'partmap']);\n\n  let segmentation = gui.addFolder('Segmentation');\n
segmentation.add(guiState.segmentation, 'segmentationThreshold', 0.0, 1.0);\n  const segmentationEffectController
=\n      segmentation.add(guiState.segmentation, 'effect', ['mask', 'bokeh']);\n\n  let multiPersonDecoding =
 gui.addFolder('MultiPersonDecoding');\n  multiPersonDecoding.add(\n      guiState.multiPersonDecoding,
'maxDetections', 0, 20, 1);\n  multiPersonDecoding.add(\n      guiState.multiPersonDecoding, 'scoreThreshold', 0.0,
1.0);\n  multiPersonDecoding.add(guiState.multiPersonDecoding, 'nmsRadius', 0, 30, 1);\n
multiPersonDecoding.add(\n      guiState.multiPersonDecoding, 'numKeypointForMatching', 1, 17, 1);\n
multiPersonDecoding.add(\n      guiState.multiPersonDecoding, 'refineSteps', 1, 10, 1);\n
multiPersonDecoding.open();\n\n  algorithmController.onChange(function(value) {\n    switch (guiState.algorithm)
{\n      case 'single-person':\n        multiPersonDecoding.close();\n        singlePersonDecoding.open();\n        break;\n
    case 'multi-person':\n        singlePersonDecoding.close();\n        multiPersonDecoding.open();\n        break;\n    }\n
});\n\n  let darknessLevel;\n  let bokehBlurAmount;\n  let edgeBlurAmount;\n  let maskBlurAmount;\n  let
maskBackground;\n\n  segmentationEffectController.onChange(function(effectType)
 {\n    if (effectType === 'mask') {\n      if (bokehBlurAmount) {\n        bokehBlurAmount.remove();\n      }\n      if
(edgeBlurAmount) {\n        edgeBlurAmount.remove();\n      }\n      darknessLevel =\n
segmentation.add(guiState.segmentation, 'opacity', 0.0, 1.0);\n      maskBlurAmount =
segmentation.add(guiState.segmentation, 'maskBlurAmount')\n                          .min(0)\n
.max(20)\n                          .step(1);\n      maskBackground =\n          segmentation.add(guiState.segmentation,
'maskBackground');\n    } else if (effectType === 'bokeh') {\n      if (darknessLevel) {\n
darknessLevel.remove();\n      }\n      if (maskBlurAmount) {\n        maskBlurAmount.remove();\n      }\n      if
(maskBackground) {\n        maskBackground.remove();\n      }\n      bokehBlurAmount = segmentation\n
        .add(\n                            guiState.segmentation,\n
                    'backgroundBlurAmount',\n                          )\n                          .min(1)\n
.max(20)\n                          .step(1);\n      edgeBlurAmount = segmentation.add(guiState.segmentation,
'edgeBlurAmount')\n                          .min(0)\n                          .max(20)\n                          .step(1);\n    }\n  });\n\n
// manually set the effect so that the options are shown.\n
segmentationEffectController.setValue(guiState.segmentation.effect);\n\n  let partMap = gui.addFolder('Part
Map');\n  partMap.add(guiState.partMap, 'segmentationThreshold', 0.0, 1.0);\n  partMap.add(\n      guiState.partMap,
'effect', ['partMap', 'pixelation', 'blurBodyPart']);\n  partMap.add(guiState.partMap, 'opacity', 0.0, 1.0);\n
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partMap.add(guiState.partMap, 'colorScale', Object.keys(partColorScales))\n      .onChange(colorScale => {\n setShownPartColorScales(colorScale);\n      });\n  setShownPartColorScales(guiState.partMap.colorScale);\n
  partMap.add(guiState.partMap, 'blurBodyPartAmount').min(1).max(20).step(1);\n  partMap.add(guiState.partMap,
'bodyPartEdgeBlurAmount')\n      .min(1)\n      .max(20)\n      .step(1);\n  partMap.open();\n\n
estimateController.onChange(function(estimationType) {\n    if (estimationType === 'segmentation') {\n
segmentation.open();\n      partMap.close();\n      document.getElementById('colors').style.display = 'none';\n    }
else {\n      segmentation.close();\n      partMap.open();\n      document.getElementById('colors').style.display =
'inline-block';\n    }\n  });\n\n  gui.add(guiState, 'showFps').onChange(showFps => {\n    if (showFps) {\n
document.body.appendChild(stats.dom);\n    } else {\n      document.body.removeChild(stats.dom);\n    }\n
})\n}\n\nfunction setShownPartColorScales(colorScale) {\n  const colors = document.getElementById('colors');\n
colors.innerHTML = '';\n\n  const partColors = partColorScales[colorScale];\n
  const partNames = bodyPix.PART_CHANNELS;\n\n  for (let i = 0; i < partColors.length; i++) {\n    const
partColor = partColors[i];\n    const child = document.createElement('li');\n\n    child.innerHTML = `\n        <div
class='color' style='background-color:rgb(${partColor[0]},${\n        partColor[1]},${partColor[2]})' ></div>\n
${partNames[i]}`;\n\n    colors.appendChild(child);\n  }\n}\n\n/**\n * Sets up a frames per second panel on the top-
left of the window\n */\nfunction setupFPS() {\n  stats.showPanel(0);  // 0: fps, 1: ms, 2: mb, 3+: custom\n  if
(guiState.showFps) {\n    document.body.appendChild(stats.dom);\n  }\n}\n\nasync function estimateSegmentation()
{\n  let multiPersonSegmentation = null;\n  switch (guiState.algorithm) {\n    case 'multi-person-instance':\n
return await state.net.segmentMultiPerson(state.video, {\n        internalResolution:
guiState.input.internalResolution,\n        segmentationThreshold: guiState.segmentation.segmentationThreshold,\n
      maxDetections: guiState.multiPersonDecoding.maxDetections,\n        scoreThreshold:
guiState.multiPersonDecoding.scoreThreshold,\n        nmsRadius: guiState.multiPersonDecoding.nmsRadius,\n
numKeypointForMatching:\n            guiState.multiPersonDecoding.numKeypointForMatching,\n        refineSteps:
guiState.multiPersonDecoding.refineSteps\n      });\n    case 'person':\n      return await
state.net.segmentPerson(state.video, {\n        internalResolution: guiState.input.internalResolution,\n
segmentationThreshold: guiState.segmentation.segmentationThreshold,\n        maxDetections:
guiState.multiPersonDecoding.maxDetections,\n        scoreThreshold:
guiState.multiPersonDecoding.scoreThreshold,\n        nmsRadius: guiState.multiPersonDecoding.nmsRadius,\n
});\n    default:\n      break;\n  };\n  return multiPersonSegmentation;\n}\n\nasync function
estimatePartSegmentation() {\n  switch (guiState.algorithm) {\n    case 'multi-person-instance':\n      return await
 state.net.segmentMultiPersonParts(state.video, {\n        internalResolution: guiState.input.internalResolution,\n
segmentationThreshold: guiState.segmentation.segmentationThreshold,\n        maxDetections:
guiState.multiPersonDecoding.maxDetections,\n        scoreThreshold:
guiState.multiPersonDecoding.scoreThreshold,\n        nmsRadius: guiState.multiPersonDecoding.nmsRadius,\n
numKeypointForMatching:\n            guiState.multiPersonDecoding.numKeypointForMatching,\n        refineSteps:
guiState.multiPersonDecoding.refineSteps\n      });\n    case 'person':\n      return await
state.net.segmentPersonParts(state.video, {\n        internalResolution: guiState.input.internalResolution,\n
segmentationThreshold: guiState.segmentation.segmentationThreshold,\n        maxDetections:
guiState.multiPersonDecoding.maxDetections,\n        scoreThreshold:
guiState.multiPersonDecoding.scoreThreshold,\n        nmsRadius: guiState.multiPersonDecoding.nmsRadius,\n
});\n
   default:\n      break;\n  };\n  return multiPersonPartSegmentation;\n}\n\nfunction
drawPoses(personOrPersonPartSegmentation, flipHorizontally, ctx) {\n  if
(Array.isArray(personOrPersonPartSegmentation)) {\n
personOrPersonPartSegmentation.forEach(personSegmentation => {\n      let pose = personSegmentation.pose;\n
if (flipHorizontally) {\n        pose = bodyPix.flipPoseHorizontal(pose, personSegmentation.width);\n      }\n
drawKeypoints(pose.keypoints, 0.1, ctx);\n      drawSkeleton(pose.keypoints, 0.1, ctx);\n    });\n  } else {\n
personOrPersonPartSegmentation.allPoses.forEach(pose => {\n      if (flipHorizontally) {\n        pose =
```

bodyPix.flipPoseHorizontal(\n pose, personOrPersonPartSegmentation.width);\n }\n drawKeypoints(pose.keypoints, 0.1, ctx);\n drawSkeleton(pose.keypoints, 0.1, ctx);\n })\n }\n}\n\nasync function loadBodyPix() {\n toggleLoadingUI(true);\n state.net = await bodyPix.load({\n architecture: guiState.input.architecture,\n
outputStride: guiState.input.outputStride,\n multiplier: guiState.input.multiplier,\n quantBytes: guiState.input.quantBytes\n });\n toggleLoadingUI(false);\n}\n\n/**\n * Feeds an image to BodyPix to estimate segmentation - this is where the\n * magic happens. This function loops with a requestAnimationFrame method.\n */\nfunction segmentBodyInRealTime() {\n const canvas = document.getElementById('output');\n // since images are being fed from a webcam\n\n async function bodySegmentationFrame() {\n // if changing the model or the camera, wait a second for it to complete\n // then try again.\n if (state.changingArchitecture || state.changingMultiplier ||\n state.changingCamera || state.changingStride ||\n state.changingQuantBytes) {\n console.log('load model...');\n loadBodyPix();\n state.changingArchitecture = false;\n state.changingMultiplier = false;\n state.changingStride = false;\n state.changingQuantBytes = false;\n }\n\n // Begin monitoring code for frames per second\n stats.begin();\n\n const flipHorizontally = guiState.flipHorizontal;\n\n switch (guiState.estimate) {\n case 'segmentation':\n const multiPersonSegmentation = await estimateSegmentation();\n switch (guiState.segmentation.effect) {\n case 'mask':\n const ctx = canvas.getContext('2d');\n const foregroundColor = {r: 255, g: 255, b: 255, a: 255};\n const backgroundColor = {r: 0, g: 0, b: 0, a: 255};\n const mask = bodyPix.toMask(\n multiPersonSegmentation, foregroundColor, backgroundColor,\n true);\n\n bodyPix.drawMask(\n canvas, state.video, mask, guiState.segmentation.opacity,\n guiState.segmentation.maskBlurAmount, flipHorizontally);\n drawPoses(multiPersonSegmentation, flipHorizontally, ctx);\n break;\n case 'bokeh':\n bodyPix.drawBokehEffect(\n canvas, state.video, multiPersonSegmentation,\n +guiState.segmentation.backgroundBlurAmount,\n guiState.segmentation.edgeBlurAmount, flipHorizontally);\n break;\n }\n\n break;\n case 'partmap':\n const ctx = canvas.getContext('2d');\n const multiPersonPartSegmentation = await estimatePartSegmentation();\n const coloredPartImageData = bodyPix.toColoredPartMask(\n multiPersonPartSegmentation,\n partColorScales[guiState.partMap.colorScale]);\n\n const maskBlurAmount = 0;\n switch (guiState.partMap.effect) {\n case 'pixelation':\n const pixelCellWidth = 10.0;\n\n bodyPix.drawPixelatedMask(\n canvas, state.video, coloredPartImageData,\n guiState.partMap.opacity, maskBlurAmount, flipHorizontally,\n pixelCellWidth);\n break;\n case 'partMap':\n bodyPix.drawMask(\n canvas, state.video, coloredPartImageData, guiState.opacity,\n maskBlurAmount, flipHorizontally);\n break;\n case 'blurBodyPart':\n const blurBodyPartIds = [0, 1];\n bodyPix.blurBodyPart(\n canvas, state.video, multiPersonPartSegmentation,\n blurBodyPartIds, guiState.partMap.blurBodyPartAmount,\n guiState.partMap.edgeBlurAmount, flipHorizontally);\n }\n drawPoses(multiPersonPartSegmentation, flipHorizontally, ctx);\n break;\n default:\n break;\n }\n\n // End monitoring code for frames per second\n stats.end();\n\n requestAnimationFrame(bodySegmentationFrame);\n }\n\n bodySegmentationFrame();\n}\n\n/**\n * Kicks off the demo.\n */\nexport async function bindPage() {\n // Load the BodyPix model weights with architecture 0.75\n await loadBodyPix();\n document.getElementById('loading').style.display = 'none';\n document.getElementById('main').style.display = 'inline-block';\n\n await loadVideo(guiState.camera);\n\n let cameras = await getVideoInputs();\n\n setupFPS();\n setupGui(cameras);\n\n segmentBodyInRealTime();\n}\n\n\nnavigator.getUserMedia = navigator.getUserMedia ||\n navigator.webkitGetUserMedia || navigator.mozGetUserMedia;\n// kick off the demo\nbindPage();\n"]}

Found in path(s):
* /tensorflow-models-zip/@tensorflow-models/body-pix/demos/dist/demos.ab0c720b.js.map

1.366 openssl 1.1.1m

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1.367 python-requests 2.27.1

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1.368 urllib3 1.26.8

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1.369 pydantic 1.9.0

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1.370 pymongo 3.12.3

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The reason we have a separate public license for some libraries is that they blur the distinction we usually make between modifying or adding to a program and simply using it. Linking a program with a library, without changing the library, is in some sense simply using the library, and is analogous to running a utility program or application program. However, in a textual and legal sense, the linked executable is a combined work, a derivative of the original library, and the ordinary General Public License treats it as such.

Because of this blurred distinction, using the ordinary General Public
License for libraries did not effectively promote software sharing, because most developers did not use the libraries. We concluded that weaker conditions might promote sharing better.

However, unrestricted linking of non-free programs would deprive the users of those programs of all benefit from the free status of the libraries themselves. This Library General Public License is intended to permit developers of non-free programs to use free libraries, while preserving your freedom as a user of such programs to change the free libraries that are incorporated in them. (We have not seen how to achieve this as regards changes in header files, but we have achieved it as regards changes in the actual functions of the Library.) The hope is that this will lead to faster development of free libraries.

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The former contains code derived from the library, while the latter only works together with the library.

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1.374 hdrhistogram 2.1.12

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* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/ZigZagEncoding.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/AllValuesIterator.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/Base64Helper.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/IntCountsHistogram.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/DoubleLinearIterator.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/PackedConcurrentDoubleHistogram.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/SynchronizedHistogram.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/packedarray/PackedArraySingleWriterRecorder.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/Histogram.java
*
 /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/LogarithmicIterator.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/Version.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/RecordedValuesIterator.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/LinearIterator.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/PackedDoubleHistogram.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/AtomicHistogram.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/HistogramIterationValue.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/Recorder.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/ConcurrentDoubleHistogram.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/HistogramLogReader.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/HistogramLogProcessor.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/PackedHistogram.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/SingleWriterDoubleRecorder.java
*
 /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/DoubleRecorder.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/DoubleHistogramIterationValue.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/AbstractHistogramIterator.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/SynchronizedDoubleHistogram.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/PercentileIterator.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/PackedConcurrentHistogram.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/DoubleRecordedValuesIterator.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/DoubleAllValuesIterator.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/SingleWriterRecorder.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/DoubleLogarithmicIterator.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/ShortCountsHistogram.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/EncodableHistogram.java
*
 /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/HistogramLogScanner.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/packedarray/PackedArrayRecorder.java
* /hdrhistogram-2-1-12-sources-jar/org/HdrHistogram/ConcurrentHistogram.java
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package org.HdrHistogram;

final class Version {
  public static final String version="$VERSION$";
  public static final String build_time="$BUILD_TIME$";
}
```

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1.375 hikaricp 3.4.5

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* /hikaricp-3-4-5-sources-jar/com/zaxxer/hikari/util/UtilityElf.java
* /hikaricp-3-4-5-sources-jar/com/zaxxer/hikari/pool/ProxyStatement.java
* /hikaricp-3-4-5-sources-jar/com/zaxxer/hikari/pool/ProxyPreparedStatement.java
* /hikaricp-3-4-5-sources-jar/com/zaxxer/hikari/HikariDataSource.java
*
/hikaricp-3-4-5-sources-jar/com/zaxxer/hikari/metrics/prometheus/PrometheusHistogramMetricsTracker.java
* /hikaricp-3-4-5-sources-jar/com/zaxxer/hikari/hibernate/HikariConnectionProvider.java
* /hikaricp-3-4-5-sources-jar/com/zaxxer/hikari/metrics/prometheus/PrometheusMetricsTracker.java
* /hikaricp-3-4-5-sources-jar/com/zaxxer/hikari/hibernate/HikariConfigurationUtil.java
* /hikaricp-3-4-5-sources-jar/com/zaxxer/hikari/HikariPoolMXBean.java
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* /hikaricp-3-4-5-sources-jar/com/zaxxer/hikari/metrics/dropwizard/CodahaleMetricsTrackerFactory.java
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* /hikaricp-3-4-5-sources-jar/com/zaxxer/hikari/metrics/dropwizard/CodaHaleMetricsTracker.java
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* /hikaricp-3-4-5-sources-jar/com/zaxxer/hikari/util/ConcurrentBag.java
* /hikaricp-3-4-5-sources-jar/com/zaxxer/hikari/pool/ProxyResultSet.java
* /hikaricp-3-4-5-sources-jar/com/zaxxer/hikari/util/DriverDataSource.java
*
 /hikaricp-3-4-5-sources-jar/com/zaxxer/hikari/util/SuspendResumeLock.java
* /hikaricp-3-4-5-sources-jar/com/zaxxer/hikari/util/JavassistProxyFactory.java
* /hikaricp-3-4-5-sources-jar/com/zaxxer/hikari/HikariConfig.java
* /hikaricp-3-4-5-sources-jar/com/zaxxer/hikari/pool/ProxyConnection.java
* /hikaricp-3-4-5-sources-jar/com/zaxxer/hikari/pool/ProxyLeakTaskFactory.java
* /hikaricp-3-4-5-sources-jar/com/zaxxer/hikari/pool/ProxyFactory.java
* /hikaricp-3-4-5-sources-jar/com/zaxxer/hikari/util/FastList.java
* /hikaricp-3-4-5-sources-jar/com/zaxxer/hikari/pool/ProxyLeakTask.java

1.376 statistics 2.1

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1.377 jctools-core 3.0.0

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<url>https://github.com/JCTools</url>
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  <url>https://github.com/nitsanw</url>
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  <url>https://github.com/RichardWarburton</url>
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 <junit.version>4.12</junit.version>
 <guava-testlib.version>21.0</guava-testlib.version>
 </properties>
</project>

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 in path(s):
* /jctools-core-3-0-0-sources-jar/META-INF/maven/org.jctools/jctools-core/pom.xml
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* /jctools-core-3-0-0-sources-jar/org/jctools/queues/MessagePassingQueueUtil.java
* /jctools-core-3-0-0-sources-jar/org/jctools/util/UnsafeJvmInfo.java
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* /jctools-core-3-0-0-sources-jar/org/jctools/maps/ConcurrentAutoTable.java
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* /jctools-core-3-0-0-sources-jar/org/jctools/queues/spec/ConcurrentQueueSpec.java
* /jctools-core-3-0-0-sources-jar/org/jctools/queues/BaseLinkedQueue.java
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* /jctools-core-3-0-0-sources-jar/org/jctools/queues/spec/Ordering.java
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* /jctools-core-3-0-0-sources-jar/org/jctools/util/RangeUtil.java
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* /jctools-core-3-0-0-sources-jar/org/jctools/queues/QueueFactory.java
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1.378 jansi-osx 1.8

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1.380 hawtjni-runtime 1.17

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* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/serialization/SerializerException.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/Status.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/expiry/Expiry.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/resilience/ResilienceStrategy.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/expiry/Expirations.java
*
 /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/service/Service.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/serialization/SerializationProvider.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/loaderwriter/CacheWritingException.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/loaderwriter/CacheLoaderWriterConfiguration.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/service/OptionalServiceDependencies.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/CacheManager.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/StateTransitionException.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/persistence/StateHolder.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/resilience/RecoveryStore.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/package-info.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/copy/Copier.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/expiry/ExpiryPolicy.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/config/units/package-info.java

*
 /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/service/MaintainableService.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/resilience/StoreAccessException.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/config/Eviction.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/config/CacheConfiguration.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/event/EventOrdering.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/persistence/PersistableResourceService.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/event/package-info.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/config/FluentConfigurationBuilder.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/config/Configuration.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/service/ServiceDependencies.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/ValueSupplier.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/loaderwriter/BulkCacheLoadingException.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/serialization/package-info.java
*
 /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/loaderwriter/CacheLoadingException.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/config/ResourceType.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/copy/package-info.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/loaderwriter/WriteBehindConfiguration.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/persistence/package-info.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/event/EventType.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/PersistentUserManagedCache.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/config/ResourcePool.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/config/EvictionAdvisor.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/CacheIterationException.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/service/PluralService.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/service/package-info.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/event/CacheEventListener.java
*
 /ehcache-api-3-8-1-sources-jar/org/ehcache/config/ResourceUnit.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/config/Builder.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/loaderwriter/BulkCacheWritingException.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/Cache.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/config/units/MemoryUnit.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/resilience/ResilienceStrategyProvider.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/loaderwriter/package-info.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/loaderwriter/CacheLoaderWriterProvider.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/event/EventFiring.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/UserManagedCache.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/expiry/Duration.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/config/ResourcePools.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/loaderwriter/WriteBehindProvider.java
*
 /ehcache-api-3-8-1-sources-jar/org/ehcache/event/CacheEvent.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/config/CacheRuntimeConfiguration.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/config/package-info.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/loaderwriter/CacheLoaderWriter.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/service/ServiceCreationConfiguration.java

* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/copy/CopyProvider.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/expiry/package-info.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/service/ServiceProvider.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/PersistentCacheManager.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/serialization/StatefulSerializer.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/serialization/UnsupportedTypeException.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/config/FluentCacheConfigurationBuilder.java
*
/ehcache-api-3-8-1-sources-jar/org/ehcache/spi/resilience/package-info.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/service/ServiceConfiguration.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/CachePersistenceException.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/config/units/EntryUnit.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/serialization/Serializer.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/spi/persistence/StateRepository.java
* /ehcache-api-3-8-1-sources-jar/org/ehcache/config/SizedResourcePool.java

1.383 sizeof 0.3.0

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1.384 sequence-generator 5.7.3

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* /sequence-generator-5-7-3-jar/META-INF/maven/org.terracotta.management/sequence-generator/pom.xml
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Manifest-Version: 1.0
Bnd-LastModified: 1563545580901
Build-Jdk: 1.8.0_202
Built-By: jenkins-slave
Bundle-Description: A set of Java modules for management and monitoring,
 common to several Terracotta products
Bundle-License: http://www.apache.org/licenses/LICENSE-2.0.txt
Bundle-ManifestVersion: 2
Bundle-Name: Terracotta Management :: Sequence Generator
Bundle-SymbolicName: org.terracotta.management.sequence-generator
Bundle-Version: 5.7.3
Created-By: Apache Maven Bundle Plugin
Export-Package: org.terracotta.management.sequence;version="5.7.3",org.t
erracotta.management.sequence.perf;version="5.7.3"
Main-Class: org.terracotta.management.sequence.perf.PerfTest
Require-Capability: osgi.ee;filter:="(&(osgi.ee=JavaSE)(version=1.8))"
Tool: Bnd-2.4.1.201501161923

Found in path(s):
* /sequence-generator-5-7-3-jar/META-INF/MANIFEST.MF

1.385 ehcache-107 3.8.1

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* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/internal/Jsr107ServiceConfigurationParser.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/ConfigurationMerger.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/config/Jsr107Configuration.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/config/package-info.java
*
 /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/internal/Jsr107CacheConfigurationParser.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/Eh107CacheLoaderWriterProvider.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/Eh107IdentityCopier.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/config/Jsr107CacheConfiguration.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/Jsr107Service.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/EhcacheCachingProvider.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/Eh107Configuration.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/Eh107CacheLoaderWriter.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/EventListenerAdaptors.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/Eh107CacheManager.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/DefaultConfigurationResolver.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/Eh107CacheMXBean.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/Eh107ReverseConfiguration.java
*
 /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/package-info.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/Eh107Expiry.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/Eh107CompleteConfiguration.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/EhcacheExpiryWrapper.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/internal/Jsr107CacheLoaderWriter.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/Eh107CacheEntryEvent.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/CacheResources.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/Eh107MXBean.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/CloseUtil.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/config/ConfigurationElementState.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/Eh107CacheStatisticsMXBean.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/ExpiryPolicyToEhcacheExpiry.java
*
 /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/Unwrap.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/NullCompletionListener.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/internal/tck/Eh107MBeanServerBuilder.java

* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/internal/DefaultJsr107Service.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/Eh107Cache.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/internal/WrappedCacheLoaderWriter.java
* /ehcache-107-3-8-1-sources-jar/org/ehcache/jsr107/ListenerResources.java

1.386 ehcache-core 3.8.1

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* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/ZeroOperationStatistic.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/EhcacheManager.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/time/TimeSource.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/PersistentUserManagedEhcache.java
*
 /ehcache-core-3-8-1-sources-jar/org/ehcache/core/exceptions/ExceptionFactory.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/LifeCycledAdapter.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/store/events/StoreEventFilter.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/store/package-info.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/time/package-info.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/InternalStatus.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/LatencyHistogramConfiguration.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/package-info.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/events/EventListenerWrapper.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/config/store/StoreEventSourceConfiguration.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/store/StoreConfigurationImpl.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/package-info.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/CacheOperationOutcomes.java
*

/ehcache-core-3-8-1-sources-jar/org/ehcache/core/osgi/EhcacheActivator.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/service/CacheManagerProviderService.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/events/StoreEventSink.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/events/CacheEvents.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/Jsr107Cache.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/Jsr107LatencyMonitor.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/internal/util/ValueSuppliers.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/DefaultStatisticsServiceFactory.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/events/CacheEventDispatcher.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/events/CacheEventDispatcherFactory.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/internal/resilience/ThrowingResilienceStrategy.java
*
/ehcache-core-3-8-1-sources-jar/org/ehcache/core/config/DefaultConfiguration.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/OperationStatistic.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/events/package-info.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/ValueStatistic.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/util/CollectionUtil.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/store/tiering/package-info.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/store/tiering/LowerCachingTier.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/EhcacheBase.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/config/store/StoreStatisticsConfiguration.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/StatsUtils.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/store/ConfigurationChangeSupport.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/package-info.java
*
/ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/TierStatistics.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/HumanReadable.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/service/LocalPersistenceService.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/service/StatisticsService.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/events/CacheEventListenerConfiguration.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/exceptions/StorePassThroughException.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/StatusTransitioner.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/Ehcache.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/time/TickingTimeSource.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/events/CacheEventListenerProvider.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/SpecIterator.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/store/heap/package-info.java
*
/ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/LowerCachingTierOperationsOutcome.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/HigherCachingTierOperationOutcomes.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/events/CacheManagerListener.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/store/heap/SizeOfEngineProvider.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/events/StateChangeListener.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/CacheConfigurationProperty.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/store/Store.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/InternalCache.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/store/tiering/HigherCachingTier.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/config/CoreConfigurationBuilder.java

* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/service/FileBasedPersistenceContext.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/store/tiering/AuthoritativeTier.java
*
 /ehcache-core-3-8-1-sources-jar/org/ehcache/core/events/NullStoreEventDispatcher.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/DefaultStatisticsService.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/store/WrapperStore.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/CachingTierOperationOutcomes.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/service/ExecutionService.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/collections/ConcurrentWeakIdentityHashMap.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/events/StoreEventDispatcher.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/config/package-info.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/LifeCycled.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/service/package-info.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/InternalRuntimeConfiguration.java
*
 /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/store/heap/LimitExceededException.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/OperationObserver.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/SourceStatistic.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/TierOperationOutcomes.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/CacheStatistics.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/DefaultCacheStatistics.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/service/DiskResourceService.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/EhcacheRuntimeConfiguration.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/StoreOperationOutcomes.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/resilience/DefaultRecoveryStore.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/exceptions/package-info.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/CacheConfigurationChangeEvent.java
*
 /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/BulkOps.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/DelegatingOperationStatistic.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/store/events/StoreEventSource.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/service/ServiceUtils.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/ServiceLocator.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/store/events/StoreEvent.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/AuthoritativeTierOperationOutcomes.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/osgi/SafeOsgi.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/DelegatingOperationObserver.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/CacheConfigurationChangeListener.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/util/ClassLoading.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/util/ByteBufferInputStream.java
*
 /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/store/InternalCacheManager.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/SuppliedValueStatistic.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/DefaultTierStatistics.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/store/events/package-info.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/DefaultCacheManagerProviderService.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/config/store/package-info.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/ChainedObserver.java

* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/config/ExpiryUtils.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/store/AbstractWrapperStoreProvider.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/ChainedOperationObserver.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/store/StoreSupport.java
*
 /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/store/tiering/CachingTier.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/service/ServiceFactory.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/store/AbstractValueHolder.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/time/SystemTimeSource.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/store/heap/SizeOfEngine.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/osgi/OsgiServiceLoader.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/time/TimeSourceService.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/spi/store/events/StoreEventListener.java
* /ehcache-core-3-8-1-sources-jar/org/ehcache/core/statistics/DelegatedMappedOperationStatistics.java

1.387 management-model 5.7.3

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Found in path(s):
* /management-model-5-7-3-sources-jar/org/terracotta/management/model/message/DefaultManagementCallMessage.java
* /management-model-5-7-3-sources-jar/org/terracotta/management/model/stats/Sample.java
* /management-model-5-7-3-sources-jar/org/terracotta/management/model/call/ContextualCall.java
* /management-model-5-7-3-sources-jar/org/terracotta/management/model/stats/DelegatingStatistic.java
*
 /management-model-5-7-3-sources-jar/org/terracotta/management/model/capabilities/descriptors/Descriptor.java
* /management-model-5-7-3-sources-jar/org/terracotta/management/model/stats/Statistic.java
* /management-model-5-7-3-sources-jar/org/terracotta/management/model/capabilities/context/CapabilityContext.java

* /management-model-5-7-3-sources-jar/org/terracotta/management/model/call/Parameter.java
* /management-model-5-7-3-sources-
jar/org/terracotta/management/model/capabilities/descriptors/CallDescriptor.java
* /management-model-5-7-3-sources-jar/org/terracotta/management/model/stats/ContextualStatistics.java
* /management-model-5-7-3-sources-
jar/org/terracotta/management/model/capabilities/descriptors/StatisticDescriptor.java
* /management-model-5-7-3-sources-jar/org/terracotta/management/model/capabilities/DefaultCapability.java
* /management-model-5-7-3-sources-jar/org/terracotta/management/model/context/ContextContainer.java
*
/management-model-5-7-3-sources-jar/org/terracotta/management/model/context/Context.java
* /management-model-5-7-3-sources-jar/org/terracotta/management/model/capabilities/Capability.java
* /management-model-5-7-3-sources-jar/org/terracotta/management/model/message/ManagementCallMessage.java
* /management-model-5-7-3-sources-jar/org/terracotta/management/model/stats/StatisticRegistry.java
* /management-model-5-7-3-sources-jar/org/terracotta/management/model/message/DefaultMessage.java
* /management-model-5-7-3-sources-jar/org/terracotta/management/model/call/ContextualReturn.java
* /management-model-5-7-3-sources-jar/org/terracotta/management/model/message/Message.java
* /management-model-5-7-3-sources-jar/org/terracotta/management/model/cluster/ClientIdentifier.java
* /management-model-5-7-3-sources-jar/org/terracotta/management/model/capabilities/descriptors/Settings.java
* /management-model-5-7-3-sources-jar/org/terracotta/management/model/notification/ContextualNotification.java
*
/management-model-5-7-3-sources-jar/org/terracotta/management/model/context/Contextual.java
* /management-model-5-7-3-sources-jar/org/terracotta/management/model/stats/StatisticType.java
* /management-model-5-7-3-sources-jar/org/terracotta/management/model/stats/DelegatingSample.java

1.388 ehcache-xml 3.8.1

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* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/BaseConfigParser.java

* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/service/OffHeapDiskStoreConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/exceptions/XmlConfigurationException.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/JaxbHelper.java
*
 /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/provider/ThreadPoolServiceCreationConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/DomUtil.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/XmlModel.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/provider/WriteBehindProviderConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/ServiceConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/ServiceCreationConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/ResourceConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/CacheServiceConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/CoreCacheConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/CacheManagerServiceConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/service/DefaultCopierConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/CoreServiceConfigurationParser.java
*
 /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/provider/CacheEventDispatcherFactoryConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/provider/DefaultSizeOfEngineProviderConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/service/DefaultCacheEventListenerConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/model/SizeOfEngineLimits.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/model/ListenersConfig.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/model/Expiry.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/multi/XmlMultiConfiguration.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/provider/PooledExecutionServiceConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/service/DefaultSerializerConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/service/SimpleCoreServiceConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/service/DefaultCacheEventDispatcherConfigurationParser.java
*
 /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/provider/DefaultCopyProviderConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/XmlConfiguration.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/service/DefaultCacheLoaderWriterConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/model/CacheTemplate.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/CoreServiceCreationConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/ConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/provider/DefaultSerializationProviderConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/service/DefaultResilienceStrategyConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/service/DefaultSizeOfEngineConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/provider/SimpleCoreServiceCreationConfigurationParser.java
*
 /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/service/DefaultWriteBehindConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/provider/CacheManagerPersistenceConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/CacheResourceConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/model/CacheDefinition.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/provider/OffHeapDiskStoreProviderConfigurationParser.java
* /ehcache-xml-3-8-1-sources-jar/org/ehcache/xml/model/CacheSpec.java

1.389 offheap-store 2.4.3

1.389.1 Available under license :

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* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/disk/persistent/AbstractPersistentConcurrentOffHeapCache.java

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* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/concurrent/WriteLockedOffHeapHashMapFactory.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/AbstractOffHeapClockCache.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/concurrent/AbstractConcurrentOffHeapCache.java

*
 /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/disk/storage/FileBackedStorageEngine.java
* /offheap-store-2-4-3-sources-
jar/org/terracotta/offheapstore/eviction/EvictionListeningReadWriteLockedOffHeapClockCache.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/concurrent/ConcurrentOffHeapClockCache.java
* /offheap-store-2-4-3-sources-
jar/org/terracotta/offheapstore/disk/persistent/PersistentReadWriteLockedOffHeapClockCacheFactory.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/SplitStorageEngine.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/Segment.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/OffHeapBufferHalfStorageEngine.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/disk/paging/PowerOfTwoFileAllocator.java
* /offheap-store-2-4-3-sources-
jar/org/terracotta/offheapstore/concurrent/ReadWriteLockedOffHeapHashMapFactory.java
*
 /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/PointerSize.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/portability/SerializablePortability.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/allocator/LongBestFitAllocator.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/StorageEngine.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/util/PhysicalMemory.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/buffersource/TimingBufferSource.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/disk/paging/MappedPageSource.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/paging/PhantomReferenceLimitedPageSource.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/IntegerStorageEngine.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/HashingMap.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/util/AATreeSet.java
*
 /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/LongStorageEngine.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/disk/storage/PersistentSplitStorageEngine.java
* /offheap-store-2-4-3-sources-
jar/org/terracotta/offheapstore/concurrent/ConcurrentWriteLockedOffHeapClockCache.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/listener/AbstractListenableStorageEngine.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/util/WeakIdentityHashMap.java
* /offheap-store-2-4-3-sources-
jar/org/terracotta/offheapstore/disk/persistent/PersistentReadWriteLockedOffHeapHashMapFactory.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/paging/UpfrontAllocatingPageSource.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/HalfStorageEngine.java
* /offheap-store-2-4-3-sources-
jar/org/terracotta/offheapstore/concurrent/ConcurrentWriteLockedOffHeapHashMap.java
*
 /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/allocator/PowerOfTwoAllocator.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/util/Retryer.java
* /offheap-store-2-4-3-sources-
jar/org/terracotta/offheapstore/concurrent/ReadWriteLockedOffHeapClockCacheFactory.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/OffHeapBufferStorageEngine.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/disk/storage/PersistentIntegerStorageEngine.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/util/FindbugsSuppressWarnings.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/concurrent/AbstractConcurrentOffHeapMap.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/set/OffHeapHashSet.java

* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/SerializableStorageEngine.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/MetadataTuple.java
*
 /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/PortabilityBasedHalfStorageEngine.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/StringStorageEngine.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/disk/storage/AATreeFileAllocator.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/OffHeapHashMap.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/PortabilityBasedStorageEngine.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/paging/OffHeapStorageArea.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/util/ByteBufferUtils.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/concurrent/ConcurrentOffHeapHashMap.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/AbstractLockedOffHeapHashMap.java
* /offheap-store-2-4-3-sources-
jar/org/terracotta/offheapstore/concurrent/WriteLockedOffHeapClockCacheFactory.java
*
 /offheap-store-2-4-3-sources-
jar/org/terracotta/offheapstore/disk/persistent/PersistentConcurrentOffHeapClockCache.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/BooleanHalfStorageEngine.java
* /offheap-store-2-4-3-sources-
jar/org/terracotta/offheapstore/eviction/EvictionListeningWriteLockedOffHeapClockCache.java
* /offheap-store-2-4-3-sources-
jar/org/terracotta/offheapstore/disk/persistent/PersistentConcurrentOffHeapHashMap.java
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Found in path(s):
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/eviction/EvictionListener.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/util/DebuggingUtils.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/allocator/Allocator.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/BinaryStorageEngine.java
*
 /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/ReadWriteLockedOffHeapHashMap.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/portability/Portability.java

* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/disk/persistent/PersistentPortability.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/pinning/PinnableSegment.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/exceptions/OversizeMappingException.java
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* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/util/Validation.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/pinning/PinnableCache.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/buffersource/HeapBufferSource.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/buffersource/OffHeapBufferSource.java
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 /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/paging/Page.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/disk/persistent/Persistent.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/disk/persistent/PersistentStorageEngine.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/paging/PageSource.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/listener/RuntimeStorageEngineListener.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/portability/ByteArrayPortability.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/portability/BooleanPortability.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/Metadata.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/WriteLockedOffHeapClockCache.java
* /offheap-store-2-4-3-sources-
jar/org/terracotta/offheapstore/disk/storage/portability/PersistentSerializablePortability.java
*
 /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/disk/persistent/AbstractPersistentOffHeapCache.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/listener/RecoveryStorageEngineListener.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/disk/storage/Region.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/util/ByteBufferInputStream.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/disk/persistent/PersistentHalfStorageEngine.java
* /offheap-store-2-4-3-sources-
jar/org/terracotta/offheapstore/disk/storage/portability/PersistentByteArrayPortability.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/util/Factory.java
* /offheap-store-2-4-3-sources-
jar/org/terracotta/offheapstore/disk/persistent/PersistentReadWriteLockedOffHeapHashMap.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/listener/StorageEngineListener.java
*
 /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/disk/paging/MappedPage.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/buffersource/BufferSource.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/util/NoOpLock.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/portability/WriteContext.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/portability/WriteBackPortability.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/portability/StringPortability.java
* /offheap-store-2-4-3-sources-
jar/org/terracotta/offheapstore/disk/persistent/AbstractPersistentLockedOffHeapHashMap.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/listener/ListenableStorageEngine.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/MapInternals.java
* /offheap-store-2-4-3-sources-
jar/org/terracotta/offheapstore/disk/persistent/PersistentReadWriteLockedOffHeapClockCache.java
*
 /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/paging/UnlimitedPageSource.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/allocator/IntegerBestFitAllocator.java

* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/util/MemoryUnit.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/ReadWriteLockedOffHeapClockCache.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/disk/persistent/AbstractPersistentConcurrentOffHeapMap.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/storage/allocator/Region.java
* /offheap-store-2-4-3-sources-jar/org/terracotta/offheapstore/concurrent/ConcurrentMapInternals.java
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Found in path(s):
* /offheap-store-2-4-3-sources-jar/META-INF/maven/org.terracotta/offheap-store/pom.xml

1.390 ehcache-impl 3.8.1

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```

Found in path(s):
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/basic/NopStore.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/resilience/RobustLoaderWriterResilienceStrategy.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/serialization/StringSerializer.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/DefaultTimeSourceService.java
*
/ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/resilience/AbstractResilienceStrategy.java
* /ehcache-impl-3-8-1-sources-
jar/org/ehcache/impl/config/loaderwriter/DefaultCacheLoaderWriterConfiguration.java
* /ehcache-impl-3-8-1-sources-
jar/org/ehcache/impl/internal/spi/serialization/DefaultSerializationProviderFactory.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/events/CacheEventDispatcherImpl.java
* /ehcache-impl-3-8-1-sources-
jar/org/ehcache/impl/config/resilience/DefaultResilienceStrategyProviderConfiguration.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/serialization/IntegerSerializer.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/loaderwriter/writebehind/AbstractWriteBehind.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/heap/Backend.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/config/builders/WriteBehindConfigurationBuilder.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/executor/OnDemandExecutionService.java
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/config/builders/CacheEventListenerConfigurationBuilder.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/persistence/package-info.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/sizeof/NoopSizeOfEngine.java
* /ehcache-impl-3-8-1-sources-
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* /ehcache-impl-3-8-1-sources-
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* /ehcache-impl-3-8-1-sources-
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* /ehcache-impl-3-8-1-sources-
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* /ehcache-impl-3-8-1-sources-
jar/org/ehcache/impl/internal/loaderwriter/writebehind/operations/BatchOperation.java
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/persistence/CacheManagerPersistenceConfiguration.java
* /ehcache-impl-3-8-1-sources-
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/resilience/RobustResilienceStrategy.java
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/persistence/FileUtils.java
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/executor/OutOfBandScheduledExecutor.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/event/DefaultCacheEventListenerConfiguration.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/classes/ClassInstanceProviderConfiguration.java
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/executor/DefaultExecutionServiceFactory.java
* /ehcache-impl-3-8-1-sources-
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/heap/OnHeapStoreProviderFactory.java
* /ehcache-impl-3-8-1-sources-
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/spi/resilience/DefaultResilienceStrategyProvider.java
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/config/builders/PooledExecutionServiceConfigurationBuilder.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/copy/IdentityCopier.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/store/disk/OffHeapDiskStoreConfiguration.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/executor/ExecutorUtil.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/persistence/UserManagedPersistenceContext.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/persistence/DefaultDiskResourceServiceFactory.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/events/ThreadLocalStoreEventDispatcher.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/TimeSourceConfiguration.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/event/DefaultCacheEventDispatcherConfiguration.java
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/ehcache-impl-3-8-1-sources-
jar/org/ehcache/impl/internal/loaderwriter/writebehind/NonBatchingLocalHeapWriteBehindQueue.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/copy/DefaultCopyProviderConfiguration.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/offheap/OffHeapStore.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/events/FudgingInvocationScopedEventSink.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/event/package-info.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/copy/SerializingCopier.java
* /ehcache-impl-3-8-1-sources-
jar/org/ehcache/impl/config/loaderwriter/writebehind/DefaultBatchingConfiguration.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/store/disk/OffHeapDiskStoreProviderConfiguration.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/event/DefaultEventSourceConfiguration.java
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/config/builders/ResourcePoolsBuilder.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/heap/holders/OnHeapValueHolder.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/sizeof/DefaultSizeOfEngine.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/heap/SimpleBackend.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/tiering/TieredStoreProviderFactory.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/BinaryValueHolder.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/spi/copy/DefaultCopyProvider.java
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/serializer/DefaultSerializerConfiguration.java
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/disk/OffHeapDiskStore.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/spi/serialization/DefaultSerializationProvider.java
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/offheap/EhcacheOffHeapBackingMap.java
*
/ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/events/DisabledCacheEventNotificationService.java
* /ehcache-impl-3-8-1-sources-
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/executor/PooledExecutionService.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/offheap/OffHeapMapStatistics.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/offheap/SwitchableEvictionAdvisor.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/util/ThreadFactoryUtil.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/serializer/package-info.java
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/loaderwriter/writebehind/WriteBehind.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/copy/package-info.java
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/events/StoreEvents.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/persistence/DefaultLocalPersistenceService.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/executor/package-info.java
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/executor/PartitionedUnorderedExecutor.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/loaderwriter/writebehind/package-info.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/ResourcePoolsImpl.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/BaseCacheConfiguration.java

* /ehcache-impl-3-8-1-sources-jar/org/ehcache/config/builders/CacheConfigurationBuilder.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/util/Pacer.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/executor/PooledExecutionServiceConfiguration.java
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/store/heap/DefaultSizeOfEngineConfiguration.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/events/CacheEventDispatcherFactoryImpl.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/concurrent/package-info.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/executor/PartitionedScheduledExecutor.java
* /ehcache-impl-3-8-1-sources-
jar/org/ehcache/impl/internal/store/offheap/EhcacheConcurrentOffHeapClockCache.java
* /ehcache-impl-3-8-1-sources-
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* /ehcache-impl-3-8-1-sources-
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/serialization/package-info.java
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/events/StoreEventImpl.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/config/builders/UserManagedCacheConfiguration.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/offheap/MemorySizeParser.java
* /ehcache-impl-3-8-1-sources-
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/heap/holders/LookupOnlyOnHeapKey.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/events/FireableStoreEventHolder.java
* /ehcache-impl-3-8-1-sources-
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/disk/OffHeapDiskStoreProviderFactory.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/loaderwriter/LocalLoaderWriterStore.java
*
 /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/loaderwriter/writebehind/StripedWriteBehind.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/classes/ClassInstanceConfiguration.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/serialization/FloatSerializer.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/concurrent/EvictingConcurrentMap.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/persistence/FileBasedStateRepository.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/copy/package-info.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/config/builders/package-info.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/heap/holders/OnHeapKey.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/heap/OnHeapStrategy.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/store/heap/package-info.java
*
 /ehcache-impl-3-8-1-sources-
jar/org/ehcache/impl/internal/sizeof/listeners/exceptions/VisitorListenerException.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/heap/holders/BaseOnHeapKey.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/resilience/DefaultResilienceStrategyConfiguration.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/heap/holders/CopiedOnHeapKey.java

* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/heap/holders/CopiedOnHeapValueHolder.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/serialization/DoubleSerializer.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/executor/PartitionedOrderedExecutor.java
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/store/disk/package-info.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/tiering/CompoundCachingTier.java
*
 /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/offheap/LazyOffHeapValueHolder.java
* /ehcache-impl-3-8-1-sources-
jar/org/ehcache/impl/internal/store/offheap/portability/OffHeapValueHolderPortability.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/sizeof/DefaultSizeOfEngineProvider.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/events/EventDispatchTask.java
* /ehcache-impl-3-8-1-sources-
jar/org/ehcache/impl/internal/spi/loaderwriter/DefaultCacheLoaderWriterProvider.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/offheap/OffHeapStoreProviderFactory.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/spi/copy/DefaultCopyProviderFactory.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/util/ServiceUtil.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/config/builders/ExpiryPolicyBuilder.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/events/package-info.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/sizeof/listeners/EhcacheVisitorListener.java
*
 /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/SizedResourcePoolImpl.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/config/builders/ConfigurationBuilder.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/events/InvocationScopedEventSink.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/heap/OnHeapStore.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/offheap/AbstractOffHeapStore.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/copy/DefaultCopierConfiguration.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/store/HashUtils.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/heap/KeyCopyBackend.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/event/CacheEventDispatcherFactoryConfiguration.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/offheap/HeuristicConfiguration.java
*
 /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/persistence/DefaultDiskResourceService.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/copy/ReadWriteCopier.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/config/builders/CacheManagerBuilder.java
* /ehcache-impl-3-8-1-sources-
jar/org/ehcache/impl/config/loaderwriter/writebehind/DefaultWriteBehindConfiguration.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/disk/DiskWriteThreadPool.java
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/sizeof/DefaultSizeOfEngineProviderFactory.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/store/BaseStore.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/serialization/ByteArraySerializer.java
*
 /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/store/loaderwriter/LoaderWriterValueHolder.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/config/persistence/package-info.java

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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/classes/commonslang/reflect/MethodUtils.java
*
/ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/classes/commonslang/ArrayUtils.java
* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/classes/commonslang/reflect/ConstructorUtils.java
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* /ehcache-impl-3-8-1-sources-jar/org/ehcache/impl/internal/concurrent/ThreadLocalRandomUtil.java

1.391 webjars-locator-core 0.45

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xwd v1.0.7

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Mesa 3-D
graphics library

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1.395 cyrus-sasl 2.1.27+dfsg-2ubuntu0.1

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This package contains a modified version of ca-bundle.crt:

ca-bundle.crt -- Bundle of CA Root Certificates

Certificate data from Mozilla as of: Thu Nov 3 19:04:19 2011#
This is a bundle of X.509 certificates of public Certificate Authorities
(CA). These were automatically extracted from Mozilla's root certificates
file (certdata.txt). This file can be found in the mozilla source tree:
http://mxr.mozilla.org/mozilla/source/security/nss/lib/ckfw/builtins/certdata.txt?raw=1#
It contains the certificates in PEM format and therefore
can be directly used with curl / libcurl / php_curl, or with
an Apache+mod_ssl webserver for SSL client authentication.
Just configure this file as the SSLCACertificateFile.#

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@(#) $RCSfile: certdata.txt,v $
$Revision: 1.80 $ $Date: 2011/11/03 15:11:58 $
A. HISTORY OF THE SOFTWARE
==========

Python was created in the early 1990s by Guido van Rossum at Stichting
Mathematisch Centrum (CWI, see http://www.cwi.nl) in the Netherlands
as a successor of a language called ABC. Guido remains Python's
principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for
National Research Initiatives (CNRI, see http://www.cnri.reston.va.us)
in Reston, Virginia where he released several versions of the
software.

In May 2000, Guido and the Python core development team moved to
BeOpen.com to form the BeOpen PythonLabs team. In October of the same

year, the PythonLabs team moved to Digital Creations (now Zope Corporation, see http://www.zope.com). In 2001, the Python Software Foundation (PSF, see http://www.python.org/psf/) was formed, a non-profit organization created specifically to own Python-related Intellectual Property. Zope Corporation is a sponsoring member of the PSF.

All Python releases are Open Source (see http://www.opensource.org for the Open Source Definition). Historically, most, but not all, Python releases have also been GPL-compatible; the table below summarizes the various releases.

Release	Derived from	Year	Owner	GPL-compatible? (1)
0.9.0 thru 1.2		1991-1995	CWI	yes
1.3 thru 1.5.2	1.2	1995-1999	CNRI	yes
1.6	1.5.2	2000	CNRI	no
2.0	1.6	2000	BeOpen.com	no
1.6.1	1.6	2001	CNRI	yes (2)
2.1	2.0+1.6.1	2001	PSF	no
2.0.1	2.0+1.6.1	2001	PSF	yes
2.1.1	2.1+2.0.1	2001	PSF	yes
2.2	2.1.1	2001	PSF	yes
2.1.2	2.1.1	2002	PSF	yes
2.1.3	2.1.2	2002	PSF	yes
2.2.1	2.2	2002	PSF	yes
2.2.2	2.2.1	2002	PSF	yes
2.2.3	2.2.2	2003	PSF	yes
2.3	2.2.2	2002-2003	PSF	yes
2.3.1	2.3	2002-2003	PSF	yes
2.3.2	2.3.1	2002-2003	PSF	yes
2.3.3	2.3.2	2002-2003	PSF	yes
2.3.4	2.3.3	2004	PSF	yes
2.3.5	2.3.4	2005	PSF	yes
2.4	2.3	2004	PSF	yes
2.4.1	2.4	2005	PSF	yes
2.4.2	2.4.1	2005	PSF	yes
2.4.3	2.4.2	2006	PSF	yes
2.4.4	2.4.3	2006	PSF	yes
2.5	2.4	2006	PSF	yes
2.5.1	2.5	2007	PSF	yes
2.5.2	2.5.1	2008	PSF	yes
2.5.3	2.5.2	2008	PSF	yes
2.6	2.5	2008	PSF	yes
2.6.1	2.6	2008	PSF	yes

2.6.2	2.6.1	2009	PSF	yes
2.6.3	2.6.2	2009	PSF	yes
2.6.4	2.6.3	2009	PSF	yes
2.6.5	2.6.4	2010	PSF	yes
2.7	2.6	2010	PSF	yes

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(1) GPL-compatible doesn't mean that we're distributing Python under the GPL. All Python licenses, unlike the GPL, let you distribute a modified version without making your changes open source. The GPL-compatible licenses make it possible to combine Python with other software that is released under the GPL; the others don't.

(2) According to Richard Stallman, 1.6.1 is not GPL-compatible, because its license has a choice of law clause. According to CNRI, however, Stallman's lawyer has told CNRI's lawyer that 1.6.1 is "not incompatible" with the GPL.

Thanks to the many outside volunteers who have worked under Guido's direction to make these releases possible.

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0.9.0 thru 1.2		1991-1995	CWI	yes
1.3 thru 1.5.2	1.2	1995-1999	CNRI	yes
1.6	1.5.2	2000	CNRI	no
2.0	1.6	2000	BeOpen.com	no
1.6.1	1.6	2001	CNRI	yes (2)
2.1	2.0+1.6.1	2001	PSF	no
2.0.1	2.0+1.6.1	2001	PSF	yes
2.1.1	2.1+2.0.1	2001	PSF	yes
2.2	2.1.1	2001	PSF	yes

2.1.2	2.1.1	2002	PSF	yes
2.1.3				
2.1.2	2002	PSF	yes	
2.2.1	2.2	2002	PSF	yes
2.2.2	2.2.1	2002	PSF	yes
2.2.3	2.2.2	2003	PSF	yes
2.3	2.2.2	2002-2003	PSF	yes
2.3.1	2.3	2002-2003	PSF	yes
2.3.2	2.3.1	2002-2003	PSF	yes
2.3.3	2.3.2	2002-2003	PSF	yes
2.3.4	2.3.3	2004	PSF	yes
2.3.5	2.3.4	2005	PSF	yes
2.4	2.3	2004	PSF	yes
2.4.1	2.4	2005	PSF	yes
2.4.2	2.4.1	2005	PSF	yes
2.4.3	2.4.2	2006	PSF	yes
2.4.4	2.4.3	2006	PSF	yes
2.5	2.4	2006	PSF	yes
2.5.1	2.5	2007	PSF	yes
2.5.2	2.5.1	2008	PSF	yes
2.5.3	2.5.2	2008	PSF	yes
2.6	2.5	2008	PSF	yes
2.6.1	2.6	2008	PSF	yes
2.6.2	2.6.1	2009	PSF	yes
2.6.3	2.6.2	2009	PSF	yes
2.6.4	2.6.3	2009	PSF	yes
2.6.5	2.6.4	2010	PSF	yes
3.0	2.6	2008	PSF	yes
3.0.1	3.0	2009	PSF	yes
3.1	3.0.1	2009	PSF	yes
3.1.1	3.1	2009	PSF	yes
3.1.2	3.1	2010	PSF	yes
3.2	3.1	2010	PSF	yes

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History

Before (and including) argparse 1.1, the argparse package was licensed under
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After argparse 1.1, all project files from the argparse project were deleted
due to license compatibility issues between Apache License 2.0 and GNU GPL v2.

The project repository then had a clean start with some files taken from
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============
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============

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A. HISTORY OF THE SOFTWARE
==========

Python was created in the early 1990s by Guido van Rossum at Stichting Mathematisch Centrum (CWI, see http://www.cwi.nl) in the Netherlands as a successor of a language called ABC. Guido remains Python's principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for National Research Initiatives (CNRI, see http://www.cnri.reston.va.us) in Reston, Virginia where he released several versions of the software.

In May 2000, Guido and the Python core development team moved to BeOpen.com to form the BeOpen PythonLabs team. In October of the same year, the PythonLabs team moved to Digital Creations (now Zope Corporation, see http://www.zope.com). In 2001, the Python Software Foundation (PSF, see http://www.python.org/psf/) was formed, a non-profit organization created specifically to own Python-related Intellectual Property. Zope Corporation is a sponsoring member of
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2.1.2	2.1.1	2002	PSF	yes
2.1.3	2.1.2	2002	PSF	yes
2.2 and above				
2.1.1		2001-now	PSF	yes

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Written by Andy Polyakov <appro@fy.chalmers.se> for the OpenSSL project. The module is, however, dual licensed under OpenSSL and CRYPTOGAMS licenses depending on where you obtain it. For further details see https://www.openssl.org/~appro/cryptogams/.

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##
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1.409 systemd 231

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/**
* NCSA HTTPd Server
* Software Development Group
* National Center for Supercomputing Applications
* University of Illinois at Urbana-Champaign
* 605 E. Springfield, Champaign, IL 61820
* httpd@ncsa.uiuc.edu
*
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****
*
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* MD5 crypt() function,
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```
* ----------------------------------------------------------------------
*/
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For the test\zb.c component:

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     ===============

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Written by Adam Twiss (adam@zeus.co.uk). March 1996

Thanks to the following people for their input:
Mike Belshe (mbelshe@netscape.com)
Michael Campanella (campanella@stevms.enet.dec.com)

*/
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN" "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
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<meta content="text/html; charset=UTF-8" http-equiv="Content-Type" />
<!--
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
X
This file is generated from xml source: DO NOT EDIT
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
X
-->
<title>The Apache License, Version 2.0 - Apache HTTP Server Version 2.4</title>
<link href="./style/css/manual.css" rel="stylesheet" media="all" type="text/css" title="Main stylesheet" />
<link href="./style/css/manual-loose-100pc.css" rel="alternate stylesheet" media="all" type="text/css" title="No Sidebar - Default font size" />
<link href="./style/css/manual-print.css" rel="stylesheet" media="print" type="text/css" /><link rel="stylesheet" type="text/css" href="./style/css/prettify.css"
/>
<script src="./style/scripts/prettify.min.js" type="text/javascript">
</script>

<link href="./images/favicon.ico" rel="shortcut icon" /></head>
<body id="manual-page" class="no-sidebar">
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var comments_shortname = 'httpd';
var comments_identifier = 'http://httpd.apache.org/docs/2.4/license.html';
(function(w, d) {
  if (w.location.hostname.toLowerCase() == "httpd.apache.org") {
    d.write(' <\/div>');
    var s = d.createElement('script');
    s.type = 'text/javascript';

```
      s.async = true;
      s.src = 'https://comments.apache.org/show_comments.lua?site=' + comments_shortname + '&page=' +
comments_identifier;
       (d.getElementsByTagName('head')[0] || d.getElementsByTagName('body')[0]).appendChild(s);
  }
  else {
      d.write('<div id="comments_thread">Comments are disabled for this page at the moment.<\/div>');
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1.412 python 3.9.12

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A. HISTORY OF THE SOFTWARE
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Python was created in the early 1990s by Guido van Rossum at Stichting
Mathematisch Centrum (CWI, see http://www.cwi.nl) in the Netherlands
as a successor of a language called ABC. Guido remains Python's

principal author, although it includes many contributions from others.

In 1995, Guido continued his work on Python at the Corporation for
National Research Initiatives (CNRI, see http://www.cnri.reston.va.us)
in Reston, Virginia where he released several versions of the
software.

In May 2000, Guido and the Python core development team moved to
BeOpen.com to form the BeOpen PythonLabs team. In October of the same
year, the PythonLabs team moved to Digital Creations, which became
Zope Corporation. In 2001, the Python Software Foundation (PSF, see
https://www.python.org/psf/) was formed, a non-profit organization
created specifically to own Python-related Intellectual Property.
Zope Corporation was a sponsoring member of the PSF.

All
Python releases are Open Source (see http://www.opensource.org for
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releases have also been GPL-compatible; the table below summarizes
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Release	Derived from	Year	Owner	GPL-compatible? (1)
0.9.0 thru 1.2		1991-1995	CWI	yes
1.3 thru 1.5.2	1.2	1995-1999	CNRI	yes
1.6	1.5.2	2000	CNRI	no
2.0	1.6	2000	BeOpen.com	no
1.6.1	1.6	2001	CNRI	yes (2)
2.1	2.0+1.6.1	2001	PSF	no
2.0.1	2.0+1.6.1	2001	PSF	yes
2.1.1	2.1+2.0.1	2001	PSF	yes
2.1.2	2.1.1	2002	PSF	yes
2.1.3	2.1.2	2002	PSF	yes
2.2 and above	2.1.1	2001-now	PSF	yes

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(2) According to Richard Stallman, 1.6.1 is not GPL-compatible,
because its license has a choice of law clause. According to
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    The End

1.416 base-files 10.3+deb10u12

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If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

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The End

1.417 click 8.1.2

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* /click-8-1-2-tar-gz/click-8.1.2/setup.cfg
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.. _contrib:

==========
click-contrib
==========

As the userbase of Click grows, more and more major feature requests pop up in Click's bugtracker. As reasonable as it may be for those features to be bundled with Click instead of being a standalone project, many of those requested features are either highly experimental or have unproven practical use, while potentially being a burden to maintain.

This is why click-contrib_ exists. The GitHub organization is a collection of possibly experimental third-party packages whose featureset does not belong into Click, but also a playground for major features that may be added to Click in the future. It is also meant to coordinate and concentrate effort on writing third-party extensions for Click, and to ease the effort of searching for such extensions. In that sense it could be described as a low-maintenance alternative to extension repositories of other frameworks.

Please
 note that the quality and stability of those packages may be different than what you expect from Click itself. While published under a common organization, they are still projects separate from Click.

.. _click-contrib: https://github.com/click-contrib/

Found in path(s):
* /click-8-1-2-tar-gz/click-8.1.2/docs/contrib.rst
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* /click-8-1-2-tar-gz/click-8.1.2/CODE_OF_CONDUCT.md
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* /click-8-1-2-tar-gz/click-8.1.2/src/click/parser.py
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Including attribution to #612

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* /click-8-1-2-tar-gz/click-8.1.2/tests/test_formatting.py
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jar/org/springframework/context/annotation/aspectj/SpringConfiguredConfiguration.java
* /spring-aspects-5-2-20-release-sources-jar/org/springframework/cache/aspectj/AspectJCachingConfiguration.java
* /spring-aspects-5-2-20-release-sources-jar/org/springframework/cache/aspectj/AspectJJCacheConfiguration.java
*
 /spring-aspects-5-2-20-release-sources-jar/org/springframework/cache/aspectj/AnyThrow.java
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* /spring-aspects-5-2-20-release-sources-

jar/org/springframework/transaction/aspectj/AspectJJtaTransactionManagementConfiguration.java
* /spring-aspects-5-2-20-release-sources-
jar/org/springframework/beans/factory/aspectj/AbstractInterfaceDrivenDependencyInjectionAspect.aj
*
 /spring-aspects-5-2-20-release-sources-
jar/org/springframework/scheduling/aspectj/AspectJAsyncConfiguration.java
* /spring-aspects-5-2-20-release-sources-
jar/org/springframework/beans/factory/aspectj/AnnotationBeanConfigurerAspect.aj
* /spring-aspects-5-2-20-release-sources-
jar/org/springframework/transaction/aspectj/AspectJTransactionManagementConfiguration.java

1.422 spring-jdbc 5.2.20.RELEASE

1.422.1 Available under license :

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*/
/**
* Implement this interface when parameters need to be customized based
* on the connection. We might need to do this to make use of proprietary
* features, available only with a specific Connection type.
*
* @author Rod Johnson
* @author Thomas Risberg
* @see CallableStatementCreatorFactory#newCallableStatementCreator(ParameterMapper)
 * @see org.springframework.jdbc.object.StoredProcedure#execute(ParameterMapper)
*/
/**
  * Create a Map of input parameters, keyed by name.
  * @param con a JDBC connection. This is useful (and the purpose of this interface)
  * if we need to do something RDBMS-specific with a proprietary Connection
  * implementation class. This class conceals such proprietary details. However,
  * it is best to avoid using such proprietary RDBMS features if possible.
```

```
 * @return a Map of input parameters, keyed by name (never {@code null})
 * @throws SQLException if an SQLException is encountered setting
 * parameter values (that is, there's no need to catch SQLException)
 */
```

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```

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* /spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/datasource/embedded/EmbeddedDatabaseFactoryBean.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/support/xml/Jdbc4SqlXmlHandler.java
*
 /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/simple/SimpleJdbcInsert.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/datasource/init/DataSourceInitializer.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/datasource/ConnectionProxy.java
* /spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/support/CustomSQLErrorCodesTranslation.java
* /spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/core/metadata/PostgresCallMetaDataProvider.java
* /spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/config/InitializeDatabaseBeanDefinitionParser.java
* /spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/core/metadata/SqlServerCallMetaDataProvider.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/support/lob/DefaultLobHandler.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/support/lob/PassThroughBlob.java
*
 /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/metadata/SybaseCallMetaDataProvider.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/ParameterDisposer.java
* /spring-jdbc-5-2-20-release-sources-

jar/org/springframework/jdbc/config/EmbeddedDatabaseBeanDefinitionParser.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/datasource/DelegatingDataSource.java
* /spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/core/metadata/OracleCallMetaDataProvider.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/support/lob/PassThroughClob.java
* /spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/datasource/AbstractDriverBasedDataSource.java
* /spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/datasource/lookup/BeanFactoryDataSourceLookup.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/support/SQLExceptionSubclassTranslator.java
*
/spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/support/SqlLobValue.java
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jar/org/springframework/jdbc/datasource/lookup/SingleDataSourceLookup.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/object/GenericStoredProcedure.java
* /spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/datasource/lookup/DataSourceLookupFailureException.java
*
/spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/support/incrementer/AbstractSequenceMaxValueIncrementer.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/support/SqlValue.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/support/xml/XmlResultProvider.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/support/xml/XmlBinaryStreamProvider.java
* /spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/support/xml/SqlXmlFeatureNotImplementedException.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/support/xml/XmlCharacterStreamProvider.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/config/JdbcNamespaceHandler.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/datasource/lookup/JndiDataSourceLookup.java
* /spring-jdbc-5-2-20-release-sources-

jar/org/springframework/jdbc/core/InterruptibleBatchPreparedStatementSetter.java
*
 /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/BatchPreparedStatementSetter.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/support/MetaDataAccessException.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/datasource/SmartDataSource.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/SQLWarningException.java
* /spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/datasource/embedded/SimpleDriverDataSourceFactory.java
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jar/org/springframework/jdbc/support/rowset/ResultSetWrappingSqlRowSet.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/datasource/JdbcTransactionObjectSupport.java
* /spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/datasource/LazyConnectionDataSourceProxy.java
*
 /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/support/KeyHolder.java
* /spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/datasource/TransactionAwareDataSourceProxy.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/namedparam/SqlParameterSource.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/object/RdbmsOperation.java
* /spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/core/namedparam/BeanPropertySqlParameterSource.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/simple/AbstractJdbcInsert.java
* /spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/core/support/AbstractLobStreamingResultSetExtractor.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/support/rowset/SqlRowSet.java
* /spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/support/CustomSQLExceptionTranslatorRegistry.java
*

/spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/namedparam/MapSqlParameterSource.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/namedparam/AbstractSqlParameterSource.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/datasource/init/ResourceDatabasePopulator.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/support/SQLStateSQLExceptionTranslator.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/object/SqlFunction.java
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*/
/**
* Strategy interface for translating between {@link SQLException SQLExceptions}
* and Spring's data access strategy-agnostic {@link DataAccessException}
* hierarchy.
*
* <p>Implementations can be generic (for example, using
* {@link java.sql.SQLException#getSQLState() SQLState} codes for JDBC) or
 wholly
* proprietary (for example, using Oracle error codes) for greater precision.
*
* @author Rod Johnson
* @author Juergen Hoeller
* @see org.springframework.dao.DataAccessException
*/

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jar/org/springframework/jdbc/datasource/embedded/AbstractEmbeddedDatabaseConfigurer.java
* /spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/datasource/lookup/AbstractRoutingDataSource.java
*
 /spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/support/SQLErrorCodeSQLExceptionTranslator.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/namedparam/ParsedSql.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/SqlProvider.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/datasource/SingleConnectionDataSource.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/datasource/SimpleDriverDataSource.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/datasource/embedded/DataSourceFactory.java
* /spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/core/metadata/CallMetaDataProviderFactory.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/PreparedStatementCreatorFactory.java
* /spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/core/namedparam/SqlParameterSourceUtils.java
*
 /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/support/SQLErrorCodesFactory.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/datasource/init/DatabasePopulatorUtils.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/SingleColumnRowMapper.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/support/JdbcUtils.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/JdbcTemplate.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/metadata/CallMetaDataContext.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/support/DatabaseMetaDataCallback.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/datasource/DriverManagerDataSource.java
* /spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/core/namedparam/NamedParameterJdbcTemplate.java
* /spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/datasource/DataSourceTransactionManager.java
*
 /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/simple/AbstractJdbcCall.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/StatementCreatorUtils.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/metadata/CallParameterMetaData.java

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jar/org/springframework/jdbc/support/incrementer/DB2MainframeSequenceMaxValueIncrementer.java
* /spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/support/incrementer/DB2SequenceMaxValueIncrementer.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/DisposableSqlTypeValue.java
*
 /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/support/xml/SqlXmlValue.java
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jar/org/springframework/jdbc/core/namedparam/NamedParameterJdbcOperations.java
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jar/org/springframework/jdbc/core/metadata/GenericTableMetaDataProvider.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/metadata/TableMetaDataContext.java
*
/spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/core/metadata/TableMetaDataProviderFactory.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/JdbcOperations.java
* /spring-jdbc-5-2-20-release-sources-
jar/org/springframework/jdbc/core/metadata/GenericCallMetaDataProvider.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/datasource/init/ScriptUtils.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/BeanPropertyRowMapper.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/namedparam/NamedParameterUtils.java
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/**
* The classes in this package make JDBC easier to use and
* reduce the likelihood of common errors. In particular, they:
*
* Simplify error handling, avoiding the need for try/catch/finally
* blocks in application code.
* Present exceptions to application code in a generic hierarchy of
* unchecked exceptions, enabling applications to catch data access
* exceptions without being dependent on JDBC, and to ignore fatal
* exceptions there is no value in catching.
* Allow the implementation of error handling to be modified
* to target different RDBMSes without introducing proprietary
* dependencies into application code.
*
*
* <p>This package and related packages are discussed in Chapter 9 of
* Expert One-On-One J2EE Design and
Development
* by Rod Johnson (Wrox, 2002).
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* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/support/AbstractSqlTypeValue.java
*
/spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/datasource/embedded/DerbyEmbeddedDatabaseConfigurer.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/SqlParameterValue.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/metadata/TableParameterMetaData.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/support/JdbcBeanDefinitionReader.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/support/AbstractFallbackSQLExceptionTranslator.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/datasource/DataSourceUtils.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/BatchUpdateUtils.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/SqlRowSetResultSetExtractor.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/ConnectionCallback.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/support/CustomSQLExceptionTranslatorRegistrar.java
*
/spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/support/incrementer/HsqlSequenceMaxValueIncrementer.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/namedparam/NamedParameterBatchUpdateUtils.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/support/incrementer/OracleSequenceMaxValueIncrementer.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/ColumnMapRowMapper.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/simple/SimpleJdbcCall.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/support/incrementer/SybaseAnywhereMaxValueIncrementer.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/config/SortedResourcesFactoryBean.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/SqlOutParameter.java
*
/spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/UncategorizedSQLException.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/ParameterizedPreparedStatementSetter.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/object/StoredProcedure.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/core/SqlReturnUpdateCount.java
* /spring-jdbc-5-2-20-release-sources-jar/org/springframework/jdbc/datasource/embedded/EmbeddedDatabaseConfigurerFactory.java
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*/
/**
  * Close this LobCreator session and free its temporarily created BLOBs and CLOBs.
  * Will not need to do anything if using PreparedStatement's standard methods,
  * but might be necessary to free database resources if using proprietary means.
  * <p>NOTE: Needs to be invoked after the involved
 PreparedStatements have
  * been executed or the affected O/R mapping sessions have been flushed.
  * Otherwise, the database resources for the temporary BLOBs might stay allocated.
  */

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1.423 spring-context 5.2.20.RELEASE

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/spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/concurrent/ReschedulingRunnable.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/config/ScheduledTask.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/config/ScheduledTaskHolder.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/support/ApplicationListenerDetector.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/interceptor/CacheErrorHandler.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/format/datetime/standard/DateTimeFormatterFactoryBean.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/MessageSourceResolvable.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scripting/ScriptFactory.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/validation/DefaultMessageCodesResolver.java
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/spring-context-5-2-20-release-sources-jar/org/springframework/remoting/support/RemoteAccessor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/config/CronTask.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/expression/EnvironmentAccessor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/format/datetime/standard/DateTimeContext.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/config/IntervalTask.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/support/DelegatingMessageSource.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/jmx/export/assembler/AbstractMBeanInfoAssembler.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/context/i18n/SimpleTimeZoneAwareLocaleContext.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/context/config/MBeanExportBeanDefinitionParser.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/event/EventPublicationInterceptor.java
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/spring-context-5-2-20-release-sources-jar/org/springframework/context/i18n/SimpleLocaleContext.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/support/RemoteExporter.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/config/FixedRateTask.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/access/MBeanProxyFactoryBean.java
* /spring-context-5-2-20-release-sources-
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* /spring-context-5-2-20-release-sources-jar/org/springframework/jndi/JndiObjectTargetSource.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/expression/AnnotatedElementKey.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/format/datetime/joda/DateTimeFormatterFactoryBean.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/format/datetime/standard/Jsr310DateTimeFormatAnnotationFormatterFactory.java
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/spring-context-5-2-20-release-sources-jar/org/springframework/cache/interceptor/NamedCacheResolver.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jndi/JndiAccessor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/config/TriggerTask.java
* /spring-context-5-2-20-release-sources-
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* /spring-context-5-2-20-release-sources-jar/org/springframework/stereotype/Indexed.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/context/support/ClassPathXmlApplicationContext.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/export/metadata/JmxMetadataUtils.java
* /spring-context-5-2-20-release-sources-
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* /spring-context-5-2-20-release-sources-jar/org/springframework/format/datetime/joda/JodaTimeContext.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/context/EnvironmentAware.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/export/metadata/ManagedNotification.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scripting/groovy/GroovyScriptEvaluator.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/export/metadata/ManagedMetric.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/rmi/JndiRmiProxyFactoryBean.java
* /spring-context-5-2-20-release-sources-
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* /spring-context-5-2-20-release-sources-
jar/org/springframework/context/support/AbstractRefreshableConfigApplicationContext.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/support/NotificationListenerHolder.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/format/support/FormattingConversionServiceFactoryBean.java
*
/spring-context-5-2-20-release-sources-
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* /spring-context-5-2-20-release-sources-
jar/org/springframework/scheduling/support/MethodInvokingRunnable.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/support/SimpleValueWrapper.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/config/Task.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/format/number/CurrencyStyleFormatter.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/stereotype/Service.java
* /spring-context-5-2-20-release-sources-

jar/org/springframework/jmx/export/naming/MetadataNamingStrategy.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/support/MetricType.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/format/number/NumberFormatAnnotationFormatterFactory.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/cache/support/NullValue.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/context/annotation/AspectJAutoProxyRegistrar.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/instrument/classloading/SimpleThrowawayClassLoader.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/scheduling/annotation/AnnotationAsyncExecutionInterceptor.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/format/datetime/DateTimeFormatAnnotationFormatterFactory.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/cache/concurrent/ConcurrentMapCacheFactoryBean.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scripting/support/StandardScriptEvaluator.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/export/metadata/ManagedResource.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/interceptor/SimpleCacheErrorHandler.java
*
/spring-context-5-2-20-release-sources-
jar/org/springframework/context/annotation/Jsr330ScopeMetadataResolver.java
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*/
/**
* Indicates that a component is only eligible for registration when all
* {@linkplain #value specified conditions} match.
*
* <p>A <em>condition</em> is any state that can be determined programmatically
* before the bean definition is due to be registered (see {@link Condition} for details).
*
*
```

```
 <p>The {@code @Conditional} annotation may be used in any of the following ways:
* <ul>
* <li>as a type-level annotation on any class directly or indirectly annotated with
* {@code @Component}, including {@link Configuration @Configuration} classes</li>
* <li>as a meta-annotation, for the purpose of composing custom stereotype
* annotations</li>
* <li>as a method-level annotation on any {@link Bean @Bean} method</li>
* </ul>
*
* <p>If a {@code @Configuration} class is marked with {@code @Conditional},
* all of the {@code @Bean} methods, {@link Import @Import} annotations, and
* {@link ComponentScan @ComponentScan} annotations associated with that
* class will be subject to the conditions.
*
* <p><strong>NOTE</strong>: Inheritance of {@code @Conditional} annotations
* is not supported; any conditions from superclasses or from overridden
* methods will not be considered. In order to enforce these semantics,
* {@code @Conditional} itself is not declared as
* {@link java.lang.annotation.Inherited
 @Inherited}; furthermore, any
* custom <em>composed annotation</em> that is meta-annotated with
* {@code @Conditional} must not be declared as {@code @Inherited}.
*
* @author Phillip Webb
* @author Sam Brannen
* @since 4.0
* @see Condition
*/
```

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```

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* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/interceptor/KeyGenerator.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/rmi/RmiClientInterceptorUtils.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/jndi/JndiPropertySource.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jndi/JndiLocatorDelegate.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scripting/bsh/BshScriptFactory.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/format/Parser.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/context/config/PropertyOverrideBeanDefinitionParser.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/ScopeMetadataResolver.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/format/datetime/standard/DurationFormatter.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/scheduling/annotation/SchedulingConfiguration.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/annotation/CacheEvict.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scripting/groovy/GroovyObjectCustomizer.java
*
/spring-context-5-2-20-release-sources-
jar/org/springframework/format/datetime/standard/TemporalAccessorParser.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/support/CompositeCacheManager.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scripting/support/StandardScriptUtils.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/format/datetime/standard/TemporalAccessorPrinter.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/interceptor/CacheEvaluationContext.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/format/datetime/standard/MonthDayFormatter.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/export/annotation/ManagedNotifications.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/format/datetime/standard/PeriodFormatter.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/context/config/AbstractPropertyLoadingBeanDefinitionParser.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/cache/annotation/Caching.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/TaskScheduler.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/scheduling/config/ExecutorBeanDefinitionParser.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/annotation/Schedules.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/support/RemoteInvocationUtils.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/format/support/FormatterPropertyEditorAdapter.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/format/datetime/standard/YearMonthFormatter.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/format/Printer.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/interceptor/SimpleKeyGenerator.java
*
/spring-context-5-2-20-release-sources-
jar/org/springframework/context/support/GenericXmlApplicationContext.java

* /spring-context-5-2-20-release-sources-jar/org/springframework/instrument/classloading/weblogic/WebLogicLoadTimeWeaver.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/config/ScheduledTasksBeanDefinitionParser.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/annotation/Cacheable.java
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* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/interceptor/BasicOperation.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/ApplicationContext.java
*

/spring-context-5-2-20-release-sources-jar/org/springframework/validation/beanvalidation/MessageSourceResourceBundleLocator.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/format/AnnotationFormatterFactory.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/validation/annotation/Validated.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/config/ContextLifecycleScheduledTaskRegistrar.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/annotation/AsyncConfigurerSupport.java
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* /spring-context-5-2-20-release-sources-jar/org/springframework/format/datetime/joda/LocalDateParser.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/format/datetime/joda/LocalDateTimeParser.java
*
 /spring-context-5-2-20-release-sources-jar/org/springframework/format/datetime/joda/ReadablePartialPrinter.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/i18n/TimeZoneAwareLocaleContext.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/scheduling/concurrent/CustomizableThreadFactory.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/i18n/LocaleContext.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/context/support/MessageSourceResourceBundle.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/format/datetime/joda/MillisecondInstantPrinter.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/format/datetime/joda/DateTimeParser.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/FilterType.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/Description.java
*
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* /spring-context-5-2-20-release-sources-
jar/org/springframework/jmx/export/assembler/SimpleReflectiveMBeanInfoAssembler.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/format/datetime/joda/JodaTimeConverters.java
*
 /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/EnableLoadTimeWeaving.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/scheduling/concurrent/ThreadPoolTaskScheduler.java

* /spring-context-5-2-20-release-sources-
jar/org/springframework/cache/annotation/AbstractCachingConfiguration.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/format/datetime/standard/DateTimeFormatterRegistrar.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/event/SmartApplicationListener.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/config/CacheAdviceParser.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/scheduling/concurrent/DefaultManagedAwareThreadFactory.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/interceptor/CacheResolver.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/cache/interceptor/CacheExpressionRootObject.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/scripting/ScriptCompilationException.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jndi/JndiObjectLocator.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/validation/beanvalidation/BeanValidationPostProcessor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/annotation/SchedulingConfigurer.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/format/datetime/DateFormatter.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/format/annotation/NumberFormat.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/cache/interceptor/VariableNotAvailableException.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/export/naming/KeyNamingStrategy.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/access/NotificationListenerRegistrar.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/support/PeriodicTrigger.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/validation/DirectFieldBindingResult.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/Scope.java
* /spring-context-5-2-20-release-sources-
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* /spring-context-5-2-20-release-sources-
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* /spring-context-5-2-20-release-sources-jar/org/springframework/format/datetime/standard/MonthFormatter.java
* /spring-context-5-2-20-release-sources-
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* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/support/RemoteInvocation.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/EmbeddedValueResolverAware.java
*
/spring-context-5-2-20-release-sources-
jar/org/springframework/ejb/access/LocalStatelessSessionProxyFactoryBean.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/ejb/access/AbstractSlsbInvokerInterceptor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/interceptor/CacheOperation.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/validation/Validator.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/scheduling/concurrent/ThreadPoolExecutorFactoryBean.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/cache/interceptor/NameMatchCacheOperationSource.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scripting/bsh/BshScriptUtils.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/validation/BindingResult.java

* /spring-context-5-2-20-release-sources-
jar/org/springframework/scheduling/support/ScheduledMethodRunnable.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/jmx/export/notification/NotificationPublisher.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/interceptor/CacheEvictOperation.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/validation/AbstractPropertyBindingResult.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/context/expression/CachedExpressionEvaluator.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/jmx/export/assembler/AbstractConfigurableMBeanInfoAssembler.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/cache/annotation/ProxyCachingConfiguration.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/event/EventExpressionRootObject.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/support/SimpleTriggerContext.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/export/naming/IdentityNamingStrategy.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/ConditionEvaluator.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/context/support/ContextTypeMatchClassLoader.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/Profile.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/support/CronSequenceGenerator.java
* /spring-context-5-2-20-release-sources-
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* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/rmi/RmiRegistryFactoryBean.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/support/JmxUtils.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/format/FormatterRegistry.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/cache/interceptor/CacheOperationExpressionEvaluator.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/ScopedProxyCreator.java
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/spring-context-5-2-20-release-sources-jar/org/springframework/context/support/MessageSourceAccessor.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/context/support/GenericGroovyApplicationContext.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/rmi/RmiInvocationWrapper.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scripting/config/ScriptBeanDefinitionParser.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/RemoteAccessException.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/instrument/classloading/ReflectiveLoadTimeWeaver.java
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* /spring-context-5-2-20-release-sources-
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* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/config/CacheManagementConfigUtils.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/cache/interceptor/CacheableOperation.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/scheduling/concurrent/ScheduledExecutorFactoryBean.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jndi/JndiLocatorSupport.java

* /spring-context-5-2-20-release-sources-jar/org/springframework/validation/SmartValidator.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/format/datetime/joda/JodaTimeContextHolder.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/EnableAspectJAutoProxy.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/AdviceModeImportSelector.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/weaving/AspectJWeavingEnabler.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/support/RemotingSupport.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/instrument/classloading/ResourceOverridingShadowingClassLoader.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/interceptor/SimpleCacheResolver.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/annotation/AsyncResult.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/annotation/AsyncAnnotationBeanPostProcessor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/export/assembler/MetadataMBeanInfoAssembler.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/annotation/EnableCaching.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/AnnotationConfigUtils.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/support/ApplicationObjectSupport.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/instrument/classloading/websphere/WebSphereClassPreDefinePlugin.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/format/datetime/standard/YearFormatter.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/interceptor/AbstractCacheResolver.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/expression/MethodBasedEvaluationContext.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/export/assembler/AbstractReflectiveMBeanInfoAssembler.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/ui/context/support/ResourceBundleThemeSource.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/event/DefaultEventListenerFactory.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/support/MessageSourceSupport.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/interceptor/CachePutOperation.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/validation/BeanPropertyBindingResult.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/interceptor/AbstractFallbackCacheOperationSource.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/support/MBeanRegistrationSupport.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/export/notification/ModelMBeanNotificationPublisher.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/BeanAnnotationHelper.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jndi/JndiObjectFactoryBean.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/annotation/EnableAsync.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/annotation/CachingConfigurationSelector.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/AdviceMode.java
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jar/org/springframework/scheduling/annotation/AsyncAnnotationAdvisor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/validation/DefaultBindingErrorProcessor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/annotation/EnableScheduling.java
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* /spring-context-5-2-20-release-sources-
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* /spring-context-5-2-20-release-sources-jar/org/springframework/ui/context/support/DelegatingThemeSource.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/Lifecycle.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/support/ObjectNameManager.java
* /spring-context-5-2-20-release-sources-
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* /spring-context-5-2-20-release-sources-
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*
/spring-context-5-2-20-release-sources-jar/org/springframework/context/ApplicationContextInitializer.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/rmi/RmiServiceExporter.java
* /spring-context-5-2-20-release-sources-
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* /spring-context-5-2-20-release-sources-
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* /spring-context-5-2-20-release-sources-jar/org/springframework/validation/MessageCodeFormatter.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/SchedulingTaskExecutor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/support/RemoteInvocationResult.java
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* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/export/MBeanExporter.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/validation/FieldError.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jndi/JndiCallback.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scripting/config/LangNamespaceUtils.java
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* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/ImportRegistry.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/expression/BeanFactoryResolver.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/rmi/JndiRmiServiceExporter.java
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* /spring-context-5-2-20-release-sources-jar/org/springframework/context/support/LiveBeansView.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/rmi/JndiRmiClientInterceptor.java
* /spring-context-5-2-20-release-sources-
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* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/DependsOn.java

* /spring-context-5-2-20-release-sources-jar/org/springframework/scripting/support/ResourceScriptSource.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/validation/Errors.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scripting/config/ScriptingDefaultsParser.java
*
 /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/export/MBeanExportOperations.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/i18n/LocaleContextHolder.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jndi/JndiTemplate.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/ProfileCondition.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/scheduling/annotation/AsyncConfigurationSelector.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/support/DefaultLifecycleProcessor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scripting/support/ScriptFactoryPostProcessor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/export/metadata/ManagedAttribute.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/MessageSourceAware.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/format/datetime/standard/DateTimeConverters.java
*
 /spring-context-5-2-20-release-sources-jar/org/springframework/cache/annotation/CachingConfigurerSupport.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/context/support/FileSystemXmlApplicationContext.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/ConfigurationMethod.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/validation/ValidationUtils.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/scheduling/annotation/ProxyAsyncConfiguration.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/instrument/classloading/websphere/WebSphereClassLoaderAdapter.java
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jar/org/springframework/format/datetime/standard/DateTimeFormatterFactory.java
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*/
/**
* {@link FactoryBean} that obtains a WebSphere {@link javax.management.MBeanServer}
* reference through WebSphere's proprietary {@code AdminServiceFactory} API,

```
* available on WebSphere 5.1 and higher.
*
* <p>Exposes the {@code MBeanServer} for bean references.
*
* <p>This {@code FactoryBean} is
 a direct alternative to {@link MBeanServerFactoryBean},
* which uses standard JMX 1.2 API to access the platform's {@link MBeanServer}.
*
* <p>See the javadocs for WebSphere's
* <a
href="https://www.ibm.com/support/knowledgecenter/SSEQTJ_9.0.0/com.ibm.websphere.javadoc.doc/web/apidocs
/com/ibm/websphere/management/AdminServiceFactory.html">{@code AdminServiceFactory}</a>
* and
* <a
href="https://www.ibm.com/support/knowledgecenter/SSEQTJ_9.0.0/com.ibm.websphere.javadoc.doc/web/apidocs
/com/ibm/websphere/management/MBeanFactory.html">{@code MBeanFactory}</a>.
*
* @author Juergen Hoeller
* @author Rob Harrop
* @since 2.0.3
* @see javax.management.MBeanServer
* @see MBeanServerFactoryBean
*/

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* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/ImportAware.java
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* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/ConflictingBeanDefinitionException.java
*
 /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/export/notification/NotificationPublisherAware.java
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* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/support/RemoteInvocationExecutor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/export/metadata/ManagedOperationParameter.java
*
 /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/support/RemoteInvocationFactory.java
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* /spring-context-5-2-20-release-sources-jar/org/springframework/validation/beanvalidation/MethodValidationPostProcessor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/ConfigurationCondition.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/validation/BindException.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/Configuration.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/annotation/ScheduledAnnotationBeanPostProcessor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/support/PostProcessorRegistrationDelegate.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/ScopedProxyMode.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/concurrent/ThreadPoolTaskExecutor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/support/AbstractRefreshableApplicationContext.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/validation/AbstractErrors.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/ScannedGenericBeanDefinition.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/LoadTimeWeavingConfiguration.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/concurrent/ConcurrentMapCacheManager.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/validation/AbstractBindingResult.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/config/TaskExecutorFactoryBean.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/support/SimpleThreadScope.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/support/AbstractResourceBasedMessageSource.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/export/metadata/AbstractJmxAttribute.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/Bean.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/ContextAnnotationAutowireCandidateResolver.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/concurrent/DefaultManagedTaskExecutor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/support/RegistrationPolicy.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/ConditionContext.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/interceptor/CacheAspectSupport.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/MBeanExportConfiguration.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/AutoProxyRegistrar.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/format/number/money/Jsr354NumberFormatAnnotationFormatterFactory.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/support/SimpleCacheManager.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scripting/groovy/GroovyScriptFactory.java

*
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* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/ConfigurationClassParser.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/interceptor/SimpleKey.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/jmx/export/assembler/InterfaceBasedMBeanInfoAssembler.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/context/annotation/AnnotationBeanNameGenerator.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/context/annotation/AnnotationConfigApplicationContext.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/support/NoOpCacheManager.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/support/AbstractValueAdaptingCache.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/context/expression/StandardBeanExpressionResolver.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/PropertySource.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/Condition.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/ejb/config/AbstractJndiLocatingBeanDefinitionParser.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/context/annotation/ConfigurationClassBeanDefinitionReader.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/validation/MapBindingResult.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/DeferredImportSelector.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/validation/beanvalidation/MethodValidationInterceptor.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/scheduling/concurrent/DefaultManagedTaskScheduler.java
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jar/org/springframework/context/annotation/FullyQualifiedAnnotationBeanNameGenerator.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/concurrent/ConcurrentMapCache.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/scheduling/concurrent/ConcurrentTaskExecutor.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/context/event/AbstractApplicationEventMulticaster.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/support/NoOpCache.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/index/CandidateComponentsIndex.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/scheduling/concurrent/ExecutorConfigurationSupport.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/ComponentScan.java
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*/
/**
* Abstract the invocation of a cache operation.
*
* <p>Does not provide a way to transmit checked exceptions but
* provide a special exception that should be used to wrap any
* exception that was thrown by the underlying invocation.
* Callers are expected to handle this issue type specifically.
*
 * @author Stephane Nicoll
* @since 4.1
*/
```

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* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/config/AnnotationDrivenCacheBeanDefinitionParser.java
*
 /spring-context-5-2-20-release-sources-jar/org/springframework/validation/beanvalidation/SpringValidatorAdapter.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/Lazy.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/annotation/CachePut.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/validation/beanvalidation/LocalValidatorFactoryBean.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/ClassPathScanningCandidateComponentProvider.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/validation/support/BindingAwareConcurrentModel.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/CommonAnnotationBeanPostProcessor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/validation/support/BindingAwareModelMap.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/format/annotation/DateTimeFormat.java
*
 /spring-context-5-2-20-release-sources-jar/org/springframework/context/support/AbstractApplicationContext.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/index/CandidateComponentsIndexLoader.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/ConfigurationClassEnhancer.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/event/SourceFilteringListener.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/ConfigurationClassPostProcessor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/ComponentScanAnnotationParser.java

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* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/interceptor/CacheOperationSourcePointcut.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/support/ApplicationContextAwareProcessor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/support/BeanDefinitionDsl.kt
*
/spring-context-5-2-20-release-sources-jar/org/springframework/jmx/access/MBeanClientInterceptor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/instrument/classloading/jboss/JBossLoadTimeWeaver.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/support/AbstractMessageSource.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/support/ReloadableResourceBundleMessageSource.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jndi/support/SimpleJndiBeanFactory.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/interceptor/AbstractCacheInvoker.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/export/annotation/AnnotationJmxAttributeSource.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/config/ScheduledTaskRegistrar.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/support/ConnectorServerFactoryBean.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/context/support/StaticMessageSource.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/instrument/classloading/ShadowingClassLoader.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/Import.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/annotation/CacheAnnotationParser.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/MessageSource.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/ConfigurationClass.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/CacheManager.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/interceptor/CacheOperationSource.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/support/GenericApplicationContext.java

* /spring-context-5-2-20-release-sources-jar/org/springframework/context/support/ResourceBundleMessageSource.java
*
 /spring-context-5-2-20-release-sources-jar/org/springframework/context/event/ApplicationListenerMethodAdapter.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/ApplicationEvent.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jndi/JndiTemplateEditor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/ApplicationListener.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/event/SimpleApplicationEventMulticaster.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/ui/Model.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/support/MBeanServerFactoryBean.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/support/TaskUtils.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/interceptor/CacheProxyFactoryBean.java
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 /spring-context-5-2-20-release-sources-jar/org/springframework/context/support/DefaultMessageSourceResolvable.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/annotation/Async.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/event/EventExpressionEvaluator.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/annotation/SpringCacheAnnotationParser.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/event/EventListenerMethodProcessor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/support/StaticApplicationContext.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/support/AbstractCacheManager.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/ParserStrategyUtils.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/annotation/Scheduled.java
*
 /spring-context-5-2-20-release-sources-jar/org/springframework/context/event/EventListener.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/instrument/classloading/InstrumentationLoadTimeWeaver.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/annotation/AnnotationCacheOperationSource.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/ClassPathBeanDefinitionScanner.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/format/datetime/standard/InstantFormatter.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/validation/ObjectError.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/ImportBeanDefinitionRegistrar.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/SmartLifecycle.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/ui/ModelMap.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/event/ApplicationEventMulticaster.java
*
 /spring-context-5-2-20-release-sources-jar/org/springframework/context/support/GenericApplicationContextExtensions.kt
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/interceptor/CompositeCacheOperationSource.java
* /spring-context-5-2-20-release-sources-

jar/org/springframework/context/weaving/DefaultContextLoadTimeWeaver.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/jmx/support/MBeanServerConnectionFactoryBean.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/context/annotation/AnnotationConfigApplicationContextExtensions.kt
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/ApplicationEventPublisher.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/context/annotation/AnnotatedBeanDefinitionReader.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/context/config/PropertyPlaceholderBeanDefinitionParser.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/scripting/support/StandardScriptFactory.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/cache/Cache.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/validation/DataBinder.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/context/annotation/AnnotationConfigRegistry.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/ResourceLoaderAware.java
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* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/JmxException.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/Trigger.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/RemoteInvocationFailureException.java
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/spring-context-5-2-20-release-sources-
jar/org/springframework/context/annotation/AnnotationConfigBeanDefinitionParser.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/ScopeMetadata.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scripting/ScriptSource.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/TriggerContext.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/RemoteLookupFailureException.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/config/ContextNamespaceHandler.java
* /spring-context-5-2-20-release-sources-

jar/org/springframework/jmx/export/notification/UnableToSendNotificationException.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/ejb/config/LocalStatelessSessionBeanDefinitionParser.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/remoting/support/DefaultRemoteInvocationExecutor.java
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/spring-context-5-2-20-release-sources-
jar/org/springframework/jmx/export/UnableToRegisterMBeanException.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/event/ContextClosedEvent.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/ApplicationContextException.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/rmi/RmiInvocationHandler.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/export/MBeanExporterListener.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/validation/MessageCodesResolver.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/ejb/access/EjbAccessException.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/EnableMBeanExport.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/HierarchicalMessageSource.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/jmx/export/assembler/AutodetectCapableMBeanInfoAssembler.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/SchedulingException.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/validation/BindingResultUtils.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/instrument/classloading/LoadTimeWeaver.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/ejb/config/JndiLookupBeanDefinitionParser.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/event/ApplicationContextEvent.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/jmx/export/annotation/AnnotationMBeanExporter.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/event/ContextStoppedEvent.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/export/metadata/JmxAttributeSource.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/remoting/support/RemoteInvocationBasedAccessor.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/ui/context/ThemeSource.java
* /spring-context-5-2-20-release-sources-
jar/org/springframework/scripting/support/RefreshableScriptTargetSource.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/export/naming/SelfNaming.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/export/MBeanExportException.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/event/ContextRefreshedEvent.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/format/Formatter.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/support/LiveBeansViewMBean.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/access/MBeanConnectFailureException.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/event/ContextStartedEvent.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/access/InvalidInvocationException.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/format/FormatterRegistrar.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/ui/context/support/SimpleTheme.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/ApplicationContextAware.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/validation/BindingErrorProcessor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/NoSuchMessageException.java

* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/support/DelegatingErrorHandlingRunnable.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/weaving/LoadTimeWeaverAware.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/support/DefaultRemoteInvocationFactory.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/access/InvocationFailureException.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/jmx/access/MBeanInfoRetrievalException.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/format/number/AbstractNumberFormatter.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/config/TaskNamespaceHandler.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/SchedulingAwareRunnable.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/validation/beanvalidation/LocaleContextMessageInterpolator.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/annotation/LoadTimeWeavingConfigurer.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/ui/context/support/UiApplicationContextUtils.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/MBeanServerNotFoundException.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/support/RemoteInvocationTraceInterceptor.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/ui/context/Theme.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/rmi/RmiClientInterceptor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/rmi/CodebaseAwareObjectInputStream.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/config/SpringConfiguredBeanDefinitionParser.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/ejb/config/JeeNamespaceHandler.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/RemoteConnectFailureException.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/ejb/config/RemoteStatelessSessionBeanDefinitionParser.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/export/metadata/InvalidMetadataException.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/context/Phased.java
*
/spring-context-5-2-20-release-sources-jar/org/springframework/scheduling/config/SchedulerBeanDefinitionParser.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/soap/SoapFaultException.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/RemoteProxyFailureException.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/rmi/RmiBasedExporter.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jmx/export/assembler/MBeanInfoAssembler.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/ui/context/HierarchicalThemeSource.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/remoting/support/UrlBasedRemoteAccessor.java
* /spring-context-5-2-20-release-sources-jar/org/springframework/jndi/JndiLookupFailureException.java

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* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/resource/WebJarsResourceResolver.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/resource/ResourceUrlProviderExposingInterceptor.java

* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/function/RouterFunction.java
*
/spring-webmvc-5-2-20-release-sources-
jar/org/springframework/web/servlet/resource/CssLinkResourceTransformer.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/DispatcherServlet.java
* /spring-webmvc-5-2-20-release-sources-
jar/org/springframework/web/servlet/resource/CachingResourceResolver.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/function/RouterFunctionDsl.kt
* /spring-webmvc-5-2-20-release-sources-
jar/org/springframework/web/servlet/mvc/method/annotation/DeferredResultMethodReturnValueHandler.java
* /spring-webmvc-5-2-20-release-sources-
jar/org/springframework/web/servlet/function/support/HandlerFunctionAdapter.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/support/RequestContext.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/config/MvcNamespaceUtils.java
* /spring-webmvc-5-2-20-release-sources-
jar/org/springframework/web/servlet/view/script/ScriptTemplateView.java
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/spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/mvc/WebContentInterceptor.java
* /spring-webmvc-5-2-20-release-sources-
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* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/function/HandlerFunction.java
* /spring-webmvc-5-2-20-release-sources-
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* /spring-webmvc-5-2-20-release-sources-
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* /spring-webmvc-5-2-20-release-sources-
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* /spring-webmvc-5-2-20-release-sources-
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* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/view/UrlBasedViewResolver.java
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* /spring-webmvc-5-2-20-release-sources-
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* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/function/EntityResponse.java
* /spring-webmvc-5-2-20-release-sources-
jar/org/springframework/web/servlet/handler/SimpleUrlHandlerMapping.java
*

/spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/mvc/method/RequestMappingInfoHandlerMethodMappingNamingStrategy.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/mvc/method/annotation/ServletInvocableHandlerMethod.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/function/ServerRequestExtensions.kt
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/handler/AbstractUrlHandlerMapping.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/view/DefaultRequestToViewNameTranslator.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/resource/CachingResourceTransformer.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/resource/PathResourceResolver.java
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* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/config/annotation/InterceptorRegistration.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/HandlerInterceptor.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/config/annotation/DefaultServletHandlerConfigurer.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/function/ToStringVisitor.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/function/ServerResponseExtensions.kt
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/config/annotation/AsyncSupportConfigurer.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/mvc/condition/AbstractRequestCondition.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/config/annotation/DelegatingWebMvcConfiguration.java
*
/spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/handler/BeanNameUrlHandlerMapping.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/handler/HandlerExceptionResolverComposite.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/mvc/method/annotation/ViewNameMethodReturnValueHandler.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/view/AbstractCachingViewResolver.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/function/RenderingResponse.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/resource/VersionResourceResolver.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/resource/EncodedResourceResolver.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/view/script/ScriptTemplateConfig.java

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* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/HandlerExceptionResolver.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/theme/CookieThemeResolver.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/view/groovy/GroovyMarkupConfigurer.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/tags/form/AbstractHtmlElementTag.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/tags/form/TagWriter.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/tags/form/ValueFormatter.java
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* /spring-webmvc-5-2-20-release-sources-
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* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/tags/form/AbstractFormTag.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/support/BindStatus.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/tags/BindErrorsTag.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/view/feed/AbstractFeedView.java
* /spring-webmvc-5-2-20-release-sources-
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jar/org/springframework/web/servlet/view/freemarker/FreeMarkerView.java
* /spring-webmvc-5-2-20-release-sources-
jar/org/springframework/web/servlet/view/tiles3/SimpleSpringPreparerFactory.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/tags/EditorAwareTag.java
* /spring-webmvc-5-2-20-release-sources-
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* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/tags/TransformTag.java
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* /spring-webmvc-5-2-20-release-sources-
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* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/tags/form/LabelTag.java
*
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jar/org/springframework/web/servlet/ModelAndViewDefiningException.java
* /spring-webmvc-5-2-20-release-sources-
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* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/tags/form/ButtonTag.java
* /spring-webmvc-5-2-20-release-sources-
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* /spring-webmvc-5-2-20-release-sources-
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* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/HttpServletBean.java
* /spring-webmvc-5-2-20-release-sources-
jar/org/springframework/web/servlet/handler/HandlerMethodMappingNamingStrategy.java
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jar/org/springframework/web/servlet/mvc/annotation/ModelAndViewResolver.java
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jar/org/springframework/web/servlet/view/document/AbstractXlsxView.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/resource/VersionPathStrategy.java
*
 /spring-webmvc-5-2-20-release-sources-
jar/org/springframework/web/servlet/view/groovy/GroovyMarkupViewResolver.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/tags/ArgumentAware.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/tags/HtmlEscapingAwareTag.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/resource/VersionStrategy.java
* /spring-webmvc-5-2-20-release-sources-
jar/org/springframework/web/servlet/view/document/AbstractXlsxStreamingView.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/NoHandlerFoundException.java
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*/
/**
* XSLT-driven View that allows for response context to be rendered as the
* result of an XSLT transformation.
*
* <p>The XSLT Source object is supplied as a parameter in the model and then
* {@link #locateSource detected} during response rendering. Users can either specify
* a specific entry in the
 model via the {@link #setSourceKey sourceKey} property or
* have Spring locate the Source object. This class also provides basic conversion
* of objects into Source implementations. See {@link #getSourceTypes() here}
* for more details.
*
* <p>All model parameters are passed to the XSLT Transformer as parameters.
* In addition the user can configure {@link #setOutputProperties output properties}
* to be passed to the Transformer.
*
* @author Rob Harrop
* @author Juergen Hoeller
* @since 2.0
*/
```

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* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/function/RouterFunctions.java
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* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/config/annotation/ResourceHandlerRegistry.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/config/annotation/ViewControllerRegistry.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/config/annotation/CorsRegistration.java

* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/mvc/method/annotation/SseEmitter.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/function/DefaultServerRequest.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/config/ResourcesBeanDefinitionParser.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/mvc/method/annotation/AbstractMessageConverterMethodProcessor.java
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* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/mvc/method/annotation/ResponseBodyEmitterReturnValueHandler.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/function/RouterFunctionBuilder.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/mvc/annotation/ResponseStatusExceptionResolver.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/tags/MessageTag.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/mvc/method/annotation/RequestMappingHandlerAdapter.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/handler/AbstractHandlerMapping.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/view/AbstractTemplateViewResolver.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/mvc/condition/RequestMethodsRequestCondition.java
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/spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/mvc/condition/AbstractMediaTypeExpression.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/mvc/UrlFilenameViewController.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/HandlerExecutionChain.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/mvc/condition/PatternsRequestCondition.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/function/RequestPredicates.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/function/ServerRequest.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/tags/form/ErrorsTag.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/resource/ResourceHttpRequestHandler.java
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/spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/support/ServletUriComponentsBuilder.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/config/annotation/CorsRegistry.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/mvc/method/RequestMappingInfo.java
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* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/tags/UrlTag.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/view/RedirectView.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/support/AbstractFlashMapManager.java
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* /spring-webmvc-5-2-20-release-sources-

jar/org/springframework/web/servlet/mvc/method/annotation/ExtendedServletRequestDataBinder.java
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jar/org/springframework/web/servlet/handler/AbstractHandlerExceptionResolver.java
* /spring-webmvc-5-2-20-release-sources-
jar/org/springframework/web/servlet/function/support/RouterFunctionMapping.java
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jar/org/springframework/web/servlet/mvc/method/annotation/RequestBodyAdviceAdapter.java
* /spring-webmvc-5-2-20-release-sources-
jar/org/springframework/web/servlet/mvc/support/DefaultHandlerExceptionResolver.java
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jar/org/springframework/web/servlet/handler/HandlerMappingIntrospector.java
* /spring-webmvc-5-2-20-release-sources-
jar/org/springframework/web/servlet/handler/MatchableHandlerMapping.java
* /spring-webmvc-5-2-20-release-sources-
jar/org/springframework/web/servlet/mvc/method/annotation/RequestMappingHandlerMapping.java
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jar/org/springframework/web/servlet/mvc/method/annotation/MvcUriComponentsBuilder.java
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jar/org/springframework/web/servlet/handler/AbstractHandlerMethodMapping.java
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* /spring-webmvc-5-2-20-release-sources-
jar/org/springframework/web/servlet/mvc/method/annotation/ReactiveTypeHandler.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/resource/ResourceUrlProvider.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/FrameworkServlet.java
* /spring-webmvc-5-2-20-release-sources-
jar/org/springframework/web/servlet/mvc/method/annotation/RequestBodyAdvice.java
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/spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/support/SessionFlashMapManager.java
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* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/LocaleContextResolver.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/mvc/support/RedirectAttributesModelMap.java
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* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/ThemeResolver.java
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jar/org/springframework/web/servlet/handler/WebRequestHandlerInterceptorAdapter.java
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* /spring-webmvc-5-2-20-release-sources-
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jar/org/springframework/web/servlet/view/feed/AbstractRssFeedView.java
* /spring-webmvc-5-2-20-release-sources-
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jar/org/springframework/web/servlet/mvc/method/annotation/JsonViewRequestBodyAdvice.java
* /spring-webmvc-5-2-20-release-sources-
jar/org/springframework/web/servlet/handler/AbstractHandlerMethodExceptionResolver.java
* /spring-webmvc-5-2-20-release-sources-
jar/org/springframework/web/servlet/handler/SimpleServletPostProcessor.java
* /spring-webmvc-5-2-20-release-sources-
jar/org/springframework/web/servlet/mvc/condition/RequestConditionHolder.java
* /spring-webmvc-5-2-20-release-sources-
jar/org/springframework/web/servlet/mvc/method/annotation/JsonViewResponseBodyAdvice.java
* /spring-webmvc-5-2-20-release-sources-
jar/org/springframework/web/servlet/mvc/method/annotation/RedirectAttributesMethodArgumentResolver.java
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jar/org/springframework/web/servlet/view/tiles3/SpringWildcardServletTilesApplicationContext.java
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 /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/mvc/Controller.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/view/AbstractTemplateView.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/mvc/method/annotation/StreamingResponseBody.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/view/tiles3/SpringLocaleResolver.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/mvc/condition/RequestCondition.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/config/annotation/WebMvcConfigurerAdapter.java
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* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/view/ViewResolverComposite.java
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* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/view/tiles3/SpringBeanPreparerFactory.java
*
 /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/handler/AbstractDetectingUrlHandlerMapping.java
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* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/view/tiles3/AbstractSpringPreparerFactory.java
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* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/mvc/support/RedirectAttributes.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/handler/ConversionServiceExposingInterceptor.java
* /spring-webmvc-5-2-20-release-sources-jar/org/springframework/web/servlet/handler/SimpleServletHandlerAdapter.java
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/**
* A contract for inspecting and potentially modifying request data values such
* as URL query parameters or form field values before they are rendered by a
* view or before a redirect.
*
* <p>Implementations may use this contract for example as part of a solution
* to provide data integrity, confidentiality,
 protection against cross-site
* request forgery (CSRF), and others or for other tasks such as automatically
* adding a hidden field to all forms and URLs.
*
* <p>View technologies that support this contract can obtain an instance to
* delegate to via {@link RequestContext#getRequestDataValueProcessor()}.
*
* @author Rossen Stoyanchev
* @since 3.1
*/

Found in path(s):

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1.425 spring-expression 5.2.20.RELEASE

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* /spring-expression-5-2-20-release-sources-jar/org/springframework/expression/spel/standard/SpelCompiler.java
*
 /spring-expression-5-2-20-release-sources-jar/org/springframework/expression/spel/ast/MethodReference.java
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* /spring-expression-5-2-20-release-sources-jar/org/springframework/expression/spel/ast/OpAnd.java
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* /spring-expression-5-2-20-release-sources-jar/org/springframework/expression/spel/ast/Assign.java
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* /spring-expression-5-2-20-release-sources-jar/org/springframework/expression/spel/ast/Projection.java

* /spring-expression-5-2-20-release-sources-jar/org/springframework/expression/spel/ast/Identifier.java
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/spring-expression-5-2-20-release-sources-jar/org/springframework/expression/spel/ast/OpLT.java
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* /spring-expression-5-2-20-release-sources-jar/org/springframework/expression/spel/ast/OperatorPower.java
* /spring-expression-5-2-20-release-sources-jar/org/springframework/expression/spel/ast/FloatLiteral.java
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jar/org/springframework/expression/spel/standard/InternalSpelExpressionParser.java
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* /spring-expression-5-2-20-release-sources-jar/org/springframework/expression/spel/ast/OpNE.java
* /spring-expression-5-2-20-release-sources-
jar/org/springframework/expression/spel/support/ReflectiveConstructorResolver.java
* /spring-expression-5-2-20-release-sources-jar/org/springframework/expression/spel/ast/OpMinus.java
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* /spring-expression-5-2-20-release-sources-
jar/org/springframework/expression/spel/support/StandardTypeLocator.java
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* /spring-web-5-2-20-release-sources-jar/org/springframework/web/accept/MediaTypeFileExtensionResolver.java
*
/spring-web-5-2-20-release-sources-jar/org/springframework/http/client/support/HttpAccessor.java
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Found in path(s):
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/multipart/MultipartHttpServletRequest.java
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Found in path(s):
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/HttpMessage.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/server/WebFilterChain.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/annotation/SessionAttributes.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/HttpSessionMutexListener.java
*
 /spring-web-5-2-20-release-sources-jar/org/springframework/web/multipart/MultipartResolver.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/filter/CommonsRequestLoggingFilter.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/filter/RequestContextFilter.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/context/request/RequestContextListener.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/annotation/RequestMethod.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/bind/support/SpringWebConstraintValidatorFactory.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/server/WebFilter.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/http/converter/HttpMessageNotWritableException.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/http/converter/HttpMessageConversionException.java
*
 /spring-web-5-2-20-release-sources-
jar/org/springframework/http/client/AbstractClientHttpRequestFactoryWrapper.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/context/request/DestructionCallbackBindingListener.java

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*/

Found in path(s):
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/client/ClientHttpResponse.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/HierarchicalUriComponents.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/accept/ContentNegotiationManagerFactoryBean.java
*
 /spring-web-5-2-20-release-sources-jar/org/springframework/http/server/reactive/ServletServerHttpResponse.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/cors/reactive/DefaultCorsProcessor.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/HttpHeaders.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/cors/DefaultCorsProcessor.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/ReadOnlyHttpHeaders.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/server/adapter/WebHttpHandlerBuilder.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/server/reactive/ServerHttpRequest.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/client/reactive/ReactorClientHttpConnector.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/client/reactive/ReactorResourceFactory.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/method/annotation/MapMethodProcessor.java
*
 /spring-web-5-2-20-release-sources-jar/org/springframework/http/server/reactive/ServerHttpResponse.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/cors/reactive/UrlBasedCorsConfigurationSource.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/context/request/WebRequest.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/client/reactive/JettyClientHttpResponse.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/ResponseCookie.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/codec/xml/Jaxb2XmlDecoder.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/cors/CorsUtils.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/method/annotation/AbstractNamedValueMethodArgumentResolver.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/codec/json/AbstractJackson2Decoder.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/codec/ServerSentEventHttpMessageWriter.java
*

/spring-web-5-2-20-release-sources-jar/org/springframework/http/converter/json/JsonbHttpMessageConverter.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/accept/ContentNegotiationManager.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/server/NotAcceptableStatusException.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/client/RestClientException.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/converter/HttpMessageConverter.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/http/server/reactive/UndertowServerHttpResponse.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/server/reactive/TomcatHttpHandlerAdapter.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/http/server/reactive/ServerHttpRequestDecorator.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/MediaType.java
*
/spring-web-5-2-20-release-sources-jar/org/springframework/web/cors/reactive/CorsUtils.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/codec/CodecConfigurer.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/server/reactive/ReactorServerHttpResponse.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/client/reactive/JettyClientHttpConnector.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/ServletContextPropertyUtils.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/converter/json/GsonHttpMessageConverter.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/annotation/RequestMapping.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/http/converter/json/AbstractJsonHttpMessageConverter.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/annotation/CrossOrigin.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/client/reactive/ReactorClientHttpResponse.java
*
/spring-web-5-2-20-release-sources-jar/org/springframework/http/codec/json/AbstractJackson2Encoder.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/http/converter/protobuf/ProtobufJsonFormatHttpMessageConverter.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/http/codec/multipart/MultipartHttpMessageReader.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/method/annotation/ModelMethodProcessor.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/http/client/HttpComponentsClientHttpRequestFactory.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/method/support/HandlerMethodArgumentResolverComposite.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/UriTemplate.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/ContentDisposition.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/multipart/support/MissingServletRequestPartException.java
*
/spring-web-5-2-20-release-sources-jar/org/springframework/web/method/support/InvocableHandlerMethod.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/UriBuilderFactory.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/support/WebExchangeBindException.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/http/server/reactive/UndertowServerHttpRequest.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/codec/ServerSentEventHttpMessageReader.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/client/reactive/JettyClientHttpRequest.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/codec/json/Jackson2JsonDecoder.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/converter/AbstractHttpMessageConverter.java

* /spring-web-5-2-20-release-sources-jar/org/springframework/web/client/UnknownContentTypeException.java
*
/spring-web-5-2-20-release-sources-jar/org/springframework/web/client/HttpMessageConverterExtractor.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/http/server/reactive/DefaultServerHttpRequestBuilder.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/context/request/async/WebAsyncManager.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/remoting/httpinvoker/AbstractHttpInvokerRequestExecutor.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/client/support/InterceptingHttpAccessor.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/context/support/ServletContextResourcePatternResolver.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/codec/json/Jackson2CodecSupport.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/DefaultUriBuilderFactory.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/client/reactive/ReactorClientHttpRequest.java
*
/spring-web-5-2-20-release-sources-jar/org/springframework/web/util/UriBuilder.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/pattern/PathPatternParser.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/RequestEntity.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/http/server/reactive/HttpHeadResponseDecorator.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/server/reactive/ReactorServerHttpRequest.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/server/MediaTypeNotSupportedStatusException.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/WebUtils.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/converter/FormHttpMessageConverter.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/client/RestTemplate.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/server/reactive/ServletServerHttpRequest.java
*
/spring-web-5-2-20-release-sources-
jar/org/springframework/http/codec/multipart/MultipartHttpMessageWriter.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/codec/support/BaseCodecConfigurer.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/server/i18n/AcceptHeaderLocaleContextResolver.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/http/converter/json/AbstractJackson2HttpMessageConverter.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/method/HandlerMethod.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/accept/ServletPathExtensionContentNegotiationStrategy.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/server/MethodNotAllowedException.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/codec/support/BaseDefaultCodecs.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/http/converter/json/Jackson2ObjectMapperBuilder.java
*
/spring-web-5-2-20-release-sources-
jar/org/springframework/http/server/reactive/AbstractListenerWriteProcessor.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/server/session/DefaultWebSessionManager.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/filter/ShallowEtagHeaderFilter.java
* /spring-web-5-2-20-release-sources-

jar/org/springframework/web/multipart/support/RequestPartServletServerHttpRequest.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/http/server/reactive/AbstractServerHttpResponse.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/converter/StringHttpMessageConverter.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/method/ControllerAdviceBean.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/accept/MappingMediaTypeFileExtensionResolver.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/codec/json/Jackson2Tokenizer.java
*
/spring-web-5-2-20-release-sources-jar/org/springframework/http/converter/ResourceHttpMessageConverter.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/server/handler/ExceptionHandlingWebHandler.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/codec/EncoderHttpMessageWriter.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/server/reactive/WriteResultPublisher.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/accept/PathExtensionContentNegotiationStrategy.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/context/support/WebApplicationContextUtils.java
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* WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
* See the License for the specific language governing permissions and
* limitations under the License.
*/
/**
  * Return the web session for the current request. Always guaranteed  to
  * return an instance either matching to the session id requested by the
  * client, or with a new session id either because the client did not
  * specify one or because the underlying session had expired. Use of this
  * method
 does not automatically create a session. See {@link WebSession}
  * for more details.
  */
```

Found in path(s):
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/server/ServerWebExchange.java

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```

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* /spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/annotation/Mapping.java
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```
# This file maps Internet media types to unique file extension(s).
# Although created for httpd, this file is used by many software systems
# and has been placed in the public domain for unlimited redistribution.
#
# The table below contains both registered and (common) unregistered types.
# A type that has no unique extension can be ignored -- they are listed
# here to guide configurations toward known types and to make it easier to
# identify "new" types.  File extensions are also commonly used to indicate
# content languages and encodings, so choose them carefully.
#
# Internet media types should be registered as described in RFC 4288.
# The registry is at <https://www.iana.org/assignments/media-types/>.
#
# This file was retrieved from
https://svn.apache.org/viewvc/httpd/httpd/trunk/docs/conf/mime.types?revision=1752884&view=co
#
# MIME type (lowercased)   Extensions
# ============================================ ==========
#
 application/1d-interleaved-parityfec
# application/3gpdash-qoe-report+xml
# application/3gpp-ims+xml
# application/a2l
# application/activemessage
# application/alto-costmap+json
# application/alto-costmapfilter+json
```

```
# application/alto-directory+json
# application/alto-endpointcost+json
# application/alto-endpointcostparams+json
# application/alto-endpointprop+json
# application/alto-endpointpropparams+json
# application/alto-error+json
# application/alto-networkmap+json
# application/alto-networkmapfilter+json
# application/aml
application/andrew-inset   ez
# application/applefile
application/applixware    aw
# application/atf
# application/atfx
application/atom+xml    atom
application/atomcat+xml    atomcat
# application/atomdeleted+xml
# application/atomicmail
application/atomsvc+xml    atomsvc
# application/atxml
# application/auth-policy+xml
# application/bacnet-xdd+zip
# application/batch-smtp
# application/beep+xml
# application/calendar+json
# application/calendar+xml
#
 application/call-completion
# application/cals-1840
# application/cbor
# application/ccmp+xml
application/ccxml+xml    ccxml
# application/cdfx+xml
application/cdmi-capability   cdmia
application/cdmi-container   cdmic
application/cdmi-domain    cdmid
application/cdmi-object    cdmio
application/cdmi-queue    cdmiq
# application/cdni
# application/cea
# application/cea-2018+xml
# application/cellml+xml
# application/cfw
# application/cms
# application/cnrp+xml
# application/coap-group+json
# application/commonground
# application/conference-info+xml
```

```
# application/cpl+xml
# application/csrattrs
# application/csta+xml
# application/cstadata+xml
# application/csvm+json
application/cu-seeme    cu
# application/cybercash
# application/dash+xml
# application/dashdelta
application/davmount+xml   davmount
# application/dca-rft
# application/dcd
# application/dec-dx
# application/dialog-info+xml
# application/dicom
# application/dii
# application/dit
# application/dns
application/docbook+xml    dbk
#
 application/dskpp+xml
application/dssc+der    dssc
application/dssc+xml    xdssc
# application/dvcs
application/ecmascript    ecma
# application/edi-consent
# application/edi-x12
# application/edifact
# application/efi
# application/emergencycalldata.comment+xml
# application/emergencycalldata.deviceinfo+xml
# application/emergencycalldata.providerinfo+xml
# application/emergencycalldata.serviceinfo+xml
# application/emergencycalldata.subscriberinfo+xml
application/emma+xml    emma
# application/emotionml+xml
# application/encaprtp
# application/epp+xml
application/epub+zip    epub
# application/eshop
# application/example
application/exi     exi
# application/fastinfoset
# application/fastsoap
# application/fdt+xml
# application/fits
# application/font-sfnt
application/font-tdpfr    pfr
```

application/font-woff woff
application/framework-attributes+xml
application/geo+json
application/gml+xml gml
application/gpx+xml gpx
application/gxf gxf
application/gzip
#
application/h224
application/held+xml
application/http
application/hyperstudio stk
application/ibe-key-request+xml
application/ibe-pkg-reply+xml
application/ibe-pp-data
application/iges
application/im-iscomposing+xml
application/index
application/index.cmd
application/index.obj
application/index.response
application/index.vnd
application/inkml+xml ink inkml
application/iotp
application/ipfix ipfix
application/ipp
application/isup
application/its+xml
application/java-archive jar
application/java-serialized-object ser
application/java-vm class
application/javascript js
application/jose
application/jose+json
application/jrd+json
application/json json
application/json-patch+json
application/json-seq
application/jsonml+json jsonml
application/jwk+json
application/jwk-set+json
application/jwt
application/kpml-request+xml
application/kpml-response+xml
application/ld+json
application/lgr+xml
application/link-format
#

application/load-control+xml
application/lost+xml lostxml
application/lostsync+xml
application/lxf
application/mac-binhex40 hqx
application/mac-compactpro cpt
application/macwriteii
application/mads+xml mads
application/marc mrc
application/marcxml+xml mrcx
application/mathematica ma nb mb
application/mathml+xml mathml
application/mathml-content+xml
application/mathml-presentation+xml
application/mbms-associated-procedure-description+xml
application/mbms-deregister+xml
application/mbms-envelope+xml
application/mbms-msk+xml
application/mbms-msk-response+xml
application/mbms-protection-description+xml
application/mbms-reception-report+xml
application/mbms-register+xml
application/mbms-register-response+xml
application/mbms-schedule+xml
application/mbms-user-service-description+xml
application/mbox mbox
application/media-policy-dataset+xml
application/media_control+xml
application/mediaservercontrol+xml mscml
application/merge-patch+json
application/metalink+xml metalink
application/metalink4+xml meta4
application/mets+xml mets
#
application/mf4
application/mikey
application/mods+xml mods
application/moss-keys
application/moss-signature
application/mosskey-data
application/mosskey-request
application/mp21 m21 mp21
application/mp4 mp4s
application/mpeg4-generic
application/mpeg4-iod
application/mpeg4-iod-xmt
application/mrb-consumer+xml
application/mrb-publish+xml

```
# application/msc-ivr+xml
# application/msc-mixer+xml
application/msword    doc dot
application/mxf     mxf
# application/nasdata
# application/news-checkgroups
# application/news-groupinfo
# application/news-transmission
# application/nlsml+xml
# application/nss
# application/ocsp-request
# application/ocsp-response
application/octet-stream bin dms lrf mar so dist distz pkg bpk dump elc deploy
application/oda     oda
# application/odx
application/oebps-package+xml   opf
application/ogg     ogx
application/omdoc+xml    omdoc
application/onenote    onetoc
 onetoc2 onetmp onepkg
application/oxps    oxps
# application/p2p-overlay+xml
# application/parityfec
application/patch-ops-error+xml   xer
application/pdf     pdf
# application/pdx
application/pgp-encrypted   pgp
# application/pgp-keys
application/pgp-signature   asc sig
application/pics-rules    prf
# application/pidf+xml
# application/pidf-diff+xml
application/pkcs10    p10
# application/pkcs12
application/pkcs7-mime    p7m p7c
application/pkcs7-signature   p7s
application/pkcs8    p8
application/pkix-attr-cert   ac
application/pkix-cert    cer
application/pkix-crl    crl
application/pkix-pkipath   pkipath
application/pkixcmp    pki
application/pls+xml    pls
# application/poc-settings+xml
application/postscript    ai eps ps
# application/ppsp-tracker+json
# application/problem+json
# application/problem+xml
```

```
# application/provenance+xml
# application/prs.alvestrand.titrax-sheet
application/prs.cww    cww
# application/prs.hpub+zip
#
 application/prs.nprend
# application/prs.plucker
# application/prs.rdf-xml-crypt
# application/prs.xsf+xml
application/pskc+xml    pskcxml
# application/qsig
# application/raptorfec
# application/rdap+json
application/rdf+xml    rdf
application/reginfo+xml    rif
application/relax-ng-compact-syntax  rnc
# application/remote-printing
# application/reputon+json
application/resource-lists+xml   rl
application/resource-lists-diff+xml  rld
# application/rfc+xml
# application/riscos
# application/rlmi+xml
application/rls-services+xml   rs
application/rpki-ghostbusters   gbr
application/rpki-manifest   mft
application/rpki-roa    roa
# application/rpki-updown
application/rsd+xml    rsd
application/rss+xml    rss
application/rtf     rtf
# application/rtploopback
# application/rtx
# application/samlassertion+xml
# application/samlmetadata+xml
application/sbml+xml    sbml
# application/scaip+xml
# application/scim+json
application/scvp-cv-request   scq
application/scvp-cv-response   scs
application/scvp-vp-request   spq
application/scvp-vp-response   spp
application/sdp     sdp
#
 application/sep+xml
# application/sep-exi
# application/session-info
# application/set-payment
```

application/set-payment-initiation setpay
application/set-registration
application/set-registration-initiation setreg
application/sgml
application/sgml-open-catalog
application/shf+xml shf
application/sieve
application/simple-filter+xml
application/simple-message-summary
application/simplesymbolcontainer
application/slate
application/smil
application/smil+xml smi smil
application/smpte336m
application/soap+fastinfoset
application/soap+xml
application/sparql-query rq
application/sparql-results+xml srx
application/spirits-event+xml
application/sql
application/srgs gram
application/srgs+xml grxml
application/sru+xml sru
application/ssdl+xml ssdl
application/ssml+xml ssml
application/tamp-apex-update
application/tamp-apex-update-confirm
application/tamp-community-update
#
 application/tamp-community-update-confirm
application/tamp-error
application/tamp-sequence-adjust
application/tamp-sequence-adjust-confirm
application/tamp-status-query
application/tamp-status-response
application/tamp-update
application/tamp-update-confirm
application/tei+xml tei teicorpus
application/thraud+xml tfi
application/timestamp-query
application/timestamp-reply
application/timestamped-data tsd
application/ttml+xml
application/tve-trigger
application/ulpfec
application/urc-grpsheet+xml
application/urc-ressheet+xml
application/urc-targetdesc+xml

```
# application/urc-uisocketdesc+xml
# application/vcard+json
# application/vcard+xml
# application/vemmi
# application/vividence.scriptfile
# application/vnd.3gpp-prose+xml
# application/vnd.3gpp-prose-pc3ch+xml
# application/vnd.3gpp.access-transfer-events+xml
# application/vnd.3gpp.bsf+xml
# application/vnd.3gpp.mid-call+xml
application/vnd.3gpp.pic-bw-large  plb
application/vnd.3gpp.pic-bw-small  psb
application/vnd.3gpp.pic-bw-var   pvb
#
 application/vnd.3gpp.sms
# application/vnd.3gpp.sms+xml
# application/vnd.3gpp.srvcc-ext+xml
# application/vnd.3gpp.srvcc-info+xml
# application/vnd.3gpp.state-and-event-info+xml
# application/vnd.3gpp.ussd+xml
# application/vnd.3gpp2.bcmcsinfo+xml
# application/vnd.3gpp2.sms
application/vnd.3gpp2.tcap   tcap
# application/vnd.3lightssoftware.imagescal
application/vnd.3m.post-it-notes  pwn
application/vnd.accpac.simply.aso  aso
application/vnd.accpac.simply.imp  imp
application/vnd.acucobol   acu
application/vnd.acucorp    atc acutc
application/vnd.adobe.air-application-installer-package+zip air
# application/vnd.adobe.flash.movie
application/vnd.adobe.formscentral.fcdt  fcdt
application/vnd.adobe.fxp   fxp fxpl
# application/vnd.adobe.partial-upload
application/vnd.adobe.xdp+xml   xdp
application/vnd.adobe.xfdf   xfdf
# application/vnd.aether.imp
# application/vnd.ah-barcode
application/vnd.ahead.space   ahead
application/vnd.airzip.filesecure.azf  azf
application/vnd.airzip.filesecure.azs  azs
application/vnd.amazon.ebook   azw
#
 application/vnd.amazon.mobi8-ebook
application/vnd.americandynamics.acc  acc
application/vnd.amiga.ami   ami
# application/vnd.amundsen.maze+xml
application/vnd.android.package-archive  apk
```

```
# application/vnd.anki
application/vnd.anser-web-certificate-issue-initiation cii
application/vnd.anser-web-funds-transfer-initiation fti
application/vnd.antix.game-component  atx
# application/vnd.apache.thrift.binary
# application/vnd.apache.thrift.compact
# application/vnd.apache.thrift.json
# application/vnd.api+json
application/vnd.apple.installer+xml  mpkg
application/vnd.apple.mpegurl   m3u8
# application/vnd.arastra.swi
application/vnd.aristanetworks.swi  swi
# application/vnd.artsquare
application/vnd.astraea-software.iota  iota
application/vnd.audiograph   aep
# application/vnd.autopackage
# application/vnd.avistar+xml
# application/vnd.balsamiq.bmml+xml
# application/vnd.balsamiq.bmpr
#
 application/vnd.bekitzur-stech+json
# application/vnd.biopax.rdf+xml
application/vnd.blueice.multipass  mpm
# application/vnd.bluetooth.ep.oob
# application/vnd.bluetooth.le.oob
application/vnd.bmi    bmi
application/vnd.businessobjects   rep
# application/vnd.cab-jscript
# application/vnd.canon-cpdl
# application/vnd.canon-lips
# application/vnd.cendio.thinlinc.clientconf
# application/vnd.century-systems.tcp_stream
application/vnd.chemdraw+xml   cdxml
# application/vnd.chess-pgn
application/vnd.chipnuts.karaoke-mmd  mmd
application/vnd.cinderella   cdy
# application/vnd.cirpack.isdn-ext
# application/vnd.citationstyles.style+xml
application/vnd.claymore   cla
application/vnd.cloanto.rp9   rp9
application/vnd.clonk.c4group   c4g c4d c4f c4p c4u
application/vnd.cluetrust.cartomobile-config  c11amc
application/vnd.cluetrust.cartomobile-config-pkg c11amz
# application/vnd.coffeescript
# application/vnd.collection+json
# application/vnd.collection.doc+json
# application/vnd.collection.next+json
#
```

application/vnd.comicbook+zip
application/vnd.commerce-battelle
application/vnd.commonspace csp
application/vnd.contact.cmsg cdbcmsg
application/vnd.coreos.ignition+json
application/vnd.cosmocaller cmc
application/vnd.crick.clicker clkx
application/vnd.crick.clicker.keyboard clkk
application/vnd.crick.clicker.palette clkp
application/vnd.crick.clicker.template clkt
application/vnd.crick.clicker.wordbank clkw
application/vnd.criticaltools.wbs+xml wbs
application/vnd.ctc-posml pml
application/vnd.ctct.ws+xml
application/vnd.cups-pdf
application/vnd.cups-postscript
application/vnd.cups-ppd ppd
application/vnd.cups-raster
application/vnd.cups-raw
application/vnd.curl
application/vnd.curl.car car
application/vnd.curl.pcurl pcurl
application/vnd.cyan.dean.root+xml
application/vnd.cybank
application/vnd.dart dart
application/vnd.data-vision.rdz rdz
application/vnd.debian.binary-package
application/vnd.dece.data uvf uvvf
uvd uvvd
application/vnd.dece.ttml+xml uvt uvvt
application/vnd.dece.unspecified uvx uvvx
application/vnd.dece.zip uvz uvvz
application/vnd.denovo.fcselayout-link fe_launch
application/vnd.desmume.movie
application/vnd.dir-bi.plate-dl-nosuffix
application/vnd.dm.delegation+xml
application/vnd.dna dna
application/vnd.document+json
application/vnd.dolby.mlp mlp
application/vnd.dolby.mobile.1
application/vnd.dolby.mobile.2
application/vnd.doremir.scorecloud-binary-document
application/vnd.dpgraph dpg
application/vnd.dreamfactory dfac
application/vnd.drive+json
application/vnd.ds-keypoint kpxx
application/vnd.dtg.local
application/vnd.dtg.local.flash

```
# application/vnd.dtg.local.html
application/vnd.dvb.ait    ait
# application/vnd.dvb.dvbj
# application/vnd.dvb.esgcontainer
# application/vnd.dvb.ipdcdftnotifaccess
# application/vnd.dvb.ipdcesgaccess
# application/vnd.dvb.ipdcesgaccess2
# application/vnd.dvb.ipdcesgpdd
# application/vnd.dvb.ipdcroaming
#
 application/vnd.dvb.iptv.alfec-base
# application/vnd.dvb.iptv.alfec-enhancement
# application/vnd.dvb.notif-aggregate-root+xml
# application/vnd.dvb.notif-container+xml
# application/vnd.dvb.notif-generic+xml
# application/vnd.dvb.notif-ia-msglist+xml
# application/vnd.dvb.notif-ia-registration-request+xml
# application/vnd.dvb.notif-ia-registration-response+xml
# application/vnd.dvb.notif-init+xml
# application/vnd.dvb.pfr
application/vnd.dvb.service   svc
# application/vnd.dxr
application/vnd.dynageo    geo
# application/vnd.dzr
# application/vnd.easykaraoke.cdgdownload
# application/vnd.ecdis-update
application/vnd.ecowin.chart   mag
# application/vnd.ecowin.filerequest
# application/vnd.ecowin.fileupdate
# application/vnd.ecowin.series
# application/vnd.ecowin.seriesrequest
# application/vnd.ecowin.seriesupdate
# application/vnd.emclient.accessrequest+xml
application/vnd.enliven    nml
# application/vnd.enphase.envoy
# application/vnd.eprints.data+xml
application/vnd.epson.esf   esf
application/vnd.epson.msf   msf
application/vnd.epson.quickanime  qam
application/vnd.epson.salt   slt
application/vnd.epson.ssf   ssf
#
 application/vnd.ericsson.quickcall
application/vnd.eszigno3+xml   es3 et3
# application/vnd.etsi.aoc+xml
# application/vnd.etsi.asic-e+zip
# application/vnd.etsi.asic-s+zip
# application/vnd.etsi.cug+xml
```

```
# application/vnd.etsi.iptvcommand+xml
# application/vnd.etsi.iptvdiscovery+xml
# application/vnd.etsi.iptvprofile+xml
# application/vnd.etsi.iptvsad-bc+xml
# application/vnd.etsi.iptvsad-cod+xml
# application/vnd.etsi.iptvsad-npvr+xml
# application/vnd.etsi.iptvservice+xml
# application/vnd.etsi.iptvsync+xml
# application/vnd.etsi.iptvueprofile+xml
# application/vnd.etsi.mcid+xml
# application/vnd.etsi.mheg5
# application/vnd.etsi.overload-control-policy-dataset+xml
# application/vnd.etsi.pstn+xml
# application/vnd.etsi.sci+xml
# application/vnd.etsi.simservs+xml
# application/vnd.etsi.timestamp-token
# application/vnd.etsi.tsl+xml
# application/vnd.etsi.tsl.der
#
 application/vnd.eudora.data
application/vnd.ezpix-album    ez2
application/vnd.ezpix-package   ez3
# application/vnd.f-secure.mobile
# application/vnd.fastcopy-disk-image
application/vnd.fdf     fdf
application/vnd.fdsn.mseed   mseed
application/vnd.fdsn.seed   seed dataless
# application/vnd.ffsns
# application/vnd.filmit.zfc
# application/vnd.fints
# application/vnd.firemonkeys.cloudcell
application/vnd.flographit   gph
application/vnd.fluxtime.clip   ftc
# application/vnd.font-fontforge-sfd
application/vnd.framemaker   fm frame maker book
application/vnd.frogans.fnc   fnc
application/vnd.frogans.ltf   ltf
application/vnd.fsc.weblaunch   fsc
application/vnd.fujitsu.oasys   oas
application/vnd.fujitsu.oasys2   oa2
application/vnd.fujitsu.oasys3   oa3
application/vnd.fujitsu.oasysgp   fg5
application/vnd.fujitsu.oasysprs  bh2
# application/vnd.fujixerox.art-ex
# application/vnd.fujixerox.art4
application/vnd.fujixerox.ddd   ddd
application/vnd.fujixerox.docuworks  xdw
application/vnd.fujixerox.docuworks.binder xbd
```

```
#
 application/vnd.fujixerox.docuworks.container
# application/vnd.fujixerox.hbpl
# application/vnd.fut-misnet
application/vnd.fuzzysheet   fzs
application/vnd.genomatix.tuxedo  txd
# application/vnd.geo+json
# application/vnd.geocube+xml
application/vnd.geogebra.file   ggb
application/vnd.geogebra.tool   ggt
application/vnd.geometry-explorer  gex gre
application/vnd.geonext    gxt
application/vnd.geoplan    g2w
application/vnd.geospace   g3w
# application/vnd.gerber
# application/vnd.globalplatform.card-content-mgt
# application/vnd.globalplatform.card-content-mgt-response
application/vnd.gmx    gmx
application/vnd.google-earth.kml+xml  kml
application/vnd.google-earth.kmz  kmz
# application/vnd.gov.sk.e-form+xml
# application/vnd.gov.sk.e-form+zip
# application/vnd.gov.sk.xmldatacontainer+xml
application/vnd.grafeq    gqf gqs
# application/vnd.gridmp
application/vnd.groove-account   gac
application/vnd.groove-help   ghf
application/vnd.groove-identity-message  gim
application/vnd.groove-injector   grv
application/vnd.groove-tool-message  gtm
application/vnd.groove-tool-template  tpl
application/vnd.groove-vcard   vcg
#
 application/vnd.hal+json
application/vnd.hal+xml    hal
application/vnd.handheld-entertainment+xml zmm
application/vnd.hbci    hbci
# application/vnd.hcl-bireports
# application/vnd.hdt
# application/vnd.heroku+json
application/vnd.hhe.lesson-player  les
application/vnd.hp-hpgl    hpgl
application/vnd.hp-hpid    hpid
application/vnd.hp-hps    hps
application/vnd.hp-jlyt    jlt
application/vnd.hp-pcl    pcl
application/vnd.hp-pclxl   pclxl
# application/vnd.httphone
```

application/vnd.hydrostatix.sof-data sfd-hdstx
application/vnd.hyperdrive+json
application/vnd.hzn-3d-crossword
application/vnd.ibm.afplinedata
application/vnd.ibm.electronic-media
application/vnd.ibm.minipay mpy
application/vnd.ibm.modcap afp listafp list3820
application/vnd.ibm.rights-management irm
application/vnd.ibm.secure-container sc
application/vnd.iccprofile icc
 icm
application/vnd.ieee.1905
application/vnd.igloader igl
application/vnd.immervision-ivp ivp
application/vnd.immervision-ivu ivu
application/vnd.ims.imsccv1p1
application/vnd.ims.imsccv1p2
application/vnd.ims.imsccv1p3
application/vnd.ims.lis.v2.result+json
application/vnd.ims.lti.v2.toolconsumerprofile+json
application/vnd.ims.lti.v2.toolproxy+json
application/vnd.ims.lti.v2.toolproxy.id+json
application/vnd.ims.lti.v2.toolsettings+json
application/vnd.ims.lti.v2.toolsettings.simple+json
application/vnd.informedcontrol.rms+xml
application/vnd.informix-visionary
application/vnd.infotech.project
application/vnd.infotech.project+xml
application/vnd.innopath.wamp.notification
application/vnd.insors.igm igm
application/vnd.intercon.formnet xpw xpx
application/vnd.intergeo i2g
application/vnd.intertrust.digibox
application/vnd.intertrust.nncp
application/vnd.intu.qbo qbo
application/vnd.intu.qfx qfx
#
 application/vnd.iptc.g2.catalogitem+xml
application/vnd.iptc.g2.conceptitem+xml
application/vnd.iptc.g2.knowledgeitem+xml
application/vnd.iptc.g2.newsitem+xml
application/vnd.iptc.g2.newsmessage+xml
application/vnd.iptc.g2.packageitem+xml
application/vnd.iptc.g2.planningitem+xml
application/vnd.ipunplugged.rcprofile rcprofile
application/vnd.irepository.package+xml irp
application/vnd.is-xpr xpr
application/vnd.isac.fcs fcs

application/vnd.jam jam
application/vnd.japannet-directory-service
application/vnd.japannet-jpnstore-wakeup
application/vnd.japannet-payment-wakeup
application/vnd.japannet-registration
application/vnd.japannet-registration-wakeup
application/vnd.japannet-setstore-wakeup
application/vnd.japannet-verification
application/vnd.japannet-verification-wakeup
application/vnd.jcp.javame.midlet-rms rms
application/vnd.jisp jisp
application/vnd.joost.joda-archive joda
application/vnd.jsk.isdn-ngn
application/vnd.kahootz ktz
ktr
application/vnd.kde.karbon karbon
application/vnd.kde.kchart chrt
application/vnd.kde.kformula kfo
application/vnd.kde.kivio flw
application/vnd.kde.kontour kon
application/vnd.kde.kpresenter kpr kpt
application/vnd.kde.kspread ksp
application/vnd.kde.kword kwd kwt
application/vnd.kenameaapp htke
application/vnd.kidspiration kia
application/vnd.kinar kne knp
application/vnd.koan skp skd skt skm
application/vnd.kodak-descriptor sse
application/vnd.las.las+xml lasxml
application/vnd.liberty-request+xml
application/vnd.llamagraphics.life-balance.desktop lbd
application/vnd.llamagraphics.life-balance.exchange+xml lbe
application/vnd.lotus-1-2-3 123
application/vnd.lotus-approach apr
application/vnd.lotus-freelance pre
application/vnd.lotus-notes nsf
application/vnd.lotus-organizer org
application/vnd.lotus-screencam scm
application/vnd.lotus-wordpro lwp
application/vnd.macports.portpkg portpkg
application/vnd.mapbox-vector-tile
application/vnd.marlin.drm.actiontoken+xml
#
application/vnd.marlin.drm.conftoken+xml
application/vnd.marlin.drm.license+xml
application/vnd.marlin.drm.mdcf
application/vnd.mason+json
application/vnd.maxmind.maxmind-db

application/vnd.mcd mcd
application/vnd.medcalcdata mc1
application/vnd.mediastation.cdkey cdkey
application/vnd.meridian-slingshot
application/vnd.mfer mwf
application/vnd.mfmp mfm
application/vnd.micro+json
application/vnd.micrografx.flo flo
application/vnd.micrografx.igx igx
application/vnd.microsoft.portable-executable
application/vnd.miele+json
application/vnd.mif mif
application/vnd.minisoft-hp3000-save
application/vnd.mitsubishi.misty-guard.trustweb
application/vnd.mobius.daf daf
application/vnd.mobius.dis dis
application/vnd.mobius.mbk mbk
application/vnd.mobius.mqy mqy
application/vnd.mobius.msl msl
application/vnd.mobius.plc plc
application/vnd.mobius.txf txf
application/vnd.mophun.application mpn
application/vnd.mophun.certificate mpc
#
application/vnd.motorola.flexsuite
application/vnd.motorola.flexsuite.adsi
application/vnd.motorola.flexsuite.fis
application/vnd.motorola.flexsuite.gotap
application/vnd.motorola.flexsuite.kmr
application/vnd.motorola.flexsuite.ttc
application/vnd.motorola.flexsuite.wem
application/vnd.motorola.iprm
application/vnd.mozilla.xul+xml xul
application/vnd.ms-3mfdocument
application/vnd.ms-artgalry cil
application/vnd.ms-asf
application/vnd.ms-cab-compressed cab
application/vnd.ms-color.iccprofile
application/vnd.ms-excel xls xlm xla xlc xlt xlw
application/vnd.ms-excel.addin.macroenabled.12 xlam
application/vnd.ms-excel.sheet.binary.macroenabled.12 xlsb
application/vnd.ms-excel.sheet.macroenabled.12 xlsm
application/vnd.ms-excel.template.macroenabled.12 xltm
application/vnd.ms-fontobject eot
application/vnd.ms-htmlhelp chm
application/vnd.ms-ims ims
application/vnd.ms-lrm lrm
application/vnd.ms-office.activex+xml

application/vnd.ms-officetheme thmx
#
application/vnd.ms-opentype
application/vnd.ms-package.obfuscated-opentype
application/vnd.ms-pki.seccat cat
application/vnd.ms-pki.stl stl
application/vnd.ms-playready.initiator+xml
application/vnd.ms-powerpoint ppt pps pot
application/vnd.ms-powerpoint.addin.macroenabled.12 ppam
application/vnd.ms-powerpoint.presentation.macroenabled.12 pptm
application/vnd.ms-powerpoint.slide.macroenabled.12 sldm
application/vnd.ms-powerpoint.slideshow.macroenabled.12 ppsm
application/vnd.ms-powerpoint.template.macroenabled.12 potm
application/vnd.ms-printdevicecapabilities+xml
application/vnd.ms-printing.printticket+xml
application/vnd.ms-printschematicket+xml
application/vnd.ms-project mpp mpt
application/vnd.ms-tnef
application/vnd.ms-windows.devicepairing
application/vnd.ms-windows.nwprinting.oob
application/vnd.ms-windows.printerpairing
application/vnd.ms-windows.wsd.oob
application/vnd.ms-wmdrm.lic-chlg-req
application/vnd.ms-wmdrm.lic-resp
#
application/vnd.ms-wmdrm.meter-chlg-req
application/vnd.ms-wmdrm.meter-resp
application/vnd.ms-word.document.macroenabled.12 docm
application/vnd.ms-word.template.macroenabled.12 dotm
application/vnd.ms-works wps wks wcm wdb
application/vnd.ms-wpl wpl
application/vnd.ms-xpsdocument xps
application/vnd.msa-disk-image
application/vnd.mseq mseq
application/vnd.msign
application/vnd.multiad.creator
application/vnd.multiad.creator.cif
application/vnd.music-niff
application/vnd.musician mus
application/vnd.muvee.style msty
application/vnd.mynfc taglet
application/vnd.ncd.control
application/vnd.ncd.reference
application/vnd.nervana
application/vnd.netfpx
application/vnd.neurolanguage.nlu nlu
application/vnd.nintendo.nitro.rom
application/vnd.nintendo.snes.rom

application/vnd.nitf ntf nitf
application/vnd.noblenet-directory nnd
application/vnd.noblenet-sealer nns
application/vnd.noblenet-web nnw
application/vnd.nokia.catalogs
#
application/vnd.nokia.conml+wbxml
application/vnd.nokia.conml+xml
application/vnd.nokia.iptv.config+xml
application/vnd.nokia.isds-radio-presets
application/vnd.nokia.landmark+wbxml
application/vnd.nokia.landmark+xml
application/vnd.nokia.landmarkcollection+xml
application/vnd.nokia.n-gage.ac+xml
application/vnd.nokia.n-gage.data ngdat
application/vnd.nokia.n-gage.symbian.install n-gage
application/vnd.nokia.ncd
application/vnd.nokia.pcd+wbxml
application/vnd.nokia.pcd+xml
application/vnd.nokia.radio-preset rpst
application/vnd.nokia.radio-presets rpss
application/vnd.novadigm.edm edm
application/vnd.novadigm.edx edx
application/vnd.novadigm.ext ext
application/vnd.ntt-local.content-share
application/vnd.ntt-local.file-transfer
application/vnd.ntt-local.ogw_remote-access
application/vnd.ntt-local.sip-ta_remote
application/vnd.ntt-local.sip-ta_tcp_stream
application/vnd.oasis.opendocument.chart odc
application/vnd.oasis.opendocument.chart-template otc
application/vnd.oasis.opendocument.database odb
application/vnd.oasis.opendocument.formula odf
application/vnd.oasis.opendocument.formula-template odft
application/vnd.oasis.opendocument.graphics odg
application/vnd.oasis.opendocument.graphics-template otg
application/vnd.oasis.opendocument.image odi
application/vnd.oasis.opendocument.image-template oti
application/vnd.oasis.opendocument.presentation odp
application/vnd.oasis.opendocument.presentation-template otp
application/vnd.oasis.opendocument.spreadsheet ods
application/vnd.oasis.opendocument.spreadsheet-template ots
application/vnd.oasis.opendocument.text odt
application/vnd.oasis.opendocument.text-master odm
application/vnd.oasis.opendocument.text-template ott
application/vnd.oasis.opendocument.text-web oth
#

application/vnd.obn
application/vnd.oftn.l10n+json
application/vnd.oipf.contentaccessdownload+xml
application/vnd.oipf.contentaccessstreaming+xml
application/vnd.oipf.cspg-hexbinary
application/vnd.oipf.dae.svg+xml
#
application/vnd.oipf.dae.xhtml+xml
application/vnd.oipf.mippvcontrolmessage+xml
application/vnd.oipf.pae.gem
application/vnd.oipf.spdiscovery+xml
application/vnd.oipf.spdlist+xml
application/vnd.oipf.ueprofile+xml
application/vnd.oipf.userprofile+xml
application/vnd.olpc-sugar xo
application/vnd.oma-scws-config
application/vnd.oma-scws-http-request
application/vnd.oma-scws-http-response
application/vnd.oma.bcast.associated-procedure-parameter+xml
application/vnd.oma.bcast.drm-trigger+xml
application/vnd.oma.bcast.imd+xml
application/vnd.oma.bcast.ltkm
application/vnd.oma.bcast.notification+xml
application/vnd.oma.bcast.provisioningtrigger
application/vnd.oma.bcast.sgboot
application/vnd.oma.bcast.sgdd+xml
application/vnd.oma.bcast.sgdu
application/vnd.oma.bcast.simple-symbol-container
application/vnd.oma.bcast.smartcard-trigger+xml
application/vnd.oma.bcast.sprov+xml
application/vnd.oma.bcast.stkm
application/vnd.oma.cab-address-book+xml
#
application/vnd.oma.cab-feature-handler+xml
application/vnd.oma.cab-pcc+xml
application/vnd.oma.cab-subs-invite+xml
application/vnd.oma.cab-user-prefs+xml
application/vnd.oma.dcd
application/vnd.oma.dcdc
application/vnd.oma.dd2+xml dd2
application/vnd.oma.drm.risd+xml
application/vnd.oma.group-usage-list+xml
application/vnd.oma.lwm2m+json
application/vnd.oma.lwm2m+tlv
application/vnd.oma.pal+xml
application/vnd.oma.poc.detailed-progress-report+xml
application/vnd.oma.poc.final-report+xml
application/vnd.oma.poc.groups+xml

```
# application/vnd.oma.poc.invocation-descriptor+xml
# application/vnd.oma.poc.optimized-progress-report+xml
# application/vnd.oma.push
# application/vnd.oma.scidm.messages+xml
# application/vnd.oma.xcap-directory+xml
# application/vnd.omads-email+xml
# application/vnd.omads-file+xml
# application/vnd.omads-folder+xml
# application/vnd.omaloc-supl-init
# application/vnd.onepager
# application/vnd.openblox.game+xml
#
 application/vnd.openblox.game-binary
# application/vnd.openeye.oeb
application/vnd.openofficeorg.extension  oxt
# application/vnd.openxmlformats-officedocument.custom-properties+xml
# application/vnd.openxmlformats-officedocument.customxmlproperties+xml
# application/vnd.openxmlformats-officedocument.drawing+xml
# application/vnd.openxmlformats-officedocument.drawingml.chart+xml
# application/vnd.openxmlformats-officedocument.drawingml.chartshapes+xml
# application/vnd.openxmlformats-officedocument.drawingml.diagramcolors+xml
# application/vnd.openxmlformats-officedocument.drawingml.diagramdata+xml
# application/vnd.openxmlformats-officedocument.drawingml.diagramlayout+xml
# application/vnd.openxmlformats-officedocument.drawingml.diagramstyle+xml
# application/vnd.openxmlformats-officedocument.extended-properties+xml
# application/vnd.openxmlformats-officedocument.presentationml.commentauthors+xml
# application/vnd.openxmlformats-officedocument.presentationml.comments+xml
# application/vnd.openxmlformats-officedocument.presentationml.handoutmaster+xml
#
 application/vnd.openxmlformats-officedocument.presentationml.notesmaster+xml
# application/vnd.openxmlformats-officedocument.presentationml.notesslide+xml
application/vnd.openxmlformats-officedocument.presentationml.presentation pptx
# application/vnd.openxmlformats-officedocument.presentationml.presentation.main+xml
# application/vnd.openxmlformats-officedocument.presentationml.presprops+xml
application/vnd.openxmlformats-officedocument.presentationml.slide sldx
# application/vnd.openxmlformats-officedocument.presentationml.slide+xml
# application/vnd.openxmlformats-officedocument.presentationml.slidelayout+xml
# application/vnd.openxmlformats-officedocument.presentationml.slidemaster+xml
application/vnd.openxmlformats-officedocument.presentationml.slideshow ppsx
# application/vnd.openxmlformats-officedocument.presentationml.slideshow.main+xml
# application/vnd.openxmlformats-officedocument.presentationml.slideupdateinfo+xml
#
 application/vnd.openxmlformats-officedocument.presentationml.tablestyles+xml
# application/vnd.openxmlformats-officedocument.presentationml.tags+xml
application/vnd.openxmlformats-officedocument.presentationml.template potx
# application/vnd.openxmlformats-officedocument.presentationml.template.main+xml
# application/vnd.openxmlformats-officedocument.presentationml.viewprops+xml
# application/vnd.openxmlformats-officedocument.spreadsheetml.calcchain+xml
```

application/vnd.openxmlformats-officedocument.spreadsheetml.chartsheet+xml
application/vnd.openxmlformats-officedocument.spreadsheetml.comments+xml
application/vnd.openxmlformats-officedocument.spreadsheetml.connections+xml
application/vnd.openxmlformats-officedocument.spreadsheetml.dialogsheet+xml
application/vnd.openxmlformats-officedocument.spreadsheetml.externallink+xml
application/vnd.openxmlformats-officedocument.spreadsheetml.pivotcachedefinition+xml
application/vnd.openxmlformats-officedocument.spreadsheetml.pivotcacherecords+xml
#
 application/vnd.openxmlformats-officedocument.spreadsheetml.pivottable+xml
application/vnd.openxmlformats-officedocument.spreadsheetml.querytable+xml
application/vnd.openxmlformats-officedocument.spreadsheetml.revisionheaders+xml
application/vnd.openxmlformats-officedocument.spreadsheetml.revisionlog+xml
application/vnd.openxmlformats-officedocument.spreadsheetml.sharedstrings+xml
application/vnd.openxmlformats-officedocument.spreadsheetml.sheet xlsx
application/vnd.openxmlformats-officedocument.spreadsheetml.sheet.main+xml
application/vnd.openxmlformats-officedocument.spreadsheetml.sheetmetadata+xml
application/vnd.openxmlformats-officedocument.spreadsheetml.styles+xml
application/vnd.openxmlformats-officedocument.spreadsheetml.table+xml
application/vnd.openxmlformats-officedocument.spreadsheetml.tablesinglecells+xml
application/vnd.openxmlformats-officedocument.spreadsheetml.template xltx
application/vnd.openxmlformats-officedocument.spreadsheetml.template.main+xml
#
 application/vnd.openxmlformats-officedocument.spreadsheetml.usernames+xml
application/vnd.openxmlformats-officedocument.spreadsheetml.volatiledependencies+xml
application/vnd.openxmlformats-officedocument.spreadsheetml.worksheet+xml
application/vnd.openxmlformats-officedocument.theme+xml
application/vnd.openxmlformats-officedocument.themeoverride+xml
application/vnd.openxmlformats-officedocument.vmldrawing
application/vnd.openxmlformats-officedocument.wordprocessingml.comments+xml
application/vnd.openxmlformats-officedocument.wordprocessingml.document docx
application/vnd.openxmlformats-officedocument.wordprocessingml.document.glossary+xml
application/vnd.openxmlformats-officedocument.wordprocessingml.document.main+xml
application/vnd.openxmlformats-officedocument.wordprocessingml.endnotes+xml
application/vnd.openxmlformats-officedocument.wordprocessingml.fonttable+xml
application/vnd.openxmlformats-officedocument.wordprocessingml.footer+xml
#
 application/vnd.openxmlformats-officedocument.wordprocessingml.footnotes+xml
application/vnd.openxmlformats-officedocument.wordprocessingml.numbering+xml
application/vnd.openxmlformats-officedocument.wordprocessingml.settings+xml
application/vnd.openxmlformats-officedocument.wordprocessingml.styles+xml
application/vnd.openxmlformats-officedocument.wordprocessingml.template dotx
application/vnd.openxmlformats-officedocument.wordprocessingml.template.main+xml
application/vnd.openxmlformats-officedocument.wordprocessingml.websettings+xml
application/vnd.openxmlformats-package.core-properties+xml
application/vnd.openxmlformats-package.digital-signature-xmlsignature+xml
application/vnd.openxmlformats-package.relationships+xml
application/vnd.oracle.resource+json
application/vnd.orange.indata

```
# application/vnd.osa.netdeploy
application/vnd.osgeo.mapguide.package  mgp
# application/vnd.osgi.bundle
application/vnd.osgi.dp    dp
application/vnd.osgi.subsystem   esa
#
 application/vnd.otps.ct-kip+xml
# application/vnd.oxli.countgraph
# application/vnd.pagerduty+json
application/vnd.palm    pdb pqa oprc
# application/vnd.panoply
# application/vnd.paos.xml
application/vnd.pawaafile   paw
# application/vnd.pcos
application/vnd.pg.format   str
application/vnd.pg.osasli   ei6
# application/vnd.piaccess.application-licence
application/vnd.picsel    efif
application/vnd.pmi.widget   wg
# application/vnd.poc.group-advertisement+xml
application/vnd.pocketlearn   plf
application/vnd.powerbuilder6   pbd
# application/vnd.powerbuilder6-s
# application/vnd.powerbuilder7
# application/vnd.powerbuilder7-s
# application/vnd.powerbuilder75
# application/vnd.powerbuilder75-s
# application/vnd.preminet
application/vnd.previewsystems.box  box
application/vnd.proteus.magazine  mgz
application/vnd.publishare-delta-tree  qps
application/vnd.pvi.ptid1   ptid
# application/vnd.pwg-multiplexed
# application/vnd.pwg-xhtml-print+xml
# application/vnd.qualcomm.brew-app-res
#
 application/vnd.quarantainenet
application/vnd.quark.quarkxpress  qxd qxt qwd qwt qxl qxb
# application/vnd.quobject-quoxdocument
# application/vnd.radisys.moml+xml
# application/vnd.radisys.msml+xml
# application/vnd.radisys.msml-audit+xml
# application/vnd.radisys.msml-audit-conf+xml
# application/vnd.radisys.msml-audit-conn+xml
# application/vnd.radisys.msml-audit-dialog+xml
# application/vnd.radisys.msml-audit-stream+xml
# application/vnd.radisys.msml-conf+xml
# application/vnd.radisys.msml-dialog+xml
```

```
# application/vnd.radisys.msml-dialog-base+xml
# application/vnd.radisys.msml-dialog-fax-detect+xml
# application/vnd.radisys.msml-dialog-fax-sendrecv+xml
# application/vnd.radisys.msml-dialog-group+xml
# application/vnd.radisys.msml-dialog-speech+xml
# application/vnd.radisys.msml-dialog-transform+xml
# application/vnd.rainstor.data
# application/vnd.rapid
# application/vnd.rar
application/vnd.realvnc.bed   bed
application/vnd.recordare.musicxml  mxl
application/vnd.recordare.musicxml+xml  musicxml
#
 application/vnd.renlearn.rlprint
application/vnd.rig.cryptonote   cryptonote
application/vnd.rim.cod    cod
application/vnd.rn-realmedia   rm
application/vnd.rn-realmedia-vbr  rmvb
application/vnd.route66.link66+xml  link66
# application/vnd.rs-274x
# application/vnd.ruckus.download
# application/vnd.s3sms
application/vnd.sailingtracker.track  st
# application/vnd.sbm.cid
# application/vnd.sbm.mid2
# application/vnd.scribus
# application/vnd.sealed.3df
# application/vnd.sealed.csf
# application/vnd.sealed.doc
# application/vnd.sealed.eml
# application/vnd.sealed.mht
# application/vnd.sealed.net
# application/vnd.sealed.ppt
# application/vnd.sealed.tiff
# application/vnd.sealed.xls
# application/vnd.sealedmedia.softseal.html
# application/vnd.sealedmedia.softseal.pdf
application/vnd.seemail    see
application/vnd.sema    sema
application/vnd.semd    semd
application/vnd.semf    semf
application/vnd.shana.informed.formdata  ifm
application/vnd.shana.informed.formtemplate itp
application/vnd.shana.informed.interchange iif
application/vnd.shana.informed.package  ipk
application/vnd.simtech-mindmapper  twd
 twds
# application/vnd.siren+json
```

application/vnd.smaf mmf
application/vnd.smart.notebook
application/vnd.smart.teacher teacher
application/vnd.software602.filler.form+xml
application/vnd.software602.filler.form-xml-zip
application/vnd.solent.sdkm+xml sdkm sdkd
application/vnd.spotfire.dxp dxp
application/vnd.spotfire.sfs sfs
application/vnd.sss-cod
application/vnd.sss-dtf
application/vnd.sss-ntf
application/vnd.stardivision.calc sdc
application/vnd.stardivision.draw sda
application/vnd.stardivision.impress sdd
application/vnd.stardivision.math smf
application/vnd.stardivision.writer sdw vor
application/vnd.stardivision.writer-global sgl
application/vnd.stepmania.package smzip
application/vnd.stepmania.stepchart sm
application/vnd.street-stream
application/vnd.sun.wadl+xml
application/vnd.sun.xml.calc sxc
application/vnd.sun.xml.calc.template stc
application/vnd.sun.xml.draw sxd
application/vnd.sun.xml.draw.template std
application/vnd.sun.xml.impress sxi
application/vnd.sun.xml.impress.template sti
application/vnd.sun.xml.math sxm
application/vnd.sun.xml.writer sxw
application/vnd.sun.xml.writer.global sxg
application/vnd.sun.xml.writer.template stw
application/vnd.sus-calendar sus
susp
application/vnd.svd svd
application/vnd.swiftview-ics
application/vnd.symbian.install sis sisx
application/vnd.syncml+xml xsm
application/vnd.syncml.dm+wbxml bdm
application/vnd.syncml.dm+xml xdm
application/vnd.syncml.dm.notification
application/vnd.syncml.dmddf+wbxml
application/vnd.syncml.dmddf+xml
application/vnd.syncml.dmtnds+wbxml
application/vnd.syncml.dmtnds+xml
application/vnd.syncml.ds.notification
application/vnd.tao.intent-module-archive tao
application/vnd.tcpdump.pcap pcap cap dmp
application/vnd.tmd.mediaflex.api+xml

```
# application/vnd.tml
application/vnd.tmobile-livetv   tmo
application/vnd.trid.tpt   tpt
application/vnd.triscape.mxs   mxs
application/vnd.trueapp    tra
#
 application/vnd.truedoc
# application/vnd.ubisoft.webplayer
application/vnd.ufdl    ufd ufdl
application/vnd.uiq.theme   utz
application/vnd.umajin    umj
application/vnd.unity    unityweb
application/vnd.uoml+xml   uoml
# application/vnd.uplanet.alert
# application/vnd.uplanet.alert-wbxml
# application/vnd.uplanet.bearer-choice
# application/vnd.uplanet.bearer-choice-wbxml
# application/vnd.uplanet.cacheop
# application/vnd.uplanet.cacheop-wbxml
# application/vnd.uplanet.channel
# application/vnd.uplanet.channel-wbxml
# application/vnd.uplanet.list
# application/vnd.uplanet.list-wbxml
# application/vnd.uplanet.listcmd
# application/vnd.uplanet.listcmd-wbxml
# application/vnd.uplanet.signal
# application/vnd.uri-map
# application/vnd.valve.source.material
application/vnd.vcx    vcx
# application/vnd.vd-study
# application/vnd.vectorworks
# application/vnd.vel+json
#
 application/vnd.verimatrix.vcas
# application/vnd.vidsoft.vidconference
application/vnd.visio    vsd vst vss vsw
application/vnd.visionary   vis
# application/vnd.vividence.scriptfile
application/vnd.vsf    vsf
# application/vnd.wap.sic
# application/vnd.wap.slc
application/vnd.wap.wbxml   wbxml
application/vnd.wap.wmlc   wmlc
application/vnd.wap.wmlscriptc   wmlsc
application/vnd.webturbo   wtb
# application/vnd.wfa.p2p
# application/vnd.wfa.wsc
# application/vnd.windows.devicepairing
```

```
# application/vnd.wmc
# application/vnd.wmf.bootstrap
# application/vnd.wolfram.mathematica
# application/vnd.wolfram.mathematica.package
application/vnd.wolfram.player   nbp
application/vnd.wordperfect   wpd
application/vnd.wqd    wqd
# application/vnd.wrq-hp3000-labelled
application/vnd.wt.stf    stf
# application/vnd.wv.csp+wbxml
# application/vnd.wv.csp+xml
# application/vnd.wv.ssp+xml
# application/vnd.xacml+json
application/vnd.xara    xar
application/vnd.xfdl    xfdl
# application/vnd.xfdl.webform
#
 application/vnd.xmi+xml
# application/vnd.xmpie.cpkg
# application/vnd.xmpie.dpkg
# application/vnd.xmpie.plan
# application/vnd.xmpie.ppkg
# application/vnd.xmpie.xlim
application/vnd.yamaha.hv-dic   hvd
application/vnd.yamaha.hv-script  hvs
application/vnd.yamaha.hv-voice   hvp
application/vnd.yamaha.openscoreformat   osf
application/vnd.yamaha.openscoreformat.osfpvg+xml osfpvg
# application/vnd.yamaha.remote-setup
application/vnd.yamaha.smaf-audio  saf
application/vnd.yamaha.smaf-phrase  spf
# application/vnd.yamaha.through-ngn
# application/vnd.yamaha.tunnel-udpencap
# application/vnd.yaoweme
application/vnd.yellowriver-custom-menu  cmp
application/vnd.zul    zir zirz
application/vnd.zzazz.deck+xml   zaz
application/voicexml+xml   vxml
# application/vq-rtcpxr
# application/watcherinfo+xml
# application/whoispp-query
# application/whoispp-response
application/widget    wgt
application/winhlp    hlp
# application/wita
# application/wordperfect5.1
application/wsdl+xml    wsdl
application/wspolicy+xml   wspolicy
```

application/x-7z-compressed 7z
application/x-abiword abw
application/x-ace-compressed ace
#
application/x-amf
application/x-apple-diskimage dmg
application/x-authorware-bin aab x32 u32 vox
application/x-authorware-map aam
application/x-authorware-seg aas
application/x-bcpio bcpio
application/x-bittorrent torrent
application/x-blorb blb blorb
application/x-bzip bz
application/x-bzip2 bz2 boz
application/x-cbr cbr cba cbt cbz cb7
application/x-cdlink vcd
application/x-cfs-compressed cfs
application/x-chat chat
application/x-chess-pgn pgn
application/x-compress
application/x-conference nsc
application/x-cpio cpio
application/x-csh csh
application/x-debian-package deb udeb
application/x-dgc-compressed dgc
application/x-director dir dcr dxr cst cct cxt w3d fgd swa
application/x-doom wad
application/x-dtbncx+xml ncx
application/x-dtbook+xml dtb
application/x-dtbresource+xml res
application/x-dvi dvi
application/x-envoy evy
application/x-eva eva
application/x-font-bdf bdf
#
application/x-font-dos
application/x-font-framemaker
application/x-font-ghostscript gsf
application/x-font-libgrx
application/x-font-linux-psf psf
application/x-font-otf otf
application/x-font-pcf pcf
application/x-font-snf snf
application/x-font-speedo
application/x-font-sunos-news
application/x-font-ttf ttf ttc
application/x-font-type1 pfa pfb pfm afm
application/x-font-vfont

application/x-freearc arc
application/x-futuresplash spl
application/x-gca-compressed gca
application/x-glulx ulx
application/x-gnumeric gnumeric
application/x-gramps-xml gramps
application/x-gtar gtar
application/x-gzip
application/x-hdf hdf
application/x-install-instructions install
application/x-iso9660-image iso
application/x-java-jnlp-file jnlp
application/x-latex latex
application/x-lzh-compressed lzh lha
application/x-mie mie
application/x-mobipocket-ebook prc
mobi
application/x-ms-application application
application/x-ms-shortcut lnk
application/x-ms-wmd wmd
application/x-ms-wmz wmz
application/x-ms-xbap xbap
application/x-msaccess mdb
application/x-msbinder obd
application/x-mscardfile crd
application/x-msclip clp
application/x-msdownload exe dll com bat msi
application/x-msmediaview mvb m13 m14
application/x-msmetafile wmf wmz emf emz
application/x-msmoney mny
application/x-mspublisher pub
application/x-msschedule scd
application/x-msterminal trm
application/x-mswrite wri
application/x-netcdf nc cdf
application/x-nzb nzb
application/x-pkcs12 p12 pfx
application/x-pkcs7-certificates p7b spc
application/x-pkcs7-certreqresp p7r
application/x-rar-compressed rar
application/x-research-info-systems ris
application/x-sh sh
application/x-shar shar
application/x-shockwave-flash swf
application/x-silverlight-app xap
application/x-sql sql
application/x-stuffit sit
application/x-stuffitx sitx

application/x-subrip srt
application/x-sv4cpio sv4cpio
application/x-sv4crc sv4crc
application/x-t3vm-image t3
application/x-tads gam
application/x-tar tar
application/x-tcl tcl
application/x-tex tex
application/x-tex-tfm tfm
application/x-texinfo texinfo
texi
application/x-tgif obj
application/x-ustar ustar
application/x-wais-source src
application/x-www-form-urlencoded
application/x-x509-ca-cert der crt
application/x-xfig fig
application/x-xliff+xml xlf
application/x-xpinstall xpi
application/x-xz xz
application/x-zmachine z1 z2 z3 z4 z5 z6 z7 z8
application/x400-bp
application/xacml+xml
application/xaml+xml xaml
application/xcap-att+xml
application/xcap-caps+xml
application/xcap-diff+xml xdf
application/xcap-el+xml
application/xcap-error+xml
application/xcap-ns+xml
application/xcon-conference-info+xml
application/xcon-conference-info-diff+xml
application/xenc+xml xenc
application/xhtml+xml xhtml
xht
application/xhtml-voice+xml
application/xml xml xsl
application/xml-dtd dtd
application/xml-external-parsed-entity
application/xml-patch+xml
application/xmpp+xml
application/xop+xml xop
application/xproc+xml xpl
application/xslt+xml xslt
application/xspf+xml xspf
application/xv+xml mxml xhvml xvml xvm
application/yang yang
application/yin+xml yin

application/zip zip
application/zlib
audio/1d-interleaved-parityfec
audio/32kadpcm
audio/3gpp
audio/3gpp2
audio/ac3
audio/adpcm adp
audio/amr
audio/amr-wb
audio/amr-wb+
audio/aptx
audio/asc
audio/atrac-advanced-lossless
audio/atrac-x
audio/atrac3
audio/basic au snd
audio/bv16
audio/bv32
audio/clearmode
audio/cn
audio/dat12
audio/dls
audio/dsr-es201108
audio/dsr-es202050
audio/dsr-es202211
audio/dsr-es202212
audio/dv
audio/dvi4
audio/eac3
audio/encaprtp
audio/evrc
audio/evrc-qcp
audio/evrc0
audio/evrc1
#
audio/evrcb
audio/evrcb0
audio/evrcb1
audio/evrcnw
audio/evrcnw0
audio/evrcnw1
audio/evrcwb
audio/evrcwb0
audio/evrcwb1
audio/evs
audio/example
audio/fwdred

```
# audio/g711-0
# audio/g719
# audio/g722
# audio/g7221
# audio/g723
# audio/g726-16
# audio/g726-24
# audio/g726-32
# audio/g726-40
# audio/g728
# audio/g729
# audio/g7291
# audio/g729d
# audio/g729e
# audio/gsm
# audio/gsm-efr
# audio/gsm-hr-08
# audio/ilbc
# audio/ip-mr_v2.5
# audio/isac
# audio/l16
# audio/l20
# audio/l24
# audio/l8
# audio/lpc
audio/midi     mid midi kar rmi
# audio/mobile-xmf
audio/mp4     m4a mp4a
# audio/mp4a-latm
# audio/mpa
# audio/mpa-robust
audio/mpeg     mpga mp2 mp2a mp3 m2a m3a
# audio/mpeg4-generic
# audio/musepack
audio/ogg     oga ogg spx
# audio/opus
# audio/parityfec
# audio/pcma
# audio/pcma-wb
# audio/pcmu
# audio/pcmu-wb
# audio/prs.sid
# audio/qcelp
# audio/raptorfec
# audio/red
# audio/rtp-enc-aescm128
# audio/rtp-midi
# audio/rtploopback
```

```
# audio/rtx
audio/s3m     s3m
audio/silk     sil
#
 audio/smv
# audio/smv-qcp
# audio/smv0
# audio/sp-midi
# audio/speex
# audio/t140c
# audio/t38
# audio/telephone-event
# audio/tone
# audio/uemclip
# audio/ulpfec
# audio/vdvi
# audio/vmr-wb
# audio/vnd.3gpp.iufp
# audio/vnd.4sb
# audio/vnd.audiokoz
# audio/vnd.celp
# audio/vnd.cisco.nse
# audio/vnd.cmles.radio-events
# audio/vnd.cns.anp1
# audio/vnd.cns.inf1
audio/vnd.dece.audio    uva uvva
audio/vnd.digital-winds    eol
# audio/vnd.dlna.adts
# audio/vnd.dolby.heaac.1
# audio/vnd.dolby.heaac.2
# audio/vnd.dolby.mlp
# audio/vnd.dolby.mps
# audio/vnd.dolby.pl2
# audio/vnd.dolby.pl2x
# audio/vnd.dolby.pl2z
# audio/vnd.dolby.pulse.1
audio/vnd.dra     dra
audio/vnd.dts     dts
audio/vnd.dts.hd    dtshd
# audio/vnd.dvb.file
# audio/vnd.everad.plj
# audio/vnd.hns.audio
audio/vnd.lucent.voice    lvp
audio/vnd.ms-playready.media.pya  pya
# audio/vnd.nokia.mobile-xmf
# audio/vnd.nortel.vbk
audio/vnd.nuera.ecelp4800   ecelp4800
audio/vnd.nuera.ecelp7470   ecelp7470
```

```
audio/vnd.nuera.ecelp9600   ecelp9600
#
 audio/vnd.octel.sbc
# audio/vnd.qcelp
# audio/vnd.rhetorex.32kadpcm
audio/vnd.rip     rip
# audio/vnd.sealedmedia.softseal.mpeg
# audio/vnd.vmx.cvsd
# audio/vorbis
# audio/vorbis-config
audio/webm     weba
audio/x-aac     aac
audio/x-aiff     aif aiff aifc
audio/x-caf     caf
audio/x-flac     flac
audio/x-matroska     mka
audio/x-mpegurl     m3u
audio/x-ms-wax     wax
audio/x-ms-wma     wma
audio/x-pn-realaudio     ram ra
audio/x-pn-realaudio-plugin     rmp
# audio/x-tta
audio/x-wav     wav
audio/xm     xm
chemical/x-cdx     cdx
chemical/x-cif     cif
chemical/x-cmdf     cmdf
chemical/x-cml     cml
chemical/x-csml     csml
# chemical/x-pdb
chemical/x-xyz     xyz
image/bmp     bmp
image/cgm     cgm
# image/dicom-rle
# image/emf
# image/example
# image/fits
image/g3fax     g3
image/gif     gif
image/ief     ief
# image/jls
# image/jp2
image/jpeg     jpeg jpg jpe
# image/jpm
# image/jpx
image/ktx     ktx
# image/naplps
image/png     png
```

image/prs.btif btif
#
image/prs.pti
image/pwg-raster
image/sgi sgi
image/svg+xml svg svgz
image/t38
image/tiff tiff tif
image/tiff-fx
image/vnd.adobe.photoshop psd
image/vnd.airzip.accelerator.azv
image/vnd.cns.inf2
image/vnd.dece.graphic uvi uvvi uvg uvvg
image/vnd.djvu djvu djv
image/vnd.dvb.subtitle sub
image/vnd.dwg dwg
image/vnd.dxf dxf
image/vnd.fastbidsheet fbs
image/vnd.fpx fpx
image/vnd.fst fst
image/vnd.fujixerox.edmics-mmr mmr
image/vnd.fujixerox.edmics-rlc rlc
image/vnd.globalgraphics.pgb
image/vnd.microsoft.icon
image/vnd.mix
image/vnd.mozilla.apng
image/vnd.ms-modi mdi
image/vnd.ms-photo wdp
image/vnd.net-fpx npx
image/vnd.radiance
image/vnd.sealed.png
image/vnd.sealedmedia.softseal.gif
image/vnd.sealedmedia.softseal.jpg
image/vnd.svf
image/vnd.tencent.tap
image/vnd.valve.source.texture
image/vnd.wap.wbmp wbmp
image/vnd.xiff xif
image/vnd.zbrush.pcx
image/webp webp
image/wmf
image/x-3ds 3ds
image/x-cmu-raster ras
image/x-cmx cmx
image/x-freehand fh
fhc fh4 fh5 fh7
image/x-icon ico
image/x-mrsid-image sid

image/x-pcx pcx
image/x-pict pic pct
image/x-portable-anymap pnm
image/x-portable-bitmap pbm
image/x-portable-graymap pgm
image/x-portable-pixmap ppm
image/x-rgb rgb
image/x-tga tga
image/x-xbitmap xbm
image/x-xpixmap xpm
image/x-xwindowdump xwd
message/cpim
message/delivery-status
message/disposition-notification
message/example
message/external-body
message/feedback-report
message/global
message/global-delivery-status
message/global-disposition-notification
message/global-headers
message/http
message/imdn+xml
message/news
message/partial
message/rfc822 eml mime
message/s-http
message/sip
message/sipfrag
message/tracking-status
message/vnd.si.simp
message/vnd.wfa.wsc
model/example
model/gltf+json
model/iges igs iges
model/mesh msh mesh silo
model/vnd.collada+xml dae
model/vnd.dwf dwf
#
model/vnd.flatland.3dml
model/vnd.gdl gdl
model/vnd.gs-gdl
model/vnd.gs.gdl
model/vnd.gtw gtw
model/vnd.moml+xml
model/vnd.mts mts
model/vnd.opengex
model/vnd.parasolid.transmit.binary

```
# model/vnd.parasolid.transmit.text
# model/vnd.rosette.annotated-data-model
# model/vnd.valve.source.compiled-map
model/vnd.vtu     vtu
model/vrml     wrl vrml
model/x3d+binary    x3db x3dbz
# model/x3d+fastinfoset
model/x3d+vrml     x3dv x3dvz
model/x3d+xml     x3d x3dz
# model/x3d-vrml
# multipart/alternative
# multipart/appledouble
# multipart/byteranges
# multipart/digest
# multipart/encrypted
# multipart/example
# multipart/form-data
# multipart/header-set
# multipart/mixed
# multipart/parallel
# multipart/related
# multipart/report
# multipart/signed
# multipart/voice-message
# multipart/x-mixed-replace
# text/1d-interleaved-parityfec
text/cache-manifest    appcache
text/calendar     ics ifb
text/css     css
text/csv     csv
# text/csv-schema
#
 text/directory
# text/dns
# text/ecmascript
# text/encaprtp
# text/enriched
# text/example
# text/fwdred
# text/grammar-ref-list
text/html     html htm
# text/javascript
# text/jcr-cnd
# text/markdown
# text/mizar
text/n3      n3
# text/parameters
# text/parityfec
```

text/plain txt text conf def list log in
text/provenance-notation
text/prs.fallenstein.rst
text/prs.lines.tag dsc
text/prs.prop.logic
text/raptorfec
text/red
text/rfc822-headers
text/richtext rtx
text/rtf
text/rtp-enc-aescm128
text/rtploopback
text/rtx
text/sgml sgml sgm
text/t140
text/tab-separated-values tsv
text/troff t tr roff man me ms
text/turtle ttl
text/ulpfec
text/uri-list uri uris urls
text/vcard vcard
text/vnd.a
text/vnd.abc
text/vnd.curl curl
text/vnd.curl.dcurl dcurl
text/vnd.curl.mcurl mcurl
text/vnd.curl.scurl scurl
text/vnd.debian.copyright
text/vnd.dmclientscript
text/vnd.dvb.subtitle sub
text/vnd.esmertec.theme-descriptor
text/vnd.fly fly
text/vnd.fmi.flexstor flx
text/vnd.graphviz gv
text/vnd.in3d.3dml 3dml
text/vnd.in3d.spot spot
#
text/vnd.iptc.newsml
text/vnd.iptc.nitf
text/vnd.latex-z
text/vnd.motorola.reflex
text/vnd.ms-mediapackage
text/vnd.net2phone.commcenter.command
text/vnd.radisys.msml-basic-layout
text/vnd.si.uricatalogue
text/vnd.sun.j2me.app-descriptor jad
text/vnd.trolltech.linguist
text/vnd.wap.si

```
# text/vnd.wap.sl
text/vnd.wap.wml    wml
text/vnd.wap.wmlscript    wmls
text/x-asm     s asm
text/x-c     c cc cxx cpp h hh dic
text/x-fortran     f for f77 f90
text/x-java-source    java
text/x-nfo     nfo
text/x-opml     opml
text/x-pascal     p pas
text/x-setext     etx
text/x-sfv     sfv
text/x-uuencode     uu
text/x-vcalendar    vcs
text/x-vcard     vcf
# text/xml
# text/xml-external-parsed-entity
# video/1d-interleaved-parityfec
video/3gpp     3gp
# video/3gpp-tt
video/3gpp2     3g2
# video/bmpeg
# video/bt656
# video/celb
# video/dv
# video/encaprtp
#
 video/example
video/h261     h261
video/h263     h263
# video/h263-1998
# video/h263-2000
video/h264     h264
# video/h264-rcdo
# video/h264-svc
# video/h265
# video/iso.segment
video/jpeg     jpgv
# video/jpeg2000
video/jpm     jpm jpgm
video/mj2     mj2 mjp2
# video/mp1s
# video/mp2p
# video/mp2t
video/mp4     mp4 mp4v mpg4
# video/mp4v-es
video/mpeg     mpeg mpg mpe m1v m2v
# video/mpeg4-generic
```

```
# video/mpv
# video/nv
video/ogg     ogv
# video/parityfec
# video/pointer
video/quicktime     qt mov
# video/raptorfec
# video/raw
# video/rtp-enc-aescm128
# video/rtploopback
# video/rtx
# video/smpte292m
# video/ulpfec
# video/vc1
# video/vnd.cctv
video/vnd.dece.hd    uvh uvvh
video/vnd.dece.mobile    uvm uvvm
# video/vnd.dece.mp4
video/vnd.dece.pd    uvp uvvp
video/vnd.dece.sd    uvs uvvs
video/vnd.dece.video    uvv uvvv
# video/vnd.directv.mpeg
# video/vnd.directv.mpeg-tts
# video/vnd.dlna.mpeg-tts
video/vnd.dvb.file    dvb
video/vnd.fvt     fvt
# video/vnd.hns.video
# video/vnd.iptvforum.1dparityfec-1010
#
 video/vnd.iptvforum.1dparityfec-2005
# video/vnd.iptvforum.2dparityfec-1010
# video/vnd.iptvforum.2dparityfec-2005
# video/vnd.iptvforum.ttsavc
# video/vnd.iptvforum.ttsmpeg2
# video/vnd.motorola.video
# video/vnd.motorola.videop
video/vnd.mpegurl    mxu m4u
video/vnd.ms-playready.media.pyv  pyv
# video/vnd.nokia.interleaved-multimedia
# video/vnd.nokia.videovoip
# video/vnd.objectvideo
# video/vnd.radgamettools.bink
# video/vnd.radgamettools.smacker
# video/vnd.sealed.mpeg1
# video/vnd.sealed.mpeg4
# video/vnd.sealed.swf
# video/vnd.sealedmedia.softseal.mov
video/vnd.uvvu.mp4    uvu uvvu
```

video/vnd.vivo viv
video/vp8
video/webm webm
video/x-f4v f4v
video/x-fli fli
video/x-flv flv
video/x-m4v m4v
video/x-matroska mkv mk3d mks
video/x-mng mng
video/x-ms-asf asf asx
video/x-ms-vob vob
video/x-ms-wm wm
video/x-ms-wmv wmv
video/x-ms-wmx wmx
video/x-ms-wvx wvx
video/x-msvideo avi
video/x-sgi-movie movie
video/x-smv smv
x-conference/x-cooltalk ice

Found
in path(s):
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/mime.types
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* /spring-web-5-2-20-release-sources-jar/org/springframework/remoting/jaxws/JaxWsSoapFaultException.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/remoting/httpinvoker/HttpInvokerClientConfiguration.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/HttpMediaTypeNotAcceptableException.java
*

/spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/annotation/ValueConstants.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/ServletRequestBindingException.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/context/ConfigurableWebEnvironment.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/IntrospectorCleanupListener.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/context/support/SpringBeanAutowiringSupport.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/annotation/InitBinder.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/jsf/DecoratingNavigationHandler.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/jsf/DelegatingPhaseListenerMulticaster.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/client/AbstractClientHttpResponse.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/MediaTypeEditor.java
*
/spring-web-5-2-20-release-sources-
jar/org/springframework/web/bind/MissingServletRequestParameterException.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/support/SimpleSessionStatus.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/client/ResourceAccessException.java
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Found in path(s):
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/pattern/LiteralPathElement.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/ResponseEntity.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/pattern/CaptureTheRestPathElement.java
*
/spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/annotation/CookieValue.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/pattern/WildcardPathElement.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/MediaTypeFactory.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/pattern/SeparatorPathElement.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/util/pattern/SingleCharWildcardedPathElement.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/server/DefaultPathContainer.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/UrlPathHelper.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/pattern/PathPattern.java

* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/UriComponents.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/pattern/WildcardTheRestPathElement.java
*
 /spring-web-5-2-20-release-sources-
jar/org/springframework/web/server/handler/ResponseStatusExceptionHandler.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/method/HandlerTypePredicate.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/client/DefaultResponseErrorHandler.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/pattern/RegexPathElement.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/support/WebRequestDataBinder.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/method/annotation/ModelAttributeMethodProcessor.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/server/reactive/JettyHeadersAdapter.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/pattern/CaptureVariablePathElement.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/http/codec/multipart/SynchronossPartHttpMessageReader.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/server/PathContainer.java
*
 /spring-web-5-2-20-release-sources-jar/org/springframework/web/cors/CorsConfiguration.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/server/adapter/HttpWebHandlerAdapter.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/server/ResponseStatusException.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/UriComponentsBuilder.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/method/support/CompositeUriComponentsContributor.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/pattern/PatternParseException.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/support/WebExchangeDataBinder.java
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Found in path(s):
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/context/ServletContextAware.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/http/server/reactive/UndertowHttpHandlerAdapter.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/server/reactive/UndertowHeadersAdapter.java

*
/spring-web-5-2-20-release-sources-jar/org/springframework/http/HttpOutputMessage.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/http/converter/xml/Jaxb2CollectionHttpMessageConverter.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/server/reactive/ReactorHttpHandlerAdapter.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/HttpRequestMethodNotSupportedException.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/http/client/HttpComponentsAsyncClientHttpRequestFactory.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/method/annotation/RequestParamMapMethodArgumentResolver.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/OpaqueUriComponents.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/client/support/RestGatewaySupport.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/codec/CodecConfigurerFactory.java
*
/spring-web-5-2-20-release-sources-jar/org/springframework/http/HttpRequest.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/remoting/caucho/HessianServiceExporter.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/bind/support/ConfigurableWebBindingInitializer.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/WebApplicationInitializer.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/http/server/reactive/AbstractListenerServerHttpResponse.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/server/session/HeaderWebSessionIdResolver.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/client/AsyncRestTemplate.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/context/support/StandardServletEnvironment.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/remoting/jaxws/SimpleJaxWsServiceExporter.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/context/request/async/WebAsyncUtils.java
*
/spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/MissingMatrixVariableException.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/server/reactive/DefaultSslInfo.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/client/reactive/JettyResourceFactory.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/method/support/HandlerMethodReturnValueHandlerComposite.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/filter/FormContentFilter.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/CookieGenerator.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/annotation/RequestPart.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/client/support/AsyncHttpAccessor.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/client/reactive/ClientHttpRequest.java
*
/spring-web-5-2-20-release-sources-jar/org/springframework/web/multipart/support/MultipartFilter.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/method/annotation/InitBinderDataBinderFactory.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/method/annotation/RequestHeaderMethodArgumentResolver.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/ContentCachingRequestWrapper.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/codec/ServerSentEvent.java

* /spring-web-5-2-20-release-sources-jar/org/springframework/http/converter/GenericHttpMessageConverter.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/util/UriTemplateHandler.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/server/reactive/SslInfo.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/HttpEntity.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/client/SimpleBufferingClientHttpRequest.java
*
/spring-web-5-2-20-release-sources-jar/org/springframework/http/codec/protobuf/ProtobufCodecSupport.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/SpringServletContainerInitializer.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/annotation/RequestBody.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/http/client/InterceptingAsyncClientHttpRequestFactory.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/HttpInputMessage.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/method/support/ModelAndViewContainer.java
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jar/org/springframework/web/context/support/StaticWebApplicationContext.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/method/support/HandlerMethodReturnValueHandler.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/filter/DelegatingFilterProxy.java
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* /spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/annotation/PostMapping.java
*
 /spring-web-5-2-20-release-sources-jar/org/springframework/http/ReactiveHttpOutputMessage.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/server/session/WebSessionIdResolver.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/context/support/ServletContextLiveBeansView.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/cors/reactive/CorsConfigurationSource.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/remoting/httpinvoker/HttpInvokerRequestExecutor.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/annotation/DeleteMapping.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/context/request/async/TimeoutDeferredResultProcessingInterceptor.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/context/WebApplicationContext.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/annotation/ModelAttribute.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/context/annotation/SessionScope.java
*
 /spring-web-5-2-20-release-sources-jar/org/springframework/web/multipart/MultipartRequest.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/annotation/RequestAttribute.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/annotation/SessionAttribute.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/HttpRequestHandler.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/converter/json/SpringHandlerInstantiator.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/context/request/SessionScope.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/support/WebBindingInitializer.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/context/annotation/RequestScope.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/context/request/FacesWebRequest.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/client/ClientHttpRequestFactory.java
*
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/spring-web-5-2-20-release-sources-jar/org/springframework/web/util/WebAppRootListener.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/context/request/WebRequestInterceptor.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/server/WebHandler.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/context/request/RequestScope.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/client/ClientHttpRequestExecution.java
* /spring-web-5-2-20-release-sources-
jar/org/springframework/web/method/annotation/RequestHeaderMapMethodArgumentResolver.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/annotation/GetMapping.java
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jar/org/springframework/web/context/request/async/AsyncRequestTimeoutException.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/annotation/PatchMapping.java
*
/spring-web-5-2-20-release-sources-jar/org/springframework/web/context/annotation/ApplicationScope.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/http/ReactiveHttpInputMessage.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/context/request/RequestContextHolder.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/bind/annotation/PutMapping.java
* /spring-web-5-2-20-release-sources-jar/org/springframework/web/server/session/WebSessionManager.java
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1.427 spring-aop 5.2.20.RELEASE

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jar/org/springframework/aop/target/dynamic/BeanFactoryRefreshableTargetSource.java
*
/spring-aop-5-2-20-release-sources-jar/org/springframework/aop/AopInvocationException.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/config/PointcutComponentDefinition.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/target/PoolingConfig.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/interceptor/ConcurrencyThrottleInterceptor.java
* /spring-aop-5-2-20-release-sources-
jar/org/springframework/aop/framework/adapter/MethodBeforeAdviceAdapter.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/framework/AopProxyFactory.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/target/SimpleBeanTargetSource.java

* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/framework/adapter/UnknownAdviceTypeException.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/support/DynamicMethodMatcherPointcut.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/target/ThreadLocalTargetSourceStats.java
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* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/support/StaticMethodMatcherPointcut.java
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jar/org/springframework/aop/support/annotation/AnnotationMatchingPointcut.java
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* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/MethodMatcher.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/framework/AopProxyUtils.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/support/NameMatchMethodPointcut.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/aspectj/TypePatternClassFilter.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/support/Pointcuts.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/aspectj/AspectJProxyUtils.java
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jar/org/springframework/aop/support/annotation/AnnotationMethodMatcher.java
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* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/framework/AdvisedSupportListener.java

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* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/SpringProxy.java
* /spring-aop-5-2-20-release-sources-
jar/org/springframework/aop/framework/InterceptorAndDynamicMethodMatcher.java
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* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/target/AbstractPoolingTargetSource.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/TruePointcut.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/support/AbstractRegexpMethodPointcut.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/framework/AdvisorChainFactory.java
* /spring-aop-5-2-20-release-sources-
jar/org/springframework/aop/aspectj/annotation/BeanFactoryAspectInstanceFactory.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/target/AbstractLazyCreationTargetSource.java
* /spring-aop-5-2-20-release-sources-
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* /spring-aop-5-2-20-release-sources-
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* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/interceptor/AsyncExecutionInterceptor.java
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* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/support/StaticMethodMatcher.java
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* /spring-aop-5-2-20-release-sources-jar/org/aopalliance/intercept/ConstructorInvocation.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/framework/Advised.java
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* /spring-aop-5-2-20-release-sources-jar/org/aopalliance/aop/AspectException.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/target/EmptyTargetSource.java

* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/interceptor/ExposeBeanNameAdvisors.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/aspectj/SimpleAspectInstanceFactory.java
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* /spring-aop-5-2-20-release-sources-
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* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/aspectj/AspectJPointcutAdvisor.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/framework/adapter/AdvisorAdapterRegistry.java
*
/spring-aop-5-2-20-release-sources-jar/org/springframework/aop/scope/ScopedProxyFactoryBean.java
* /spring-aop-5-2-20-release-sources-
jar/org/springframework/aop/framework/autoproxy/AbstractBeanFactoryAwareAdvisingPostProcessor.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/MethodBeforeAdvice.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/framework/ProxyCreatorSupport.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/support/DynamicMethodMatcher.java
* /spring-aop-5-2-20-release-sources-
jar/org/springframework/aop/target/AbstractBeanFactoryBasedTargetSource.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/config/ConfigBeanDefinitionParser.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/config/AopNamespaceUtils.java
* /spring-aop-5-2-20-release-sources-
jar/org/springframework/aop/support/StaticMethodMatcherPointcutAdvisor.java
* /spring-aop-5-2-20-release-sources-
jar/org/springframework/aop/framework/adapter/GlobalAdvisorAdapterRegistry.java
*
/spring-aop-5-2-20-release-sources-jar/org/springframework/aop/TrueClassFilter.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/interceptor/AsyncExecutionAspectSupport.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/target/AbstractPrototypeBasedTargetSource.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/aspectj/DeclareParentsAdvisor.java
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* /spring-aop-5-2-20-release-sources-
jar/org/springframework/aop/framework/autoproxy/AbstractAutoProxyCreator.java
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jar/org/springframework/aop/aspectj/annotation/AbstractAspectJAdvisorFactory.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/framework/DefaultAopProxyFactory.java
* /spring-aop-5-2-20-release-sources-jar/org/aopalliance/intercept/Joinpoint.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/support/DefaultIntroductionAdvisor.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/DynamicIntroductionAdvice.java
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* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/aspectj/AspectJMethodBeforeAdvice.java
*
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* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/aspectj/AspectJAfterAdvice.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/ProxyMethodInvocation.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/aspectj/SingletonAspectInstanceFactory.java
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jar/org/springframework/aop/aspectj/annotation/PrototypeAspectInstanceFactory.java
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jar/org/springframework/aop/aspectj/MethodInvocationProceedingJoinPoint.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/interceptor/ExposeInvocationInterceptor.java
*
 /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/config/AspectEntry.java
* /spring-aop-5-2-20-release-sources-

jar/org/springframework/aop/aspectj/autoproxy/AspectJPrecedenceComparator.java
* /spring-aop-5-2-20-release-sources-
jar/org/springframework/aop/aspectj/annotation/BeanFactoryAspectJAdvisorsBuilder.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/interceptor/AbstractMonitoringInterceptor.java
* /spring-aop-5-2-20-release-sources-
jar/org/springframework/aop/aspectj/autoproxy/AspectJAwareAdvisorAutoProxyCreator.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/config/AdviceEntry.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/config/AdvisorEntry.java
* /spring-aop-5-2-20-release-sources-
jar/org/springframework/aop/aspectj/AspectJAdviceParameterNameDiscoverer.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/framework/AopContext.java
* /spring-aop-5-2-20-release-sources-
jar/org/springframework/aop/aspectj/annotation/ReflectiveAspectJAdvisorFactory.java
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jar/org/springframework/aop/framework/adapter/MethodBeforeAdviceInterceptor.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/config/PointcutEntry.java
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* /spring-aop-5-2-20-release-sources-jar/org/aopalliance/aop/Advice.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/framework/autoproxy/TargetSourceCreator.java
* /spring-aop-5-2-20-release-sources-jar/org/aopalliance/intercept/ConstructorInterceptor.java
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/spring-aop-5-2-20-release-sources-jar/org/springframework/aop/framework/ProxyFactory.java
* /spring-aop-5-2-20-release-sources-
jar/org/springframework/aop/aspectj/annotation/MetadataAwareAspectInstanceFactory.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/aspectj/AspectJAfterReturningAdvice.java

* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/target/ThreadLocalTargetSource.java
* /spring-aop-5-2-20-release-sources-jar/org/aopalliance/intercept/MethodInvocation.java
* /spring-aop-5-2-20-release-sources-
jar/org/springframework/aop/aspectj/annotation/SingletonMetadataAwareAspectInstanceFactory.java
* /spring-aop-5-2-20-release-sources-
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* /spring-aop-5-2-20-release-sources-
jar/org/springframework/aop/config/AbstractInterceptorDrivenBeanDefinitionDecorator.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/support/ExpressionPointcut.java
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* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/interceptor/SimpleTraceInterceptor.java
* /spring-aop-5-2-20-release-sources-

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jar/org/springframework/aop/framework/autoproxy/BeanNameAutoProxyCreator.java
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* /spring-aop-5-2-20-release-sources-
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* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/config/AspectComponentDefinition.java
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* /spring-aop-5-2-20-release-sources-
jar/org/springframework/aop/aspectj/annotation/LazySingletonAspectInstanceFactoryDecorator.java
* /spring-aop-5-2-20-release-sources-jar/org/springframework/aop/support/DelegatingIntroductionInterceptor.java
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1.428 spring-tx 5.2.20.RELEASE

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/spring-tx-5-2-20-release-sources-jar/org/springframework/jca/context/BootstrapContextAware.java
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* /spring-tx-5-2-20-release-sources-jar/org/springframework/jca/endpoint/GenericMessageEndpointManager.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/jca/cci/core/support/CciDaoSupport.java
* /spring-tx-5-2-20-release-sources-

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* /spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/jta/WebLogicJtaTransactionManager.java
* /spring-tx-5-2-20-release-sources-
jar/org/springframework/transaction/config/AnnotationDrivenBeanDefinitionParser.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/jca/cci/connection/CciLocalTransactionManager.java
* /spring-tx-5-2-20-release-sources-
jar/org/springframework/transaction/annotation/TransactionManagementConfigurationSelector.java
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/spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/support/TransactionSynchronization.java
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jar/org/springframework/transaction/support/ResourceTransactionDefinition.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/jca/cci/core/RecordExtractor.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/jca/cci/core/CciTemplate.java
* /spring-tx-5-2-20-release-sources-
jar/org/springframework/transaction/interceptor/AbstractFallbackTransactionAttributeSource.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/support/TransactionCallback.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/interceptor/RollbackRuleAttribute.java
* /spring-tx-5-2-20-release-sources-
jar/org/springframework/jca/cci/connection/TransactionAwareConnectionFactoryProxy.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/jca/cci/object/SimpleRecordOperation.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/InvalidTimeoutException.java
*
/spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/interceptor/DefaultTransactionAttribute.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/jca/cci/CannotGetCciConnectionException.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/support/SimpleTransactionStatus.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/support/TransactionTemplate.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/jta/SpringJtaSynchronizationAdapter.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/jca/support/LocalConnectionFactoryBean.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/jca/cci/RecordTypeNotSupportedException.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/jca/endpoint/GenericMessageEndpointFactory.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/jca/cci/connection/SingleConnectionFactory.java
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/spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/jta/JtaTransactionManager.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/jca/cci/connection/ConnectionHolder.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/support/ResourceHolderSupport.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/HeuristicCompletionException.java
* /spring-tx-5-2-20-release-sources-
jar/org/springframework/transaction/support/ResourceHolderSynchronization.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/dao/support/DataAccessUtils.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/annotation/Isolation.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/support/DefaultTransactionDefinition.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/jca/cci/CannotCreateRecordException.java
*
/spring-tx-5-2-20-release-sources-jar/org/springframework/jca/cci/CciOperationNotSupportedException.java
* /spring-tx-5-2-20-release-sources-
jar/org/springframework/transaction/interceptor/NameMatchTransactionAttributeSource.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/jca/cci/core/ConnectionCallback.java
* /spring-tx-5-2-20-release-sources-

jar/org/springframework/dao/support/ChainedPersistenceExceptionTranslator.java
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jar/org/springframework/transaction/config/TransactionManagementConfigUtils.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/jca/work/SimpleTaskWorkManager.java
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jar/org/springframework/transaction/interceptor/MatchAlwaysTransactionAttributeSource.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/jca/cci/object/MappingCommAreaOperation.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/jca/context/SpringContextResourceAdapter.java
*
/spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/jta/JtaTransactionObject.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/jta/SimpleTransactionFactory.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/jca/cci/connection/ConnectionFactoryUtils.java
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* /spring-tx-5-2-20-release-sources-
jar/org/springframework/transaction/jta/JtaAfterCompletionSynchronization.java
*
/spring-tx-5-2-20-release-sources-jar/org/springframework/dao/DuplicateKeyException.java
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* /spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/config/TxNamespaceHandler.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/jca/cci/connection/NotSupportedRecordFactory.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/jca/work/DelegatingWork.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/TransactionUsageException.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/dao/DataIntegrityViolationException.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/InvalidIsolationLevelException.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/dao/PessimisticLockingFailureException.java

* /spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/support/ResourceTransactionManager.java
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/spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/IllegalTransactionStateException.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/TransactionTimedOutException.java
* /spring-tx-5-2-20-release-sources-
jar/org/springframework/dao/annotation/PersistenceExceptionTranslationAdvisor.java
* /spring-tx-5-2-20-release-sources-
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* /spring-tx-5-2-20-release-sources-jar/org/springframework/dao/TypeMismatchDataAccessException.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/dao/CannotAcquireLockException.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/dao/InvalidDataAccessResourceUsageException.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/dao/DeadlockLoserDataAccessException.java
* /spring-tx-5-2-20-release-sources-
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* /spring-tx-5-2-20-release-sources-
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* /spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/NoTransactionException.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/dao/TransientDataAccessResourceException.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/CannotCreateTransactionException.java
*
/spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/UnexpectedRollbackException.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/dao/QueryTimeoutException.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/dao/CleanupFailureDataAccessException.java
* /spring-tx-5-2-20-release-sources-
jar/org/springframework/transaction/interceptor/TransactionAttributeSourceEditor.java
* /spring-tx-5-2-20-release-sources-jar/org/springframework/transaction/jta/UserTransactionAdapter.java
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* /spring-beans-5-2-20-release-sources-
jar/org/springframework/beans/factory/config/YamlPropertiesFactoryBean.java
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 /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/TypeConverterDelegate.java
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/xml/ResourceEntityResolver.java
* /spring-beans-5-2-20-release-sources-
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/BeanMetadataElement.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/config/BeanDefinitionVisitor.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/config/BeanPostProcessor.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/annotation/Autowired.java
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/xml/PluggableSchemaResolver.java
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/xml/BeansDtdResolver.java
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/ExtendedBeanInfo.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/propertyeditors/CustomMapEditor.java
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/spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/config/BeanFactoryPostProcessor.java
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* /spring-beans-5-2-20-release-sources-
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/propertyeditors/CustomCollectionEditor.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/PropertyBatchUpdateException.java
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/parsing/PassThroughSourceExtractor.java
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/xml/DocumentLoader.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/support/MutableSortDefinition.java
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/config/PropertyResourceConfigurer.java
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/propertyeditors/CharsetEditor.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/config/BeanReference.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/xml/SimplePropertyNamespaceHandler.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/HierarchicalBeanFactory.java
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/parsing/ProblemReporter.java
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 /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/BeanIsNotAFactoryException.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/wiring/ClassNameBeanWiringInfoResolver.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/annotation/Configurable.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/PropertyEditorRegistrar.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/BeanIsAbstractException.java
* /spring-beans-5-2-20-release-sources-

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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/PropertyEditorRegistry.java
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* /spring-beans-5-2-20-release-sources-
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/xml/BeanDefinitionDecorator.java
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/spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/support/MethodReplacer.java
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* /spring-beans-5-2-20-release-sources-
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/support/SortDefinition.java
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/propertyeditors/TimeZoneEditor.java
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jar/org/springframework/beans/factory/groovy/GroovyDynamicElementReader.groovy
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/ListableBeanFactory.java
* /spring-beans-5-2-20-release-sources-
jar/org/springframework/beans/factory/support/CglibSubclassingInstantiationStrategy.java
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/AbstractPropertyAccessor.java
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/parsing/ParseState.java
* /spring-beans-5-2-20-release-sources-
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/parsing/QualifierEntry.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/DirectFieldAccessor.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/support/BeanDefinitionDefaults.java
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* /spring-beans-5-2-20-release-sources-
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/config/BeanDefinition.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/support/ReplaceOverride.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/BeanWrapperImpl.java
* /spring-beans-5-2-20-release-sources-
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* /spring-beans-5-2-20-release-sources-
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* /spring-beans-5-2-20-release-sources-
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/spring-beans-5-2-20-release-sources-
jar/org/springframework/beans/factory/support/AutowireCandidateResolver.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/BeanUtils.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/annotation/Lookup.java
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/NotReadablePropertyException.java
* /spring-beans-5-2-20-release-sources-
jar/org/springframework/beans/factory/xml/AbstractSimpleBeanDefinitionParser.java
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/InitializingBean.java
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/config/AbstractFactoryBean.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/config/CustomEditorConfigurer.java
* /spring-beans-5-2-20-release-sources-
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* /spring-beans-5-2-20-release-sources-
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* /spring-beans-5-2-20-release-sources-
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/PropertyValues.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/support/ManagedArray.java
* /spring-beans-5-2-20-release-sources-
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/PropertyAccessor.java
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/propertyeditors/CustomDateEditor.java
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/annotation/AnnotationBeanWiringInfoResolver.java
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/InvalidPropertyException.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/xml/DefaultDocumentLoader.java
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/CannotLoadBeanClassException.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/support/AutowireCandidateQualifier.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/propertyeditors/CustomBooleanEditor.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/annotation/RequiredAnnotationBeanPostProcessor.java
*
 /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/UnsatisfiedDependencyException.java
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* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/PropertyValuesEditor.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/parsing/ReaderEventListener.java
*

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jar/org/springframework/beans/factory/xml/BeanDefinitionDocumentReader.java
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```
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* /spring-beans-5-2-20-release-sources-
jar/org/springframework/beans/factory/xml/NamespaceHandlerResolver.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/propertyeditors/ReaderEditor.java
*
 /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/NamedBean.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/propertyeditors/FileEditor.java
* /spring-beans-5-2-20-release-sources-
jar/org/springframework/beans/factory/serviceloader/ServiceListFactoryBean.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/parsing/SourceExtractor.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/NullValueInNestedPathException.java
* /spring-beans-5-2-20-release-sources-
jar/org/springframework/beans/factory/support/ImplicitlyAppearedSingletonException.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/config/Scope.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/support/ResourceEditorRegistrar.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/xml/UtilNamespaceHandler.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/BeanInitializationException.java
*
 /spring-beans-5-2-20-release-sources-
jar/org/springframework/beans/factory/config/SmartInstantiationAwareBeanPostProcessor.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/propertyeditors/URLEditor.java
* /spring-beans-5-2-20-release-sources-
jar/org/springframework/beans/factory/config/BeanDefinitionCustomizer.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/propertyeditors/ZoneIdEditor.java
* /spring-beans-5-2-20-release-sources-jar/org/springframework/beans/factory/BeanNameAware.java
```

1.430 tzlocal 4.2

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1.434 pcre 8.39-12build1

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This is Debian GNU/Linux's prepackaged version of the PCRE regular
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This package was put together by me, Mark Baker <mbaker@iee.org> from the
original sources obtained from ftp.csx.cam.ac.uk:/pub/software/programming/pcre.

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Written by: Philip Hazel
Email local part: ph10
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1.435 glibc 2.28-10+deb10u1

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1.446 glibc 2.31-0ubuntu9.9

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1.449 spring-webflux 5.2.20.RELEASE

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1.454 sqlite 3.13.0

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* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/access/expression/WebExpressionVoter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/authentication/preauth/RequestAttributeAuthenticationFilter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/context/package-info.java
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 /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/authentication/logout/package-info.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/authentication/session/SessionAuthenticationStrategy.java
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* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/authentication/preauth/PreAuthenticatedGrantedAuthoritiesWebAuthenticationDetails.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/context/SecurityContextRepository.java
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* /spring-security-web-5-4-10-sources-
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* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/savedrequest/SavedCookie.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/AuthenticationSuccessHandler.java
*
/spring-security-web-5-4-10-sources-jar/org/springframework/security/web/header/Header.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/authentication/preauth/package-
info.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/preauth/x509/X509AuthenticationFilter.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/savedrequest/HttpSessionRequestCache.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/savedrequest/NullRequestCache.java

* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/access/expression/package-info.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/util/matcher/RegexRequestMatcher.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/session/SimpleRedirectInvalidSessionStrategy.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/firewall/RequestRejectedException.java
*
/spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/preauth/PreAuthenticatedGrantedAuthoritiesUserDetailsServic
e.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/savedrequest/RequestCache.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/rememberme/PersistentRememberMeToken.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/util/matcher/AndRequestMatcher.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/firewall/FirewalledRequest.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/session/SimpleRedirectSessionInformationExpiredStrategy.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/servletapi/HttpServletRequestFactory.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/access/expression/WebSecurityExpressionRoot.java
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/spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/header/writers/frameoptions/AbstractRequestParameterAllowFromStrategy.ja
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* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/Http403ForbiddenEntryPoint.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/context/HttpRequestResponseHolder.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/access/expression/DefaultWebSecurityExpressionHandler.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/servletapi/HttpServlet3RequestFactory.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/util/OnCommittedResponseWrapper.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/preauth/PreAuthenticatedAuthenticationProvider.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/context/NullSecurityContextRepository.java
*
/spring-security-web-5-4-10-sources-jar/org/springframework/security/web/session/InvalidSessionStrategy.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/session/RegisterSessionAuthenticationStrategy.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/util/TextEscapeUtils.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/logout/CompositeLogoutHandler.java
* /spring-security-web-5-4-10-sources-

jar/org/springframework/security/web/authentication/rememberme/InvalidCookieException.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/RedirectStrategy.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/preauth/PreAuthenticatedAuthenticationToken.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/switchuser/SwitchUserAuthorityChanger.java
*
/spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/savedrequest/RequestCacheAwareFilter.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/access/channel/AbstractRetryEntryPoint.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/context/SecurityContextPersistenceFilter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/access/intercept/package-info.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/savedrequest/SavedRequest.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/session/SessionManagementFilter.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/preauth/x509/X509PrincipalExtractor.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/rememberme/InMemoryTokenRepositoryImpl.java
*
/spring-security-web-5-4-10-sources-jar/org/springframework/security/web/savedrequest/package-info.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/AuthenticationFailureHandler.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/util/RedirectUrlBuilder.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/DefaultRedirectStrategy.java
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* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/authentication/logout/LogoutWebFilter.java
*
/spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/DefaultServerRedirectStrategy.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/util/matcher/AndServerWebExchangeMatcher.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/savedrequest/CookieServerRequestCache.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/context/WebSessionServerSecurityContextRepository.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/firewall/RequestRejectedHandler.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/session/HttpSessionIdChangedEvent.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/authentication/AuthenticationConverterServerWebExchangeMatcher.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/DelegatingServerAuthenticationEntryPoint.java
*
/spring-security-web-5-4-10-sources-jar/org/springframework/security/web/authentication/session/SessionFixationProtectionStrategy.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/savedrequest/WebSessionServerRequestCache.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/firewall/HttpStatusRequestRejectedHandler.java
* /spring-security-web-5-4-10-sources-

jar/org/springframework/security/web/firewall/DefaultRequestRejectedHandler.java
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jar/org/springframework/security/web/server/authorization/DelegatingReactiveAuthorizationManager.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/server/util/matcher/PathPatternParserServerWebExchangeMatcher.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/server/authentication/SwitchUserWebFilter.java
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/spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/server/authentication/AnonymousAuthenticationWebFilter.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/savedrequest/CookieRequestCache.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/server/util/matcher/OrServerWebExchangeMatcher.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/server/authentication/AuthenticationWebFilter.java
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* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/access/DefaultWebInvocationPrivilegeEvaluator.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/csrf/MissingCsrfTokenException.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/context/HttpSessionSecurityContextRepository.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/csrf/CsrfWebFilter.java
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* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/access/expression/AbstractVariableEvaluationContextPostProcessor.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/authentication/DelegatingAuthenticationFailureHandler.java
*
 /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/access/DelegatingAccessDeniedHandler.java
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* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/session/SessionInformationExpiredEvent.java
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/spring-security-web-5-4-10-sources-jar/org/springframework/security/web/access/expression/DelegatingEvaluationContext.java

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* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/util/matcher/MediaTypeServerWebExchangeMatcher.java
*
 /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/header/ServerHttpHeadersWriter.java
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* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/csrf/CsrfException.java
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* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/util/matcher/ServerWebExchangeMatchers.java

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* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/authentication/HttpBasicServerAuthenticationEntryPoint.java
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* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/savedrequest/ServerRequestCacheWebFilter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/authentication/ServerAuthenticationFailureHandler.java
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* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/authentication/logout/ServerLogoutSuccessHandler.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/authorization/ExceptionTranslationWebFilter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/ServerFormLoginAuthenticationConverter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/authorization/AuthorizationContext.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/authentication/RedirectServerAuthenticationFailureHandler.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/csrf/DefaultCsrfToken.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/authorization/HttpStatusServerAccessDeniedHandler.java
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 /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/ServerAuthenticationEntryPoint.java
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* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/csrf/CsrfToken.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/context/ServerSecurityContextRepository.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/authentication/rememberme/PersistentTokenBasedRememberMeServices.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/WebFilterExchange.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/authentication/RedirectServerAuthenticationEntryPoint.java
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* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/DelegatingAuthenticationEntryPoint.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/util/matcher/ELRequestMatcher.java
*
 /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/jaasapi/JaasApiIntegrationFilter.java
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* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/servlet/support/csrf/CsrfRequestDataValueProcessor.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/csrf/CsrfAuthenticationStrategy.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/csrf/CsrfToken.java
*
 /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/method/annotation/CsrfTokenArgumentResolver.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/bind/annotation/AuthenticationPrincipal.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/bind/support/AuthenticationPrincipalArgumentResolver.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/authentication/session/AbstractSessionFixationProtectionStrategy.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/csrf/HttpSessionCsrfTokenRepository.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/authentication/session/CompositeSessionAuthenticationStrategy.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/header/writers/DelegatingRequestMatcherHeaderWriter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/header/HeaderWriter.java
*
 /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/csrf/CsrfTokenRepository.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/header/writers/XContentTypeOptionsHeaderWriter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/method/annotation/AuthenticationPrincipalArgumentResolver.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/util/matcher/AnyRequestMatcher.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/authentication/session/SessionFixationProtectionEvent.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/csrf/CsrfException.java
* /spring-security-web-5-4-10-sources-

jar/org/springframework/security/web/context/AbstractSecurityWebApplicationInitializer.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/csrf/CsrfLogoutHandler.java
*
/spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/session/InvalidSessionAccessDeniedHandler.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/csrf/InvalidCsrfTokenException.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/csrf/DefaultCsrfToken.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/session/ChangeSessionIdAuthenticationStrategy.java
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jar/org/springframework/security/web/server/csrf/CsrfServerLogoutHandler.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/preauth/AbstractPreAuthenticatedProcessingFilter.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/ExceptionMappingAuthenticationFailureHandler.java
*
/spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/server/header/ReferrerPolicyServerHttpHeadersWriter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/http/SecurityHeaders.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/context/request/async/SecurityContextCallableProcessingInterceptor.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/server/authentication/HttpStatusServerEntryPoint.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/server/header/ContentSecurityPolicyServerHttpHeadersWriter.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/server/authentication/ServerHttpBasicAuthenticationConverter.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/access/RequestMatcherDelegatingAccessDeniedHandler.java

*
/spring-security-web-5-4-10-sources-jar/org/springframework/security/web/reactive/result/method/annotation/AuthenticationPrincipalArgumentResolver.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/authentication/ForwardAuthenticationFailureHandler.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/header/FeaturePolicyServerHttpHeadersWriter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/authentication/DelegatingServerAuthenticationSuccessHandler.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/authentication/ForwardAuthenticationSuccessHandler.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/authentication/ui/DefaultLoginPageGeneratingFilter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/authentication/ServerX509AuthenticationConverter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/MatcherSecurityWebFilterChain.java
*
/spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/authentication/logout/HttpStatusReturningServerLogoutSuccessHandler.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/firewall/FirewalledResponse.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/authentication/ServerAuthenticationConverter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/authentication/SimpleUrlAuthenticationFailureHandler.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/authentication/ui/DefaultLogoutPageGeneratingFilter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/header/writers/CacheControlHeadersWriter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/header/XXssProtectionServerHttpHeadersWriter.java
*
/spring-security-web-5-4-10-sources-jar/org/springframework/security/web/reactive/result/view/CsrfRequestDataValueProcessor.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/authentication/ServerFormLoginAuthenticationConverter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/authorization/ServerWebExchangeDelegatingServerAccessDeniedHandler.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/authentication/logout/DelegatingServerLogoutHandler.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/authentication/logout/ForwardLogoutSuccessHandler.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/ServerHttpBasicAuthenticationConverter.java

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* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/session/SessionInformationExpiredStrategy.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/jackson2/SavedCookieMixin.java
*
 /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/jackson2/CookieMixin.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/jackson2/DefaultCsrfTokenMixin.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/jackson2/DefaultSavedRequestMixin.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/jackson2/PreAuthenticatedAuthenticationTokenMixin.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/jackson2/WebServletJackson2Module.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/jackson2/WebAuthenticationDetailsMixin.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/jackson2/CookieDeserializer.java
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* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/util/matcher/IpAddressMatcher.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/authentication/logout/LogoutSuccessEventPublishingLogoutHandler.java
*
 /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/csrf/CookieServerCsrfTokenRepository.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/authentication/www/BasicAuthenticationConverter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/header/HeaderWriterFilter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/session/ConcurrentSessionFilter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/access/intercept/RequestKey.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/authentication/AuthenticationConverter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/authentication/AuthenticationEntryPointFailureHandler.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/util/matcher/MediaTypeRequestMatcher.java
*
 /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/util/matcher/AntPathRequestMatcher.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/header/writers/FeaturePolicyHeaderWriter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/header/ClearSiteDataServerHttpHeadersWriter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/authentication/logout/HeaderWriterServerLogoutHandler.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/authentication/session/ConcurrentSessionControlAuthenticationStrategy.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/header/writers/CompositeHeaderWriter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/header/writers/ReferrerPolicyHeaderWriter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/authentication/AbstractAuthenticationTargetUrlRequestHandler.java
*
 /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/server/authentication/ReactivePreAuthenticatedAuthenticationManager.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/header/writers/HstsHeaderWriter.java
* /spring-security-web-5-4-10-sources-

jar/org/springframework/security/web/header/writers/XXssProtectionHeaderWriter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/util/matcher/RequestMatcher.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/logout/CookieClearingLogoutHandler.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/server/transport/HttpsRedirectWebFilter.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/header/writers/HpkpHeaderWriter.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/header/writers/ClearSiteDataHeaderWriter.java
*
/spring-security-web-5-4-10-sources-jar/org/springframework/security/web/header/writers/StaticHeadersWriter.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/reactive/result/method/annotation/CurrentSecurityContextArgumentResolver.
java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/AuthenticationFilter.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/method/annotation/CurrentSecurityContextArgumentResolver.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/header/writers/ContentSecurityPolicyHeaderWriter.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/logout/HeaderWriterLogoutHandler.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/header/writers/frameoptions/XFrameOptionsHeaderWriter.java
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* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/access/channel/SecureChannelProcessor.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/access/AccessDeniedHandler.java

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 /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/access/intercept/DefaultFilterInvocationSecurityMetadataSource.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/savedrequest/DefaultSavedRequest.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/PortResolverImpl.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/savedrequest/SimpleSavedRequest.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/access/channel/RetryWithHttpEntryPoint.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/access/channel/ChannelDecisionManager.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/PortMapper.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/rememberme/RememberMeAuthenticationFilter.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/access/channel/ChannelEntryPoint.java
*
 /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/switchuser/SwitchUserFilter.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/logout/LogoutFilter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/session/HttpSessionCreatedEvent.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/LoginUrlAuthenticationEntryPoint.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/switchuser/AuthenticationSwitchUserEvent.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/PortResolver.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/access/channel/RetryWithHttpsEntryPoint.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/RememberMeServices.java
*
 /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/UsernamePasswordAuthenticationFilter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/AuthenticationEntryPoint.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/savedrequest/SavedRequestAwareWrapper.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/servletapi/SecurityContextHolderAwareRequestWrapper.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/access/channel/ChannelProcessingFilter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/savedrequest/FastHttpDateFormat.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/WebAuthenticationDetailsSource.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/logout/SecurityContextLogoutHandler.java
* /spring-security-web-5-4-10-sources-

jar/org/springframework/security/web/authentication/www/DigestAuthenticationEntryPoint.java
*
/spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/WebAuthenticationDetails.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/www/BasicAuthenticationEntryPoint.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/access/intercept/FilterInvocationSecurityMetadataSource.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/access/WebInvocationPrivilegeEvaluator.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/NullRememberMeServices.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/access/AccessDeniedHandlerImpl.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/www/BasicAuthenticationFilter.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/session/HttpSessionEventPublisher.java
*
/spring-security-web-5-4-10-sources-jar/org/springframework/security/web/savedrequest/Enumerator.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/servletapi/SecurityContextHolderAwareRequestFilter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/PortMapperImpl.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/AnonymousAuthenticationFilter.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/rememberme/TokenBasedRememberMeServices.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/logout/LogoutHandler.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/switchuser/SwitchUserGrantedAuthority.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/www/NonceExpiredException.java
*
/spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/session/HttpSessionDestroyedEvent.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/access/channel/ChannelDecisionManagerImpl.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/access/intercept/FilterSecurityInterceptor.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/authentication/AbstractAuthenticationProcessingFilter.java
* /spring-security-web-5-4-10-sources-jar/org/springframework/security/web/access/channel/ChannelProcessor.java
* /spring-security-web-5-4-10-sources-
jar/org/springframework/security/web/access/channel/InsecureChannelProcessor.java
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1.457 spring-security-config 5.4.10

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* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/method/configuration/EnableReactiveMethodSecurity.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/method/configuration/ReactiveMethodSecuritySelector.java

*
 /spring-security-config-5-4-10-sources-
jar/org/springframework/security/config/annotation/web/reactive/EnableWebFluxSecurity.java
* /spring-security-config-5-4-10-sources-
jar/org/springframework/security/config/core/userdetails/ReactiveUserDetailsServiceResourceFactoryBean.java
* /spring-security-config-5-4-10-sources-
jar/org/springframework/security/config/annotation/authentication/configuration/GlobalAuthenticationConfigurerAd
apter.java
* /spring-security-config-5-4-10-sources-
jar/org/springframework/security/config/provisioning/UserDetailsManagerResourceFactoryBean.java
* /spring-security-config-5-4-10-sources-
jar/org/springframework/security/config/web/server/SecurityWebFiltersOrder.java
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* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/DebugBeanDefinitionParser.java
* /spring-security-config-5-4-10-sources-
jar/org/springframework/security/config/core/GrantedAuthorityDefaults.java
*
 /spring-security-config-5-4-10-sources-
jar/org/springframework/security/config/http/FilterChainMapBeanDefinitionDecorator.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/authentication/package-info.java
* /spring-security-config-5-4-10-sources-
jar/org/springframework/security/config/http/FilterInvocationSecurityMetadataSourceParser.java
* /spring-security-config-5-4-10-sources-
jar/org/springframework/security/config/method/InterceptMethodsBeanDefinitionDecorator.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/method/package-info.java
* /spring-security-config-5-4-10-sources-
jar/org/springframework/security/config/method/ProtectPointcutPostProcessor.java

* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/http/UserDetailsServiceFactoryBean.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/ldap/LdapProviderBeanDefinitionParser.java
*
/spring-security-config-5-4-10-sources-jar/org/springframework/security/config/http/ChannelAttributeFactory.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/http/FilterChainBeanDefinitionParser.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/BeanIds.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/ldap/ContextSourceSettingPostProcessor.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/http/package-info.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/ldap/LdapUserServiceBeanDefinitionParser.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/method/MethodSecurityMetadataSourceBeanDefinitionParser.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/authentication/PasswordEncoderParser.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/http/PortMappingsBeanDefinitionParser.java
*
/spring-security-config-5-4-10-sources-jar/org/springframework/security/config/authentication/UserServiceBeanDefinitionParser.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/http/HttpFirewallBeanDefinitionParser.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/messaging/MessageSecurityMetadataSourceRegistry.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/package-info.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/http/DefaultFilterChainValidator.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/authentication/AuthenticationProviderBeanDefinitionParser.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/authentication/AbstractUserDetailsServiceBeanDefinitionParser.java
*
/spring-security-config-5-4-10-sources-jar/org/springframework/security/config/http/MatcherType.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/ldap/package-info.java
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*
 /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/builders/FilterOrderRegistration.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/authentication/AuthenticationManagerBeanDefinitionParser.java
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* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/rsocket/RSocketSecurity.java
*

/spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/rsocket/PayloadInterceptorOrder.java
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* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/X509Configurer.java
*
/spring-security-config-5-4-10-sources-jar/org/springframework/security/config/websocket/WebSocketMessageBrokerSecurityBeanDefinitionParser.java

* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configuration/WebSecurityConfigurerAdapter.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/method/configuration/GlobalMethodSecuritySelector.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/ExceptionHandlingConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/ServletApiConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/authentication/AuthenticationManagerFactoryBean.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/http/FormLoginBeanDefinitionParser.java
*
/spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/ExpressionUrlAuthorizationConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/configuration/AutowireBeanFactoryObjectPostProcessor.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/oauth2/client/OAuth2ClientConfigurerUtils.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/core/userdetails/UserDetailsResourceFactoryBean.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/SecurityContextConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/CorsConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/UrlAuthorizationConfigurer.java
*
/spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/method/configuration/MethodSecurityMetadataSourceAdvisorRegistrar.java
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jar/org/springframework/security/config/web/server/ServerSecurityMarker.kt
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/Elements.java
*
 /spring-security-config-5-4-10-sources-
jar/org/springframework/security/config/web/server/ServerContentTypeOptionsDsl.kt
* /spring-security-config-5-4-10-sources-
jar/org/springframework/security/config/web/server/ServerFrameOptionsDsl.kt
* /spring-security-config-5-4-10-sources-
jar/org/springframework/security/config/web/servlet/RequiresChannelDsl.kt
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/web/servlet/CsrfDsl.kt
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/web/server/ServerCorsDsl.kt
* /spring-security-config-5-4-10-sources-
jar/org/springframework/security/config/web/servlet/headers/HttpPublicKeyPinningDsl.kt
* /spring-security-config-5-4-10-sources-
jar/org/springframework/security/config/annotation/web/configuration/WebSecurityCustomizer.java
* /spring-security-config-5-4-10-sources-
jar/org/springframework/security/config/http/OAuth2ResourceServerBeanDefinitionParser.java
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jar/org/springframework/security/config/web/servlet/oauth2/login/AuthorizationEndpointDsl.kt
* /spring-security-config-5-4-10-sources-

jar/org/springframework/security/config/http/AuthenticationConfigBuilder.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/web/servlet/HttpSecurityDsl.kt
* /spring-security-config-5-4-10-sources-
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* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/web/servlet/SecurityMarker.kt
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* /spring-security-config-5-4-10-sources-
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* /spring-security-config-5-4-10-sources-
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/spring-security-config-5-4-10-sources-jar/org/springframework/security/config/web/server/ServerCsrfDsl.kt
* /spring-security-config-5-4-10-sources-
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* /spring-security-config-5-4-10-sources-
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* /spring-security-config-5-4-10-sources-
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* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/web/servlet/HeadersDsl.kt
* /spring-security-config-5-4-10-sources-
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* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/web/server/ServerLogoutDsl.kt
* /spring-security-config-5-4-10-sources-
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* /spring-security-config-5-4-10-sources-
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* /spring-security-config-5-4-10-sources-
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* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/web/servlet/Saml2Dsl.kt
* /spring-security-config-5-4-10-sources-
jar/org/springframework/security/config/annotation/web/configuration/EnableWebSecurity.java
* /spring-security-config-5-4-10-sources-
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* /spring-security-config-5-4-10-sources-
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/spring-security-config-5-4-10-sources-jar/org/springframework/security/config/web/server/ServerHttpBasicDsl.kt
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* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/web/servlet/session/SessionFixationDsl.kt
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/web/server/ServerAnonymousDsl.kt
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/web/server/ServerOAuth2ResourceServerDsl.kt
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/web/servlet/oauth2/resourceserver/JwtDsl.kt
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/spring-security-config-5-4-10-sources-jar/org/springframework/security/config/oauth2/client/ClientRegistrationsBeanDefinitionParser.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/oauth2/client/CommonOAuth2Provider.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/web/servlet/headers/HttpStrictTransportSecurityDsl.kt
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/http/OAuth2ClientBeanDefinitionParserUtils.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/http/OAuth2LoginBeanDefinitionParser.java
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* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/web/server/ServerFormLoginDsl.kt
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/web/servlet/FormLoginDsl.kt
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* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/web/server/ServerRequestCacheDsl.kt
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* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/web/servlet/oauth2/login/OAuth2LoginSecurityMarker.kt
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/web/server/ServerOAuth2ClientDsl.kt
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/web/servlet/headers/ReferrerPolicyDsl.kt
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* /spring-security-config-5-4-10-sources-
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/spring-security-config-5-4-10-sources-
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* /spring-security-config-5-4-10-sources-
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jar/org/springframework/security/config/web/servlet/session/SessionConcurrencyDsl.kt
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* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/servlet/configuration/EnableWebMvcSecurity.java
*
 /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/authentication/configurers/userdetails/UserDetailsServiceConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configuration/SpringWebMvcImportSelector.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/method/configuration/GlobalMethodSecurityAspectJAutoProxyRegistrar.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/AbstractHttpConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/ChannelSecurityConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/authentication/configurers/userdetails/AbstractDaoAuthenticationConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/FormLoginConfigurer.java
*
 /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/AbstractConfiguredSecurityBuilder.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/SecurityBuilder.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/AbstractInterceptUrlConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/authentication/configurers/provisioning/InMemoryUserDetailsManagerConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/RequestCacheConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/ObjectPostProcessor.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/AnonymousConfigurer.java
*

/spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configuration/AutowiredWebSecurityConfigurersIgnoreParents.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/authentication/ProviderManagerBuilder.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/method/configuration/EnableGlobalMethodSecurity.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/authentication/builders/AuthenticationManagerBuilder.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/authentication/configuration/EnableGlobalAuthentication.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/AlreadyBuiltException.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/AbstractSecurityBuilder.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/authentication/configurers/provisioning/UserDetailsManagerConfigurer.java
*
/spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/authentication/configurers/userdetails/DaoAuthenticationConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/PermitAllSupport.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/JeeConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/SecurityConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/authentication/configurers/provisioning/JdbcUserDetailsManagerConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/PortMapperConfigurer.java
*
/spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/authentication/configurers/userdetails/UserDetailsAwareConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/SecurityConfigurerAdapter.java
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* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/AbstractAuthenticationFilterConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/CsrfConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/authentication/configuration/InitializeAuthenticationProviderBeanManagerConfigurer.java
*
 /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/AbstractRequestMatcherRegistry.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/method/configuration/Jsr250MetadataSourceConfiguration.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/builders/HttpSecurity.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/openid/OpenIDLoginConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/HeadersConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/socket/AbstractSecurityWebSocketMessageBrokerConfigurer.java
*
 /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/method/configuration/GlobalMethodSecurityConfiguration.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/configuration/ObjectPostProcessorConfiguration.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/LogoutConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/method/configuration/ReactiveMethodSecurityConfiguration.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/servlet/configuration/WebMvcSecurityConfiguration.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/SessionManagementConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configuration/OAuth2ImportSelector.java
*

/spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/HttpBasicConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/authentication/configuration/InitializeUserDetailsBeanManagerConfigurer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/http/HeadersBeanDefinitionParser.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/Customizer.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configuration/WebMvcSecurityConfiguration.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/reactive/ReactiveOAuth2ClientImportSelector.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/reactive/WebFluxSecurityConfiguration.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/crypto/RsaKeyConversionServicePostProcessor.java
*
/spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/authentication/configuration/AuthenticationConfiguration.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/reactive/ServerHttpSecurityConfiguration.java
* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/http/LogoutBeanDefinitionParser.java
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* /spring-security-config-5-4-10-sources-jar/org/springframework/security/config/annotation/web/configurers/RememberMeConfigurer.java

1.458 spring-security-core 5.4.10

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* limitations under the License.
*/
/**
* Reviews the <code>Object</code> returned from a secure object invocation, being able to
* modify the <code>Object</code> or throw an {@link AccessDeniedException}.
* <p>
* Typically used to ensure the principal is permitted to access the domain object
* instance returned by a service layer bean.
```

Can also be used to mutate the domain object
* instance so the principal is only able to access authorised bean properties or
* <code>Collection</code> elements.
*
* Special consideration should be given to using an <code>AfterInvocationManager</code>
* on bean methods that modify a database. Typically an
* <code>AfterInvocationManager</code> is used with read-only methods, such as
* <code>public DomainObject getById(id)</code>. If used with methods that modify a
* database, a transaction manager should be used to ensure any
* <code>AccessDeniedException</code> will cause a rollback of the changes made by the
* transaction.
*
*
* @author Ben Alex
*/

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* /spring-security-core-5-4-10-sources-jar/org/springframework/security/crypto/keygen/BytesKeyGenerator.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/crypto/keygen/SharedKeyGenerator.java
*
 /spring-security-core-5-4-10-sources-jar/org/springframework/security/crypto/keygen/HexEncodingStringKeyGenerator.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/crypto/encrypt/HexEncodingTextEncryptor.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/crypto/keygen/StringKeyGenerator.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/crypto/encrypt/CipherUtils.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/crypto/password/PasswordEncoder.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/crypto/encrypt/BytesEncryptor.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/crypto/keygen/SecureRandomBytesKeyGenerator.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/crypto/password/NoOpPasswordEncoder.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/crypto/encrypt/TextEncryptor.java
*
 /spring-security-core-5-4-10-sources-jar/org/springframework/security/crypto/password/StandardPasswordEncoder.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/crypto/encrypt/AesBytesEncryptor.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/crypto/encrypt/BouncyCastleAesCbcBytesEncryptor.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/crypto/encrypt/BouncyCastleAesBytesEncryptor.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/crypto/keygen/KeyGenerators.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/crypto/util/EncodingUtils.java
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* /spring-security-core-5-4-10-sources-jar/org/springframework/security/jackson2/AnonymousAuthenticationTokenMixin.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/jackson2/RememberMeAuthenticationTokenMixin.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/jackson2/UnmodifiableSetDeserializer.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/jackson2/SimpleGrantedAuthorityMixin.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/jackson2/UserMixin.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/jackson2/UnmodifiableSetMixin.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/jackson2/UsernamePasswordAuthenticationTokenMixin.java
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* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/session/SessionIdChangedEvent.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/session/SessionDestroyedEvent.java
*
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/expression/method/DefaultMethodSecurityExpressionHandler.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/ProviderManager.java

* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/expression/method/MethodSecurityEvaluationContext.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/DefaultAuthenticationEventPublisher.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/session/AbstractSessionEvent.java
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*/
/**
  * @param authentication represents the user in question. Should not be null.
  * @param targetDomainObject the domain object for which permissions should be
  * checked. May be null in which case implementations should return false, as the null
  * condition can be checked explicitly in the expression.

 * @param permission a representation of the permission object as supplied by the
  * expression system. Not null.
  * @return true if the permission is granted, false otherwise
  */
```

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* /spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/rcp/RemoteAuthenticationException.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/vote/AbstractAclVoter.java
*
/spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/event/AuthenticationFailureBadCredentialsEvent.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/event/AuthorizedEvent.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/event/LoggerListener.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/AuthenticationDetailsSource.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/util/MethodInvocationUtils.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/jaas/event/JaasAuthenticationEvent.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/util/SimpleMethodInvocation.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/AnonymousAuthenticationProvider.java
*
/spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/UsernamePasswordAuthenticationToken.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/util/FieldUtils.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/method/AbstractMethodSecurityMetadataSource.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/userdetails/UserCache.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/AuthenticationManager.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/dao/DaoAuthenticationProvider.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/context/InheritableThreadLocalSecurityContextHolderStrategy.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/AccessDeniedException.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/event/LoggerListener.java
*
/spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/AuthenticationServiceException.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/method/MethodSecurityMetadataSource.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/TestingAuthenticationProvider.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/event/AuthenticationSuccessEvent.java
* /spring-security-core-5-4-10-sources-

jar/org/springframework/security/authentication/jaas/DefaultLoginExceptionResolver.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/SpringSecurityMessageSource.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/Authentication.java
* /spring-security-core-5-4-10-sources-
jar/org/springframework/security/access/annotation/SecuredAnnotationSecurityMetadataSource.java
*
/spring-security-core-5-4-10-sources-
jar/org/springframework/security/authentication/BadCredentialsException.java
* /spring-security-core-5-4-10-sources-
jar/org/springframework/security/access/intercept/aopalliance/MethodSecurityInterceptor.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/vote/AffirmativeBased.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/AuthenticationProvider.java
* /spring-security-core-5-4-10-sources-
jar/org/springframework/security/authentication/event/AuthenticationFailureLockedEvent.java
* /spring-security-core-5-4-10-sources-
jar/org/springframework/security/access/annotation/Jsr250MethodSecurityMetadataSource.java
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* /spring-security-core-5-4-10-sources-
jar/org/springframework/security/access/event/AbstractAuthorizationEvent.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/AuthenticationException.java
*
/spring-security-core-5-4-10-sources-jar/org/springframework/security/core/context/SecurityContext.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/AuthorizationServiceException.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/vote/ConsensusBased.java
* /spring-security-core-5-4-10-sources-
jar/org/springframework/security/authentication/TestingAuthenticationToken.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/userdetails/UserDetails.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/ConfigAttribute.java
* /spring-security-core-5-4-10-sources-
jar/org/springframework/security/authentication/event/AuthenticationFailureCredentialsExpiredEvent.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/GrantedAuthority.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/vote/UnanimousBased.java
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* /spring-security-core-5-4-10-sources-
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* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/context/SecurityContextHolder.java

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* /spring-security-core-5-4-10-sources-
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* /spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/jaas/AuthorityGranter.java
* /spring-security-core-5-4-10-sources-
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* /spring-security-core-5-4-10-sources-
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* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/userdetails/cache/NullUserCache.java
* /spring-security-core-5-4-10-sources-
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* /spring-security-core-5-4-10-sources-
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* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/AccessDecisionVoter.java
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jar/org/springframework/security/authentication/CachingUserDetailsService.java
* /spring-security-core-5-4-10-sources-
jar/org/springframework/security/authorization/AuthorityReactiveAuthorizationManager.java

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* /spring-security-core-5-4-10-sources-
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* /spring-security-core-5-4-10-sources-
jar/org/springframework/security/core/token/KeyBasedPersistenceTokenService.java
* /spring-security-core-5-4-10-sources-
jar/org/springframework/security/crypto/keygen/Base64StringKeyGenerator.java
* /spring-security-core-5-4-10-sources-
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* /spring-security-core-5-4-10-sources-
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* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/Transient.java
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* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/annotation/CurrentSecurityContext.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/ReactiveAuthenticationManagerResolver.java
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* /spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/ReactiveAuthenticationManagerAdapter.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/AuthenticationManagerResolver.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/crypto/scrypt/SCryptPasswordEncoder.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/userdetails/UserDetailsPasswordService.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/token/SecureRandomFactoryBean.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/AbstractUserDetailsReactiveAuthenticationManager.java
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* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/authority/AuthorityUtils.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/prepost/PostAuthorize.java
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* /spring-security-core-5-4-10-sources-
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* /spring-security-core-5-4-10-sources-jar/org/springframework/security/scheduling/DelegatingSecurityContextSchedulingTaskExecutor.java
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* /spring-security-core-5-4-10-sources-
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* /spring-security-core-5-4-10-sources-
jar/org/springframework/security/concurrent/DelegatingSecurityContextExecutorService.java
* /spring-security-core-5-4-10-sources-
jar/org/springframework/security/access/hierarchicalroles/CycleInRoleHierarchyException.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/package-info.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/PermissionCacheOptimizer.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/userdetails/package-info.java
* /spring-security-core-5-4-10-sources-
jar/org/springframework/security/access/expression/method/MethodSecurityExpressionHandler.java
* /spring-security-core-5-4-10-sources-
jar/org/springframework/security/access/method/DelegatingMethodSecurityMetadataSource.java
*
/spring-security-core-5-4-10-sources-
jar/org/springframework/security/access/expression/method/MethodSecurityExpressionOperations.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/prepost/PreFilter.java
* /spring-security-core-5-4-10-sources-
jar/org/springframework/security/core/userdetails/AuthenticationUserDetailsService.java
* /spring-security-core-5-4-10-sources-
jar/org/springframework/security/access/expression/DenyAllPermissionEvaluator.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/intercept/aspectj/package-info.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/ComparableVersion.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/prepost/PreInvocationAttribute.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/intercept/package-info.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/annotation/Jsr250Voter.java
*
/spring-security-core-5-4-10-sources-
jar/org/springframework/security/access/intercept/aspectj/MethodInvocationAdapter.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/token/package-info.java
* /spring-security-core-5-4-10-sources-
jar/org/springframework/security/access/expression/AbstractSecurityExpressionHandler.java
* /spring-security-core-5-4-10-sources-
jar/org/springframework/security/core/authority/mapping/MapBasedAttributes2GrantedAuthoritiesMapper.java
* /spring-security-core-5-4-10-sources-
jar/org/springframework/security/crypto/password/AbstractPasswordEncoder.java
* /spring-security-core-5-4-10-sources-
jar/org/springframework/security/core/authority/SimpleGrantedAuthority.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/jaas/event/package-info.java
* /spring-security-core-5-4-10-sources-

jar/org/springframework/security/core/userdetails/UserDetailsByNameServiceWrapper.java
*
/spring-security-core-5-4-10-sources-jar/org/springframework/security/access/intercept/aopalliance/package-info.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/task/DelegatingSecurityContextTaskExecutor.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/annotation/AnnotationMetadataExtractor.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/prepost/PostInvocationAuthorizationAdvice.java
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* /spring-security-core-5-4-10-sources-jar/org/springframework/security/jackson2/package-info.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/authority/mapping/package-info.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/authority/mapping/SimpleAuthorityMapper.java
*
/spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/jaas/package-info.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/provisioning/InMemoryUserDetailsManager.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/rcp/package-info.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/annotation/package-info.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/prepost/PostInvocationAttribute.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/prepost/PostInvocationAdviceProvider.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/prepost/PreAuthorize.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/method/P.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/expression/SecurityExpressionRoot.java
*
/spring-security-core-5-4-10-sources-jar/org/springframework/security/access/prepost/PrePostAnnotationSecurityMetadataSource.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/task/DelegatingSecurityContextAsyncTaskExecutor.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/userdetails/jdbc/package-info.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/package-info.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/concurrent/DelegatingSecurityContextExecutor.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/concurrent/AbstractDelegatingSecurityContextSupport.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/token/DefaultToken.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/crypto/codec/package-info.java
*
/spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/InternalAuthenticationServiceException.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/provisioning/MutableUserDetails.java
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jar/org/springframework/security/core/authority/mapping/SimpleMappableAttributesRetriever.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/provisioning/GroupManager.java
* /spring-security-core-5-4-10-sources-
jar/org/springframework/security/access/expression/method/AbstractExpressionBasedMethodConfigAttribute.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/util/package-info.java
* /spring-security-core-5-4-10-sources-
jar/org/springframework/security/access/prepost/PreInvocationAuthorizationAdvice.java
* /spring-security-core-5-4-10-sources-
jar/org/springframework/security/access/expression/method/PreInvocationExpressionAttribute.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/event/package-info.java
*
/spring-security-core-5-4-10-sources-
jar/org/springframework/security/access/method/AbstractFallbackMethodSecurityMetadataSource.java
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jar/org/springframework/security/core/userdetails/cache/SpringCacheBasedUserCache.java
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* /spring-security-core-5-4-10-sources-
jar/org/springframework/security/access/expression/method/MethodSecurityExpressionRoot.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/access/hierarchicalroles/package-info.java
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*/
/**
* A token issued by {@link TokenService}.
*
* <p>
* It is important that the keys assigned to tokens are sufficiently randomised and
* secured that they can serve as identifying a unique user session. Implementations of
* {@link TokenService} are free to use encryption or encoding strategies of their
 choice.
* It is strongly recommended that keys are of sufficient length to balance safety against
* persistence cost. In relation to persistence cost, it is strongly recommended that
* returned keys are small enough for encoding in a cookie.
* </p>
*
* @author Ben Alex
* @since 2.0.1
*/
```

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*/
/**
* Base64 encoder which is a reduced version of Robert Harder's public domain
```

* implementation (version 2.3.7). See <a href=
* "http://iharder.sourceforge.net/current/java/base64/">http://iharder.sourceforge.net/current/java/base64/
* for more information.
* <p>
* For internal use only.
*
* @author
 Luke Taylor
* @since 3.0
* @deprecated Use java.util.Base64
*/

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* /spring-security-core-5-4-10-sources-jar/org/springframework/security/crypto/factory/PasswordEncoderFactories.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/authentication/ReactiveAuthenticationManager.java
*
 /spring-security-core-5-4-10-sources-jar/org/springframework/security/authorization/AuthorizationDecision.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/AuthenticatedPrincipal.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/authorization/AuthenticatedReactiveAuthorizationManager.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/crypto/password/PasswordEncoderUtils.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/context/ReactiveSecurityContextHolder.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/authorization/ReactiveAuthorizationManager.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/SpringSecurityCoreVersion.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/crypto/password/Md4.java
* /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/parameters/P.java
*
 /spring-security-core-5-4-10-sources-jar/org/springframework/security/core/userdetails/ReactiveUserDetailsService.java
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*/
/**
  * Determines if the {@link #getAuthentication()} has permission to access the target
  * given the permission

```
 * @param target the target domain object to check permission on
 * @param permission the permission to check on the domain object (i.e. "read",
 * "write", etc).
 * @return true if permission
is granted to the {@link #getAuthentication()}, else
 * false
 */
```

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1.459 pytest 4.6.3

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1.460 golang 1.16.7

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1.461 golang 1.13.10

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```

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#     http://code.google.com/legal/individual-cla-v1.0.html
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#
# The agreement for individuals can be filled out on the web.

# Names should be added to this file like so:
#     Individual's name <submission email address>
#     Individual's name <submission email address> <email2> <emailN>
#
# An entry with multiple email addresses specifies that the
# first address should be used in the submit logs and
# that the other addresses should be recognized
 as the
# same person when interacting with Gerrit.

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1.462 golang 1.15.15

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#

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# Names should be added to this file only after verifying that
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#
# The agreement for individuals can be filled out on the web.

# Names should be added to this file like so:
#     Individual's name <submission email address>
#     Individual's name <submission email address> <email2> <emailN>
#
# An entry with multiple email addresses specifies that the
# first address should be used in the submit logs and
# that the other addresses should be recognized
 as the
# same person when interacting with Gerrit.

# Please keep the list sorted.

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1.465 zlib 1.2.11

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/* zlib.h -- interface of the 'zlib' general purpose compression library
version 1.2.11, January 15th, 2017

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Jean-loup Gailly Mark Adler
jloup@gzip.org madler@alumni.caltech.edu

The data format used by the zlib library is described by RFCs (Request for
Comments) 1950 to 1952 in the files http://tools.ietf.org/html/rfc1950
(zlib format), rfc1951 (deflate format) and rfc1952 (gzip format).
*/

1.466 nss-pam-ldapd 0.9.11

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1.469 packaging 21.3

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1.472 cglib 3.3.0

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1.481 xz 5.2.4-1

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1.489 jaxb-core 2.3.3

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1.490 activation-api 1.2.2

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1.491 chardet 3.0.4

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* /servlet-api-4-0-0-sources-7-jar/org/xipki/http/servlet/package-info.java
* /servlet-api-4-0-0-sources-7-jar/org/xipki/http/servlet/TlsHelper.java
* /servlet-api-4-0-0-sources-7-jar/org/xipki/http/servlet/HttpServlet.java
*
 /servlet-api-4-0-0-sources-7-jar/org/xipki/http/servlet/SimpleLruCache.java
* /servlet-api-4-0-0-sources-7-jar/org/xipki/http/servlet/SslReverseProxyMode.java
* /servlet-api-4-0-0-sources-7-jar/org/xipki/http/servlet/ServletURI.java
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1.494 activation 1.2.2

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* /jline-3-11-0-sources-2-jar/org/jline/reader/impl/UndoTree.java
* /jline-3-11-0-sources-2-jar/org/jline/builtins/Commands.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/Highlighter.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/impl/completer/EnumCompleter.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/Widget.java
* /jline-3-11-0-sources-2-jar/org/jline/keymap/KeyMap.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/impl/completer/NullCompleter.java
* /jline-3-11-0-sources-2-jar/org/jline/utils/DiffHelper.java
*
/jline-3-11-0-sources-2-jar/org/jline/terminal/impl/MouseSupport.java
* /jline-3-11-0-sources-2-jar/org/jline/utils/Log.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/package-info.java
* /jline-3-11-0-sources-2-jar/org/jline/utils/ExecHelper.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/package-info.java
* /jline-3-11-0-sources-2-jar/org/jline/utils/Levenshtein.java
* /jline-3-11-0-sources-2-jar/org/jline/builtins/Tmux.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/jna/linux/LinuxNativePty.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/impl/completer/package-info.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/CursorSupport.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/Expander.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/impl/ReaderUtils.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/jna/win/WindowsAnsiWriter.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/jna/osx/CLibrary.java
*
/jline-3-11-0-sources-2-jar/org/jline/terminal/impl/jna/linux/CLibrary.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/jna/osx/OsXNativePty.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/Macro.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/Attributes.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/MouseEvent.java

* /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/jna/JnaNativePty.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/AbstractPosixTerminal.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/NativeSignalHandler.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/impl/DefaultHighlighter.java
* /jline-3-11-0-sources-2-jar/org/jline/builtins/TTop.java
* /jline-3-11-0-sources-2-jar/org/jline/utils/WCWidth.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/Reference.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/Binding.java
* /jline-3-11-0-sources-2-jar/org/jline/utils/AttributedString.java
* /jline-3-11-0-sources-2-jar/org/jline/utils/Signals.java
*
 /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/jna/solaris/SolarisNativePty.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/spi/Pty.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/Parser.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/EndOfFileException.java
* /jline-3-11-0-sources-2-jar/org/jline/utils/InputStreamReader.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/impl/history/package-info.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/UserInterruptException.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/jna/freebsd/CLibrary.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/jna/freebsd/FreeBsdNativePty.java
* /jline-3-11-0-sources-2-jar/org/jline/utils/ClosedException.java
* /jline-3-11-0-sources-2-jar/org/jline/utils/OSUtils.java
* /jline-3-11-0-sources-2-jar/org/jline/builtins/Source.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/Cursor.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/impl/DefaultExpander.java
*
 /jline-3-11-0-sources-2-jar/org/jline/utils/ShutdownHooks.java
* /jline-3-11-0-sources-2-jar/org/jline/utils/package-info.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/impl/completer/StringsCompleter.java
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* /jline-3-11-0-sources-2-jar/org/jline/builtins/Completers.java
* /jline-3-11-0-sources-2-jar/org/jline/utils/NonBlockingInputStream.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/PosixSysTerminal.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/ParsedLine.java
* /jline-3-11-0-sources-2-jar/org/jline/builtins/Less.java
* /jline-3-11-0-sources-2-jar/org/jline/utils/NonBlockingInputStreamImpl.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/impl/completer/FileNameCompleter.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/CompletingParsedLine.java
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* /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/AbstractTerminal.java
* /jline-3-11-0-sources-2-jar/org/jline/utils/Curses.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/MaskingCallback.java
* /jline-3-11-0-sources-2-jar/org/jline/style/StyleExpression.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/Terminal.java
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* /jline-3-11-0-sources-2-jar/org/jline/utils/Display.java
* /jline-3-11-0-sources-2-jar/org/jline/style/StyleFactory.java
* /jline-3-11-0-sources-2-jar/org/jline/keymap/BindingReader.java
* /jline-3-11-0-sources-2-jar/org/jline/utils/NonBlocking.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/LineReader.java
* /jline-3-11-0-sources-2-jar/org/jline/builtins/InputRC.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/ExternalTerminal.java
*
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* /jline-3-11-0-sources-2-jar/org/jline/utils/NonBlockingReader.java
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* /jline-3-11-0-sources-2-jar/org/jline/reader/impl/history/DefaultHistory.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/LineDisciplineTerminal.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/History.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/DumbTerminal.java
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/jline-3-11-0-sources-2-jar/org/jline/style/Styler.java
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* /jline-3-11-0-sources-2-jar/org/jline/builtins/telnet/ConnectionData.java
* /jline-3-11-0-sources-2-jar/org/jline/builtins/telnet/ConnectionManager.java
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* /jline-3-11-0-sources-2-jar/org/jline/utils/AttributedCharSequence.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/spi/JnaSupport.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/jna/win/JnaWinSysTerminal.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/AbstractPty.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/jansi/win/JansiWinSysTerminal.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/spi/JansiSupport.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/impl/LineReaderImpl.java
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* /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/jansi/win/JansiWinConsoleWriter.java
* /jline-3-11-0-sources-2-jar/org/jline/utils/NonBlockingPumpInputStream.java
* /jline-3-11-0-sources-2-jar/org/jline/builtins/ssh/ShellCommand.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/jna/win/JnaWinConsoleWriter.java
* /jline-3-11-0-sources-2-jar/org/jline/style/StyleBundle.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/jansi/freebsd/FreeBsdNativePty.java
* /jline-3-11-0-sources-2-jar/org/jline/style/NopStyleSource.java
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 /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/jansi/linux/LinuxNativePty.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/impl/SimpleMaskingCallback.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/jansi/JansiNativePty.java
* /jline-3-11-0-sources-2-jar/org/jline/utils/NonBlockingPumpReader.java
* /jline-3-11-0-sources-2-jar/org/jline/builtins/ssh/ShellFactoryImpl.java
* /jline-3-11-0-sources-2-jar/org/jline/style/InterpolationHelper.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/impl/BufferImpl.java
* /jline-3-11-0-sources-2-jar/org/jline/style/StyleBundleInvocationHandler.java
* /jline-3-11-0-sources-2-jar/org/jline/builtins/telnet/Telnet.java
* /jline-3-11-0-sources-2-jar/org/jline/style/StyleColor.java
* /jline-3-11-0-sources-2-jar/org/jline/style/StyledWriter.java
* /jline-3-11-0-sources-2-jar/org/jline/style/MemoryStyleSource.java
* /jline-3-11-0-sources-2-jar/org/jline/style/StyleResolver.java
* /jline-3-11-0-sources-2-jar/org/jline/utils/PumpReader.java

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 /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/jansi/osx/OsXNativePty.java
* /jline-3-11-0-sources-2-jar/org/jline/builtins/ssh/Ssh.java
* /jline-3-11-0-sources-2-jar/org/jline/reader/Buffer.java
* /jline-3-11-0-sources-2-jar/org/jline/terminal/impl/AbstractWindowsConsoleWriter.java
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* /jline-3-11-0-sources-2-jar/org/jline/reader/EOFError.java
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