The LXGW Font Family* | 落霞与孤鹜齐飞 秋水共长天一色

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This package packs a selection of open-source CJK fonts from 霞鹜新智宋, 霞鹜新晰黑, 霞鹜文楷, **霞鹜臻楷**, which are released into public domain by LXGW and 朱雀仿宋 released into public domain by TrionesType since 2021. They are licensed under the SIL Open Font License (OFL).

Abstract

The LXGW Font Family provides an open-source CJK font family with a comprehensive character set for Chinese (Simplified/Traditional), Cantonese, and Japanese. A `fontset` configuration of this font family for the ctex-kit is also provided in this package.

1 Usage

Users are allowed to use the friendly interface: the `fontset` key in the ctex package

```
\usepackage[fontset = lxgw]{ctex}
```

or the ctex classes

```
\documentclass[fontset = lxgw]{ctex⟨art|book|rep|beamer⟩}
```

with XeLaTeX, LuaLaTeX, LaTeX + DVIPDFMx, upLaTeX + DVIPDFMx, and ApLaTeX (aka pLaTeX-ng) supported. pdfLaTeX is not supported temporarily since the long mapping time of `zhmap`. Additionally, the following four commands are provided for convenience.

```
\songti    宋体 (CJKmainfont): LXGWNeoZhiSong.ttf, LXGWNeoZhiSongScreen.ttf
\heiti     黑体 (CJKsansfont): LXGWNeoXiHei.ttf, LXGWNeoXiHeiScreen.ttf
\fangsong  仿宋 (CJKmonofont): LXGWZhuqueFangsong-Regular.ttf (AutoFakeBold enabled)
\kaishu    楷书 (it. of CJKmainfont): LXGWWenKaiLite-Regular.ttf, LXGWZhenKaiGB-Regular.ttf
```

Note that the names of the four control sequences make no sense here, just to *keep the same naming habit of ctex-kit*.

The implementation of this user-friendly interface is included in A.1, A.2, and A.3.

*https://github.com/myhsia/LXGW-CTAN

†https://github.com/lxgw, https://github.com/TrionesType/zhuque

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2 Font Demos

The following lists the Chinese/English name, filename, and demos of the fonts: Cantonese, Japanese, Chinese (Simplified/Traditional) versions of "**I Can Eat Glass**", missing character markers are provided with punctuation compression disabled and fulfilling line.

霞鶩新智宋 (LXGW Neo ZhiSong) `LXGWNeoZhiSong.ttf`, `LXGWNeoZhiSongScreen.ttf`

我可以食玻璃，**佢傷唔到我㗎。**私はガラスを食べられます。**それは私を傷つけません。**
我能吞下玻璃而不伤身体。**我能吞下玻璃而不伤身体。**我能吞下玻璃而不傷身體。□□□

霞鶩新晰黑 (LXGW Neo XiHei) `LXGWNeoXiHei.ttf`, `LXGWNeoXiHeiScreen.ttf`

我可以食玻璃，**佢傷唔到我㗎。**私はガラスを食べられます。**それは私を傷つけません。**
我能吞下玻璃而不伤身体。**我能吞下玻璃而不伤身体。**我能吞下玻璃而不傷身體。□□□

朱雀仿宋 (Zhuque Fangsong) `LXGWZhuqueFangsong-Regular.ttf`

我可以食玻璃，**佢傷唔到我㗎。**私はガラスを食べられます。**それは私を傷つけません。**
我能吞下玻璃而不伤身体。**我能吞下玻璃而不伤身体。**我能吞下玻璃而不傷身體。□□□

霞鶩 文楷/臻楷 (LXGW WenKai/ZhenKai) `LXGWWenKaiLite-Regular.ttf`, `LXGWZhenKaiGB-Regular.ttf`

我可以食玻璃，**佢傷唔到我㗎。**私はガラスを食べられます。**それは私を傷つけません。**
我能吞下玻璃而不伤身体。**我能吞下玻璃而不伤身体。**我能吞下玻璃而不傷身體。□□□

A The Source Code

A.1 The `ctex-fontset-lxgw.def` file

Start the optionlist `fontset` for l3docstrip.

```
⟨*fontset⟩
```

Declare the ctex-kit font configuration file with date, version, and description.

```
\ProvidesExplFile {ctex-fontset-lxgw.def} {2026-01-13} {v1.521K}
  {lxgw fontset configuration for ctex-kit}
```

Load CJK font family, interface, accepts the following 4 branches, provided by ctex-kit.

```
\ctex_fontset_case:nnnn
```

pdfTEX (generate PDF) This branch is no longer supported here, and a `fontset-unavailable` error will raise.

```
  { \ctex_fontset_error:n { lxgw } }
```

TEXhackers note: For some fontset that supports this branch, line 4 – 5 should be replaced as a line

```
\ctex_fontset_case:nnn
```

pdfTEX (generate DVI) For those use LATEX + DVIPDFMx.

```
  {
```

Load the `.spa` file for the CJKpunct package.

```
    \ctex_file_input:n { ctex-spa-lxgw.spa }
```

Case choice controlled by the `zhmap` key of ctex-kit.

```
    \ctex_zhmap_case:nnn
```

`#1` : Content of this argument will be outputted to the input stream when `zhmap = zhmCJK`

```
\cs_gset_eq:NN \ctex_zhmap_case:nnn \use_i:nnn
```

The LXGW font family uses the `UniGB-UTF16-H` cmap (Character To Glyph Index Mapping Table).

```
    {
      \setCJKmainfont { LXGWNeoZhiSong.ttf              }
        [
          cmap           = UniGB-UTF16-H, AutoFakeBold,
          ItalicFont     = LXGWWenKaiLite-Regular.ttf,
          BoldItalicFont = LXGWZhenKaiGB-Regular.ttf
        ]
      \setCJKsansfont { LXGWNeoXiHei.ttf                }
        [ cmap = UniGB-UTF16-H, AutoFakeBold ]
      \setCJKmonofont { LXGWZhuqueFangsong-Regular.ttf  }
        [ cmap = UniGB-UTF16-H, AutoFakeBold ]
      \setCJKfamilyfont { zhsong } { LXGWNeoZhiSong.ttf             }
        [ cmap = UniGB-UTF16-H, AutoFakeBold ]
      \setCJKfamilyfont { zhhei  } { LXGWNeoXiHei.ttf               }
        [ cmap = UniGB-UTF16-H, AutoFakeBold ]
      \setCJKfamilyfont { zhfs   } { LXGWZhuqueFangsong-Regular.ttf }
        [ cmap = UniGB-UTF16-H, AutoFakeBold ]
      \setCJKfamilyfont { zhkai  } { LXGWWenKaiLite-Regular.ttf     }
        [ cmap = UniGB-UTF16-H, BoldFont = LXGWZhenKaiGB-Regular.ttf ]
```

Configure the usages of the edge information of the defined CJK families.

```
          \ctex_punct_set:n { lxgw }
          \ctex_punct_map_family:nn   { \CJKrmdefault         } { zhsong  }
          \ctex_punct_map_family:nn   { \CJKsfdefault         } { zhhei   }
          \ctex_punct_map_family:nn   { \CJKttdefault         } { zhfs    }
          \ctex_punct_map_bfseries:nn { \CJKrmdefault, zhsong } { zhsongb }
          \ctex_punct_map_bfseries:nn { \CJKsfdefault, zhhei  } { zhheib  }
          \ctex_punct_map_itshape:nn  { \CJKrmdefault         } { zhkai   }
        }
```

`#2` : Content of this argument will be outputted to the input stream when `zhmap = true`

```
\cs_gset_eq:NN \ctex_zhmap_case:nnn \use_ii:nnn
```

Load the mapping file `ctex-zhmap-lxgw.tex` for zhmatrices and set `\CJKrmdefault`, `\CJKsfdefault`, `\CJKttdefault`, respectively.

```
        {
          \ctex_load_zhmap:nnnn { rm } { zhhei } { zhfs } { lxgw }
```

Configure the usages of the edge information of `\CJKrmdefault`.

```
          \ctex_punct_set:n { lxgw }
          \ctex_punct_map_family:nn   { \CJKrmdefault } { zhsong }
          \ctex_punct_map_bfseries:nn { \CJKrmdefault } { zhhei  }
          \ctex_punct_map_itshape:nn  { \CJKrmdefault } { zhkai  }
        }
```

`#3` : Content of this argument will be outputted to the input stream when `zhmap = false`

```
\cs_gset_eq:NN \ctex_zhmap_case:nnn \use_iii:nnn
```

Here will raise a fontset-unavailable error.

```
        { \ctex_fontset_error:n { lxgw } }
    }
```

upTEX, ApTEX (aka pTEX-ng) For those use upLATEX + DVIPDFMx. Configure the basic font mapping for upTEX. Due to the definition in zhmetrics-uptex, configure

1. upshape of serif font.
2. bfseries of serif font.
3. itshape of serif font.
4. upshape of sans font.
5. bfseries of sans font.
6. upshape of mono font.

```
{
  \ctex_set_upfonts:nnnnnn
    { LXGWNeoZhiSong.ttf             }
    { LXGWNeoZhiSongScreen.ttf       }
    { LXGWWenKaiLite-Regular.ttf     }
    { LXGWNeoXiHei.ttf               }
    { LXGWNeoXiHeiScreen.ttf         }
    { LXGWZhuqueFangsong-Regular.ttf }
```

Config the NFSS font families zhsong, zhhei, zhfs, and zhkai to the JFM name in normal type and bold type. Leave empty for those font families with no bold version.

```
  \ctex_set_upfamily:nnn { zhsong } { upzhserif    } { upzhserifb }
  \ctex_set_upfamily:nnn { zhhei  } { upzhsans     } { upzhsans   }
  \ctex_set_upfamily:nnn { zhfs   } { upzhmono     } { }
  \ctex_set_upfamily:nnn { zhkai  } { upzhserifit  } { }
}
```

XeTeX, LuaTeX For those use XeLaTeX or LuaLaTeX.

```
{
  \setCJKmainfont { LXGWNeoZhiSong              }
    [
      Extension      = .ttf, AutoFakeBold,
      ItalicFont     = LXGWWenKaiLite-Regular,
      BoldItalicFont = LXGWZhenKaiGB-Regular.ttf
    ]
  \setCJKsansfont { LXGWNeoXiHei                }
    [ Extension = .ttf, AutoFakeBold ]
  \setCJKmonofont { LXGWZhuqueFangsong-Regular  }
    [ Extension = .ttf, AutoFakeBold  ]
  \setCJKfamilyfont { zhsong } { LXGWNeoZhiSong }
    [ Extension = .ttf, AutoFakeBold ]
  \setCJKfamilyfont { zhhei  } { LXGWNeoXiHei               }
    [ Extension = .ttf, AutoFakeBold ]
  \setCJKfamilyfont { zhfs   } { LXGWZhuqueFangsong-Regular }
    [ Extension = .ttf, AutoFakeBold ]
  \setCJKfamilyfont { zhkai  } { LXGWWenKaiLite-Regular     }
    [ Extension = .ttf, BoldFont = LXGWZhenKaiGB-Regular ]
}
```

\songti
\heiti
\fangsong
\kaishu

Shortcuts that same as those in the ctex-kit.

```
\NewDocumentCommand \songti   { } { \CJKfamily { zhsong } }
\NewDocumentCommand \heiti    { } { \CJKfamily { zhhei  } }
\NewDocumentCommand \fangsong { } { \CJKfamily { zhfs   } }
\NewDocumentCommand \kaishu   { } { \CJKfamily { zhkai  } }
```

(*End of definition for* `\songti` *and others. These functions are documented on page* 1.)

End the optionlist `fontset` for l3docstrip.

⟨/fontset⟩

A.2 The `ctex-spa-make.tex` and the `ctexpunct-lxgw.tex` file

The `.spa` file of the corresponding font will be used for the CJKpunct package to achieve the punctuation compression, which can ensure the best typeset effect (under the pdfTeX engine). Run the following script, `ctex-spa-make.tex`, by executing

```
xetex ctex-spa-make
```

in the terminal. Then, one can obtain the `ctexpunct-lxgw.tex` file.

Implementation of the script Start the optionlist `makespa` for l3docstrip.

⟨*makespa⟩

Assign the module name of the variables and control sequences, which will be automatically replaced by l3docstrip.

⟨@@=ctex⟩

Loading the macro file `ctex-spa-macro.tex` provided by ctex-kit.

```
\input ctex-spa-macro %
```

However, the macro file needs to be hacked due to the interface change of XeTeX.

```
\ExplSyntaxOn
\cs_set_protected:Npn \__ctex_write_family:nn #1#2
  {
    \group_begin:
      \tex_font:D \l__ctex_punct_font = "[#2]" ~ at ~ 100 pt \scan_stop:
      \l__ctex_punct_font
      \clist_clear:N \l__ctex_punct_bounds_clist
      \seq_map_inline:Nn \c__ctex_punct_seq
        {
          \exp_args:No \__ctex_save_bounds:n
            { \int_use:N \tex_XeTeXcharglyph:D ##1 }
        }
      \iow_now:Nx \g__ctex_spa_iow
        {
          \token_to_str:N \ctexspadef {#1}
            { \l__ctex_punct_bounds_clist , , , }
        }
    \group_end:
  }
\ExplSyntaxOff
```

List all the CJK families with the corresponding font files in terms of "case-pairs".

```
\MAKESPA {ctexpunct-lxgw.tex}
  {
    {lxgwzhsong}      {LXGWNeoZhiSong} ,
    {lxgwzhsongb}     {LXGWNeoZhiSongScreen} ,
    {lxgwzhhei}       {LXGWNeoXiHei} ,
    {lxgwzhheib}      {LXGWNeoXiHeiScreen} ,
    {lxgwzhfs}        {LXGWZhuqueFangsong-Regular} ,
    {lxgwzhkai}       {LXGWWenKaiLite-Regular} ,
    {lxgwzhkaib}      {LXGWZhenKaiGB-Regular} ,
  }
```

End of the script.

```
\primitive\end
```

Restore the module name.

```
⟨@@=⟩
```

End the optionlist zhmap for l3docstrip.

```
⟨/makespa⟩
```

A.3 The `ctex-zhmap-lxgw.tex` file

Start the optionlist zhmap for l3docstrip.

```
⟨*zhmap⟩
```

Forked from the zhmap optionlist of `ctex.dtx`[1].

```
\begingroup\catcode61\catcode48\catcode32=10\relax%
  \catcode 35=6  % #
  \catcode 45=12 % -
  \catcode123=1  % {
```

[1] https://github.com/CTeX-org/ctex-kit/blob/master/ctex/ctex.dtx

```
  \catcode125=2  % }
  \toks0{\endlinechar=\the\endlinechar\relax}%
  \toks2{\endlinechar=-1 }%
  \def\x#1 #2 {%
    \toks0\expandafter{\the\toks0 \catcode#1=\the\catcode#1\relax}%
    \toks2\expandafter{\the\toks2 \catcode#1=#2 }}%
  \x  13  5 % carriage return
  \x  32 10 % space
  \x  35  6 % #
  \x  40 12 % (
  \x  41 12 % )
  \x  45 12 % -
  \x  46 12 % .
  \x  47 12 % /
  \x  58 12 % :
  \x  60 12 % <
  \x  61 12 % =
  \x  64 11 % @
  \x  91 12 % [
  \x  93 12 % ]
  \x 123  1 % {
  \x 125  2 % }
  \edef\x#1{\endgroup%
    \edef\noexpand#1{%
      \the\toks0 %
      \let\noexpand\noexpand\noexpand#1%
          \noexpand\noexpand\noexpand\undefined%
      \noexpand\noexpand\noexpand\endinput}%
    \the\toks2}%
\expandafter\x\csname ctex@zhmap@endinput\endcsname
\begingroup\expandafter\endgroup
\expandafter\let\csname ifzhmappdf\expandafter\endcsname\csname
  \expandafter\ifx\csname ifctexpdf\endcsname\relax
    \expandafter\ifx\csname pdfoutput\endcsname\relax
      iffalse\else\ifnum\pdfoutput < 1 iffalse\else iftrue\fi\fi
  \else ifctexpdf\fi
\endcsname
\begingroup
\expandafter\ifx\csname ProvidesFile\endcsname\relax
  \long\def\x#1\ProvidesFile#2[#3]{%
    #1%
    \immediate\write-1{File: #2 #3}%
    \expandafter\xdef\csname ver@#2\endcsname{#3}}
  \expandafter\x%
\fi
\endgroup
```

Provides the identification information of the font map loader.

```
\ProvidesFile{ctex-zhmap-lxgw.tex}%
  [2026-01-13 v1.521K lxgw font map loader for DVIPDFMx (CTEX)]
```

Font map loader for pdfTEX and DVIPDFMx.

```
\ifzhmappdf
```

Since pdfTEX maps too slowly, this mode is obsolete.

```
\iffalse
  \pdfmapline{=gbk@UGBK@           <LXGWNeoZhiSong.ttf}
  \pdfmapline{=gbksong@UGBK@       <LXGWNeoZhiSong.ttf}
  \pdfmapline{=gbkkai@UGBK@        <LXGWWenKaiLite-Regular.ttf}
  \pdfmapline{=gbkhei@UGBK@        <LXGWNeoXiHei.ttf}
  \pdfmapline{=gbkfs@UGBK@         <LXGWZhuqueFangsong-Regular.ttf}
  \pdfmapline{=cyberb@Unicode@     <LXGWNeoZhiSong.ttf}
  \pdfmapline{=unisong@Unicode@    <LXGWNeoZhiSong.ttf}
  \pdfmapline{=unikai@Unicode@     <LXGWWenKaiLite-Regular.ttf}
  \pdfmapline{=unihei@Unicode@     <LXGWNeoXiHei.ttf}
  \pdfmapline{=unifs@Unicode@      <LXGWZhuqueFangsong-Regular.ttf}
  \pdfmapline{=gbksongsl@UGBK@     <LXGWNeoZhiSong.ttf}
  \pdfmapline{=gbkkaisl@UGBK@      <LXGWWenKaiLite-Regular.ttf}
  \pdfmapline{=gbkheisl@UGBK@      <LXGWNeoXiHei.ttf}
  \pdfmapline{=gbkfssl@UGBK@       <LXGWZhuqueFangsong-Regular.ttf}
  \pdfmapline{=unisongsl@Unicode@ <LXGWNeoZhiSong.ttf}
  \pdfmapline{=unikaisl@Unicode@  <LXGWWenKaiLite-Regular.ttf}
  \pdfmapline{=uniheisl@Unicode@  <LXGWNeoXiHei.ttf}
  \pdfmapline{=unifssl@Unicode@   <LXGWZhuqueFangsong-Regular.ttf}
\fi
```

Configuration for pdfTEX (generate DVI).

```
\else
```

Configure the upright shape of `\songti`, `\kaishu`, `\heiti`, and `\fangsong` mapping for GBK encoding and UTF8 encoding.

```
  \special{pdf:mapline gbk@UGBK@           UniGB-UTF16-H LXGWNeoZhiSong.ttf}
  \special{pdf:mapline gbksong@UGBK@       UniGB-UTF16-H LXGWNeoZhiSong.ttf}
  \special{pdf:mapline gbkkai@UGBK@        UniGB-UTF16-H LXGWWenKaiLite-Regular.ttf}
  \special{pdf:mapline gbkhei@UGBK@        UniGB-UTF16-H LXGWNeoXiHei.ttf}
  \special{pdf:mapline gbkfs@UGBK@         UniGB-UTF16-H LXGWZhuqueFangsong-Regular.ttf}
  \special{pdf:mapline cyberb@Unicode@     UniGB-UTF16-H LXGWNeoZhiSong.ttf}
  \special{pdf:mapline unisong@Unicode@    UniGB-UTF16-H LXGWNeoZhiSong.ttf}
  \special{pdf:mapline unikai@Unicode@     UniGB-UTF16-H LXGWWenKaiLite-Regular.ttf}
  \special{pdf:mapline unihei@Unicode@     UniGB-UTF16-H LXGWNeoXiHei.ttf}
  \special{pdf:mapline unifs@Unicode@      UniGB-UTF16-H LXGWZhuqueFangsong-Regular.ttf}
```

Similar for the (fake) slant shape, set the *Afine Transformation coefficient* to `0.167`, which is the same as the default value of `AutoFakeSlant` in the xeCJK package.

```
  \special{pdf:mapline gbksongsl@UGBK@     UniGB-UTF16-H LXGWNeoZhiSong.ttf -s .167}
  \special{pdf:mapline gbkkaisl@UGBK@      UniGB-UTF16-H LXGWWenKaiLite-Regular.ttf -s .167}
  \special{pdf:mapline gbkheisl@UGBK@      UniGB-UTF16-H LXGWNeoXiHei.ttf -s .167}
  \special{pdf:mapline gbkfssl@UGBK@       UniGB-UTF16-H LXGWZhuqueFangsong-Regular.ttf -s .16
  \special{pdf:mapline unisongsl@Unicode@ UniGB-UTF16-H LXGWNeoZhiSong.ttf -s .167}
  \special{pdf:mapline unikaisl@Unicode@  UniGB-UTF16-H LXGWWenKaiLite-Regular.ttf -s .167}
  \special{pdf:mapline uniheisl@Unicode@  UniGB-UTF16-H LXGWNeoXiHei.ttf -s .167}
  \special{pdf:mapline unifssl@Unicode@   UniGB-UTF16-H LXGWZhuqueFangsong-Regular.ttf -s .16
\fi
```

End the optionlist `zhmap` for l3docstrip.

```
⟨/zhmap⟩
```

Index

The italic numbers denote the pages where the corresponding entry is described, numbers underlined point to the definition, all others indicate the places where it is used.