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 fonts from the 霞鹜文楷, 霞鹜文楷国标, 霞鹜臻楷, 霞鹜漫黑, 小赖字体, and 悠哉字体, which are released into public domain by LXGW 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, and upLaTeX + DVIPDFMx 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): LXGWWenKaiGBLite-Regular.ttf, LXGWZhenKaiGB-Regular.ttf.
`\heiti`	**黑体** (CJKsansfont): LXGWMarkerGothic-Regular.ttf (with the AutoFakeBold option).
`\fangsong`	仿宋 (CJKmonofont): LXGWXiaolai-Regular.ttf (with the AutoFakeBold option).
`\kaishu`	楷书 (itshape of CJKmainfont): LXGWYozai-Regular.ttf, LXGWYozai-Medium.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/lxgw, https://github.com/myhsia/LXGW-CTAN
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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.

霞鹜文楷 (LXGW WenKai) 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。㊣㊣㊣

霞鹜文楷国标 (LXGW WenKai$_{GB}$) LXGWWenKaiGBLite-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。㊣㊣㊣

霞鹜漫黑 (LXGW Marker Gothic) LXGWMarkerGothic-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。□□□

小赖字体 (Xiaolai Font) LXGWXiaolai-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。□□□

悠哉字体 (Yozai Font) LXGWYozai-Regular.ttf, LXGWYozai-Medium.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} {2025-12-11} {v1.521H}
  {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 { ctexpunct-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 default `unicode` cmap (Character To Glyph Index Mapping Table), not `UniGB-UTF16-H`.

```
    {
      \setCJKmainfont { LXGWWenKaiLite-Regular.ttf   }
        [
          BoldFont   = LXGWZhenKaiGB-Regular.ttf,
          ItalicFont = LXGWYozai-Regular.ttf,
        ]
      \setCJKsansfont { LXGWMarkerGothic-Regular.ttf } [ AutoFakeBold ]
      \setCJKmonofont { LXGWXiaolai-Regular.ttf      } [ AutoFakeBold ]
      \setCJKfamilyfont { zhsong } { LXGWWenKaiLite-Regular.ttf   }
        [ BoldFont = LXGWZhenKaiGB-Regular.ttf ]
      \setCJKfamilyfont { zhhei  } { LXGWMarkerGothic-Regular.ttf }
        [ AutoFakeBold ]
      \setCJKfamilyfont { zhfs   } { LXGWXiaolai-Regular.ttf      }
        [ AutoFakeBold ]
      \setCJKfamilyfont { zhkai  } { LXGWYozai-Regular.ttf        }
        [ BoldFont = LXGWYozai-Medium.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 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_upmap_unicode:nnn { upserif   }
    { LXGWWenKaiLite-Regular.ttf   } { LXGWZhenKaiGB-Regular.ttf }
  \ctex_set_upmap_unicode:nnn { upsans    }
    { LXGWMarkerGothic-Regular.ttf } { }
  \ctex_set_upmap_unicode:nnn { upmono    }
    { LXGWXiaolai-Regular.ttf      } { }
  \ctex_set_upmap_unicode:nnn { upserifit }
    { LXGWYozai-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     } { }
    \ctex_set_upfamily:nnn { zhfs   } { upzhmono     } { }
    \ctex_set_upfamily:nnn { zhkai  } { upzhserifit  } { }
  }
```

XeTeX, LuaTeX For those use XeLaTeX or LuaLaTeX.

```
  {
    \setCJKmainfont { LXGWWenKaiLite-Regular }
      [
        Extension  = .ttf,
        BoldFont   = LXGWZhenKaiGB-Regular,
        ItalicFont = LXGWYozai-Regular
      ]
    \setCJKsansfont { LXGWMarkerGothic-Regular }
      [ Extension = .ttf, AutoFakeBold ]
    \setCJKmonofont { LXGWXiaolai-Regular      }
      [ Extension = .ttf, AutoFakeBold  ]
    \setCJKfamilyfont { zhsong } { LXGWWenKaiLite-Regular   }
      [ Extension = .ttf, BoldFont = LXGWZhenKaiGB-Regular ]
    \setCJKfamilyfont { zhhei  } { LXGWMarkerGothic-Regular }
      [ Extension = .ttf, AutoFakeBold ]
    \setCJKfamilyfont { zhfs   } { LXGWXiaolai-Regular      }
      [ Extension = .ttf, AutoFakeBold ]
    \setCJKfamilyfont { zhkai  } { LXGWYozai-Regular        }
      [ Extension = .ttf, BoldFont = LXGWYozai-Medium ]
  }
```

\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.spa` 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.spa` 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.spa}
  {
    {lxgwzhsong}      {LXGWWenKaiLite-Regular} ,
    {lxgwzhsongb}     {LXGWZhenKaiGB-Regular} ,
    {lxgwgbzhsong}    {LXGWWenKaiGBLite-Regular} ,
    {lxgwgbzhsongb}   {LXGWZhenKaiGB-Regular} ,
    {lxgwzhhei}       {LXGWMarkerGothic-Regular} ,
    {lxgwzhfs}        {LXGWXiaolai-Regular} ,
    {lxgwzhkai}       {LXGWYozai-Regular} ,
    {lxgwzhkaib}      {LXGWYozai-Medium} ,
  }
```

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%
```

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

```
  \catcode 35=6  % #
  \catcode 45=12 % -
  \catcode123=1  % {
  \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}%
  [2025-12-11 v1.521H 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@           <LXGWWenKaiLite-Regular.ttf}
  \pdfmapline{=gbksong@UGBK@       <LXGWWenKaiLite-Regular.ttf}
  \pdfmapline{=gbkkai@UGBK@        <LXGWYozai-Regular.ttf}
  \pdfmapline{=gbkhei@UGBK@        <LXGWMarkerGothic-Regular.ttf}
  \pdfmapline{=gbkfs@UGBK@         <LXGWXiaolai-Regular.ttf}
  \pdfmapline{=cyberb@Unicode@     <LXGWWenKaiLite-Regular.ttf}
  \pdfmapline{=unisong@Unicode@    <LXGWWenKaiLite-Regular.ttf}
  \pdfmapline{=unikai@Unicode@     <LXGWYozai-Regular.ttf}
  \pdfmapline{=unihei@Unicode@     <LXGWMarkerGothic-Regular.ttf}
  \pdfmapline{=unifs@Unicode@      <LXGWXiaolai-Regular.ttf}
  \pdfmapline{=gbksongsl@UGBK@     <LXGWWenKaiLite-Regular.ttf}
  \pdfmapline{=gbkkaisl@UGBK@      <LXGWYozai-Regular.ttf}
  \pdfmapline{=gbkheisl@UGBK@      <LXGWMarkerGothic-Regular.ttf}
  \pdfmapline{=gbkfssl@UGBK@       <LXGWXiaolai-Regular.ttf}
  \pdfmapline{=unisongsl@Unicode@ <LXGWWenKaiLite-Regular.ttf}
  \pdfmapline{=unikaisl@Unicode@  <LXGWYozai-Regular.ttf}
  \pdfmapline{=uniheisl@Unicode@  <LXGWMarkerGothic-Regular.ttf}
  \pdfmapline{=unifssl@Unicode@   <LXGWXiaolai-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@           unicode LXGWWenKaiLite-Regular.ttf}
  \special{pdf:mapline gbksong@UGBK@       unicode LXGWWenKaiLite-Regular.ttf}
  \special{pdf:mapline gbkkai@UGBK@        unicode LXGWYozai-Regular.ttf}
  \special{pdf:mapline gbkhei@UGBK@        unicode LXGWMarkerGothic-Regular.ttf}
  \special{pdf:mapline gbkfs@UGBK@         unicode LXGWXiaolai-Regular.ttf}
  \special{pdf:mapline cyberb@Unicode@     unicode LXGWWenKaiLite-Regular.ttf}
  \special{pdf:mapline unisong@Unicode@    unicode LXGWWenKaiLite-Regular.ttf}
  \special{pdf:mapline unikai@Unicode@     unicode LXGWYozai-Regular.ttf}
  \special{pdf:mapline unihei@Unicode@     unicode LXGWMarkerGothic-Regular.ttf}
  \special{pdf:mapline unifs@Unicode@      unicode LXGWXiaolai-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@     unicode LXGWWenKaiLite-Regular.ttf -s .167}
  \special{pdf:mapline gbkkaisl@UGBK@      unicode LXGWYozai-Regular.ttf -s .167}
  \special{pdf:mapline gbkheisl@UGBK@      unicode LXGWMarkerGothic-Regular.ttf -s .167}
  \special{pdf:mapline gbkfssl@UGBK@       unicode LXGWXiaolai-Regular.ttf -s .167}
  \special{pdf:mapline unisongsl@Unicode@ unicode LXGWWenKaiLite-Regular.ttf -s .167}
  \special{pdf:mapline unikaisl@Unicode@  unicode LXGWYozai-Regular.ttf -s .167}
  \special{pdf:mapline uniheisl@Unicode@  unicode LXGWMarkerGothic-Regular.ttf -s .167}
  \special{pdf:mapline unifssl@Unicode@   unicode LXGWXiaolai-Regular.ttf -s .167}
\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.