caxetexFree · version 0.12
A XeTeX Stylesheet Using Free Opentype Fonts

Demonstration and Tips

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LaTeX offers a powerful set of scientific typesetting tools but tends to lock users into a single set of functional-but-aesthetically limited fonts. Changing fonts in LaTeX is so cumbersome that few users ever make the effort – and few such efforts are rewarded. XeTeX is a powerful new engine for compiling LaTeX code which lets users select more readable or beautiful fonts. But even in XeTeX selecting and optimizing a set of replacement fonts is a time-consuming and potentially expensive task.

This document explains how to install the XeTeX stylesheet caxetexFree and associated freely available opentype fonts. Using this stylesheet, users can quickly upgrade to a more readable format for scientific papers, presentations, and curricula vitae without spending money on new fonts or time writing new code. Simply install the stylesheet and fonts as directed below, add

```
\usepackage{caxetexFree}
```

to the preamble of your LaTeX documents, and compile your documents with pdfxetex instead of pdflatex.

However, caxetexFree also loads a complete suite of packages and settings for beautiful book and paper design – if Latex is the Swiss Army sledgehammer of typography (as John Regehr put it), this sort of style sheet is an effort to jam a few more tools on, then wrap the whole monstrosity in velvet. Out of the many things caxetexFree was built to do, a few features are documented below, along

with suggestions for layout of tables and figures, and thoughts on customizing the package for use with other fonts. Users seeking more ideas for use of this package might look at the book I typeset using its big brother, **caxetexBook**, which differs mainly in using commercial fonts (Adolph, 2013).

Installation

caxetexFree uses five free Opentype typefaces. While these typefaces can be freely downloaded from their original creators, they cannot be freely redistributed, so you will need to download them directly from the following websites:

Linux Libertine	`sourceforge.net/projects/linuxlibertine`
Adobe Source Sans	`www.fontsquirrel.com/fonts/source-sans-pro`
Inconsolata	`github.com/google/fonts/tree/master/ofl/inconsolata`
Museo Slab 500	`www.myfonts.com/fonts/exljbris/museo-slab`
GFS Porson	`www.greekfontsociety-gfs.gr/typefaces/19th_century`

In each case, you will likely end up with a `.zip` files containing a number of files. The key files to collect from these archives are those with the extension `.otf` or, in some cases, `.ttf`. Specifically, you need the following font files:

```
LinLibertine_R.otf
LinLibertine_RI.otf
LinLibertine_RZ.otf
LinLibertine_RZI.otf
SourceSansPro-Regular.otf
SourceSansPro-It.otf
SourceSansPro-Bold.otf
SourceSansPro-BoldIt.otf
Inconsolata-Regular.ttf
Inconsolata-Bold.ttf
Museo_Slab_500.otf
Museo_Slab_500italic.otf
GFSPorson.otf
```

If you use a Mac, you should place the above files in the `/Library/Fonts` folder in root; doing so will install these fonts for your immediate use.

Windows users can install these fonts from the Start menu. Select Control Panel, then Fonts, then Install New Font, and select the files listed above. Unsurprisingly, you may need to restart Windows to complete the installation.

After installing the required fonts, users have two options for installing `caxetexFree.sty` itself. A simple solution is to place this file in the same directory as the `tex` file to be compiled. A more permanent solution is to place `caxetexFree.sty` in the local path of your Latex installation, and then update the Latex package database by running `mktexlsr` at the command prompt.

Usage

Compiling XeTeX documents is fundamentally similar to compiling LaTeX documents, and your LaTeX installation may already include a XeTeX engine.

For Mac users of MacTeX, this is almost certainly the case unless your installation is venerable. Moreover, if you use Aquamacs to compile your LaTeX documents, you need take only one step: with your document open and ready to compile, go to the `Command` menu, choose `TeXing Options`, and select `XeTeX engine`, and check to make sure that `Generate PDF` is also selected. Now when you choose `LaTeX` from the `Command` menu, your file will compile with `pdfxetex`.[1]

For Windows users… *to add*

Support for Numbers

Most fonts contain two kinds of numbers: oldstyle or "lowercase" numerals (1234567890), which are often easier to read when mixed with text or arrayed in tables, and lining or "uppercase" numerals (1234567890), which look more modern and tend to look better in mathematical formulas, where numbers should stand out from variables. The stylesheet tries to use the appropriate number in any given situation, but it is possible to override the defaults.

This section's commands are specific to caxetex.

In text mode, the default is oldstyle numbers (1234567890). If you want a number like 15 to show up as lining, use `\lnt{15}`. As recommended by most typographers, numbers inside of math mode (that is, inside $$ or an equation environment) will

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1 XeTeX compiles directly to PDF without passing through a `.dvi` or postscript stage. While this is mostly convenient, it means you won't be able to use the graphics package `pstricks` in XeTeX.

always be lining. For example, using the usual Latex math notation, we might have

$$\Pr(y_i = j | \tau, \beta, \mathbf{x}_i) = \int_{\tau_{j-1}}^{\tau_j} \mathcal{N}(\mathbf{x}_i \beta, 1) \, \mathrm{d}\mathbf{x}_i \beta. \tag{1}$$

(See the Appendix for underlying code.) If you want oldstyle numbers in an equation, wrap each number in \textrm{}.

By default, numbers in a tabular environment will be oldstyle. Control of numbers inside a tabular environment can be tricky, especially if you also want to center a numeric column on the decimal, as is usually desired. To create a column of decimal-centered numeric data set in oldstyle numbers, use column type S. This is usually the most elegant option (see Table 1 below). However, if you want a column of numeric data to be decimal-centered lining numerals, use column type :. In general, to make a specific number in a table to be lining, wrap the number in \lnt{}. This is necessary for most numbers embedded in \multicolumn{} commands, should lining numbers be desired.

Expanded Text Options

Properly installed, the stylesheet includes numerous options for text beyond the usual Roman typeface. In addition to *italics*, **bold**, ***bold italics***, and their *san* **serif variants** – all of which rely on the usual Latex commands – the stylesheet offers support for nicely LETTERSPACED SMALL CAPS and a slab serif font, also available in *italics*.

These are letterspaced SMALL CAPS, which are made using:

        \textsc{\caps{your text here in lowercase}}

As an alternative, these are tightly-spaced SMALL CAPS, which are made using:

        \textsc{your text here in lowercase}

If you want to put text in a slab serif font – trendy and nice for emphasis or display – wrap the text in \textsb{your text here}.[2]

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2 \textsb is a special command for my style sheet – it doesn't work unless you load some version of caxetex.

Table 1. Main caption of a regression table.

Covariates	Model 1	Model 2
A covariate	1.0	−2.0
	(0.2)	(0.1)
Another covariate	1.1	3.0
	(0.4)	(1.2)
N	123	99
s.e.r.	0.05	0.10

Note that Model 1's results are in Oldstyle numerals (column type S and Model 2's results are in Lining numerals (column type :). To place an individual number in lining numeral, wrap them in \lnt{}.

Recommended Caption Styles for Tables and Figures

To ensure XeTeX uses your typeface for numbers in tables, and not the default LaTeX font, it is often best to use the siunitx package to enable the powerful S column for tabular environments.[3] For an example, see Table 1 and the relevant code in the Appendix. Table 1 and Figure 1 (*to add*) also demonstrate recommended caption styles for **caxetexFree** users.

Making a Figure

Figure 1 gives an example of a graphic floated in a Latex document. Note the informative caption, the careful sizing of the graphic to both fit within the document margins and display text within the figure at a readable size, and the automatic generation and reference of figure numbers. This figure is floated at the top of the nearest available page if possible (option t); otherwise, it will appear at the bottom of a page (option b), or on its own page, clear of text (option p). Try to avoid floating figures in the midst of text (the h option), which usually looks inelegant and interrupts flow.

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[3] For complex tables, it may also be necessary to revise the options for tabular environments set by \sisetup.
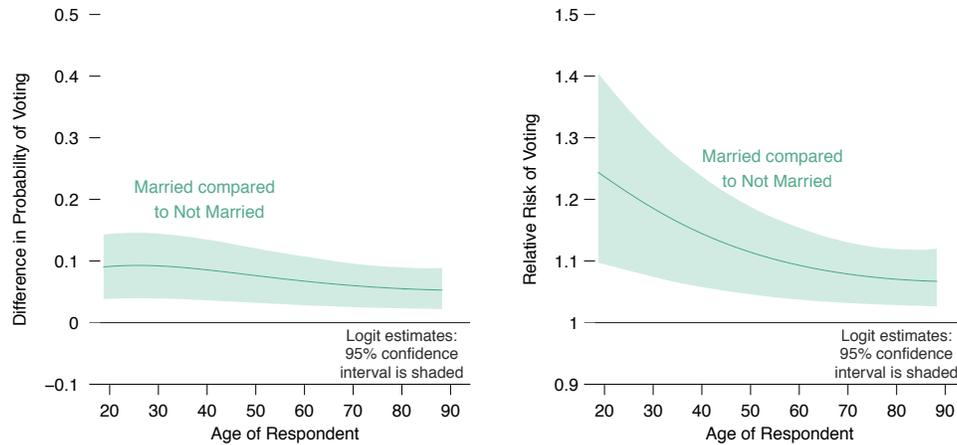
Figure 1. *This is the main part of the caption, in italics.* This is additional caption informa-
tion. For a graphic like that above, this paragraph should explain way the data show was
obtained (if the plot explores new data) or the way the data was calculated (if the plot in-
vestigates a model presented in the paper). The caption should be terse, yet sufficiently
detailed that an expert flipping through the paper could mostly or entirely understand the
figure without reading the main text. Any essential assumptions needed to replicate the
results shown in the figure should be highlighted, often in precise numerical detail.

A second figure (Figure 2) shows an example where ironically a figure with
fewer plots takes up more space (small multiples of plots can be very space effi-
cient). The width of these graphics must be set manually in the `\includegraphics{}`
command and should be chosen to maximize readability and efficient use of space.
Try to avoid turning figures sideways; usually it is better to redesign the figure by
changing aspect ratios, rearranging plots, etc.

Citation with `BibTeX` and `natbib`

There are helpful resources on the web for using `BibTeX` and `natbib`; here, I provide
some quick examples. One appears on an earlier page on which I cite my own book
(Adolph, 2013), which is achieved simply be using `\citep{adolph13}`. But suppose
I wanted to cite another work, this time in a sentence. I might want to say that
Borges and Bolaño (2012) make a particular claim. This is an "in text" citation, and
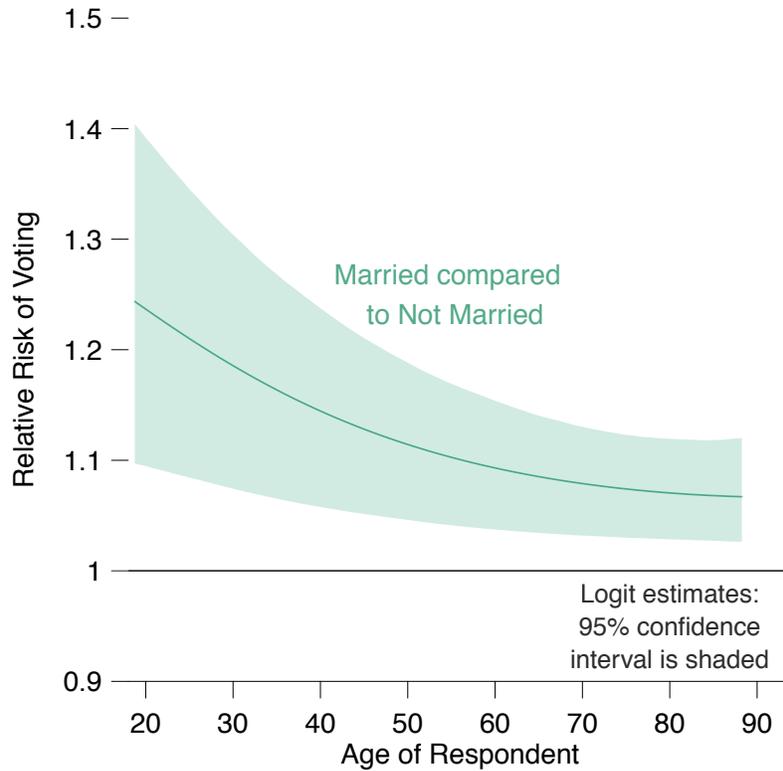can be achieved with `\citet{borgesbolano12}`.

Figure 2. *A second figure, with a single large plot.* Note that this figure has a width of only 4.25 inches; Figure 1 was wider, at 5.10 inches. Setting the graphic above to a wider width would make the graphic comically large.

Using caxetexFree as a Template

For those interested in exploring the use of new fonts in their XeTeX documents, modifying and building on **caxetexFree** may be a relatively easy way to get started, but users should be warned: while XeTeX and OpenType fonts make it easier to use your desired fonts, but if you want to produce professional-quality documents, there's more to do than just loading up the new fonts. Put bluntly, unless you truly love type and typesetting, it makes sense to find a system that works for you, get on with the real work of composing scientific papers, and leave the customization of typesetting systems to others.

Table 2. A guide to harmonious type combinations.

Cells are exemplary typefaces **Form**	**Style**		
	"Dynamic" Humanist (walker)	"Static" Neoclassical (soldier)	"Geometrical" Constructed (robot)
Roman	Bembo	Bodoni	—
Sans serif	Gill Sans	Helvetica	Futura
Slab serif	Caecillia	Glypha	Rockwell

To mesh type across forms (rows), choose a single style (column) and select typefaces like those in that column. The columns are ideal types, and intermediate mixtures are also possible – this document is typeset using "transitional" typefaces that lie somewhere between humanist and neoclassical styles.

Source: Hans Peter Willberg, *Wegweiser Schrift* (Verlag Hermann Schmidt, 2001); reproduced in Joep Pohlen, *Letter Fountain* (Taschen, 2010), p. 81, and shown here in simplified form.

In choosing a set of typefaces for Latex typesetting, two considerations limit the field considerably: one needs complete families with associated bold and italic fonts, and one needs serifed and san-serifed typefaces that complement each other. If your documents involve mathematical equations, then you will also need to choose fonts that look "right" in equations or that match your chosen math and Greek fonts. One strategy is to select typefaces that share a common aesthetic tradition (see Table 2). This document, made with caxetexFree, brings together a mixture of clean, transitional typefaces. My alternative stylesheet caxetexBook uses the more expressive and humanist faces Bembo Book and Gill Sans. Traditional LaTeX uses Donald Knuth's Computer Modern fonts, which belong to the neoclassical tradition.[4]

Even after choosing typefaces that go well together, there are several tricky technical issues to work out. First, you will need to rewrite the commands in caxetexFree that load the .otf files, being sure to use exactly the right font family

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4 See Karen Cheng's *Designing Type* (Yale University Press, 2007) for helpful specimens and pointers for classifying type into stylistic movements.

name.[5] Then after getting a document to compile using the new fonts, you should check for typographical errors or awkwardness and revise the adjustable parameters of **caxetexFree** as needed. It is typically necessary to adjust:

(1) the *x-height* of various fonts to achieve a good match;[6]

(2) the *leading*, which is set separately for the main text (through the `\linespread` argument), the captions (through the options to `\usepackage{caption}`), and the footnotes (through `\footnotesep`);

(3) the paragraph *indent* length;

(4) the *size* of titles, chapter titles, and section heads;

(5) various *tolerances*; and

(6) the *point size* of the document, normally set in the first line of the `.tex` file.

If you do embark on changing the fonts in `caxetex`, you might test your new stylesheet by compiling this document, which embeds the typographical elements most likely to go wrong without stylesheet tweaking. Good luck!

References

Adolph, Christopher. 2013. *Bankers, Bureaucrats, and Central Bank Politics: The Myth of Neutrality.* Cambridge: Cambridge University Press. **2 and 6**

Borges, Jorge Luis and Roberto Bolaño. 2012. "A tragically nonexistent story." *Journal of Impossible Literature* 10(3):50–54. **6**

Cheng, Karen. 2006. *Designing Type.* Yale University Press. **8**

Pohlen, Joep. 2010. *Letter Fountain.* Taschen. **8**

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5 This is the last argument to `fontspec`; for example, the font family name of Linux Libertine is `Linux Libertine O`. One easy way to check font family names is to select the font in LibreOffice, which identifies fonts by this name.

6 The automatic `MatchLowercase` option doesn't always work.

Appendix: Code for Examples

Code for Equation 1

```
\begin{equation}
\mathrm{Pr}(y_i = j|\boldsymbol{\tau}, \boldsymbol{\beta},
\mathbf{x}_i) = \int_{\tau_{j-1}}^{\tau_j} \!
\mathcal{N}(\mathbf{x}_i\boldsymbol{\beta},1) \,
\mathrm{d} \mathbf{x}_i\boldsymbol{\beta}.
\end{equation}
```

Code for Table 1

```
\begin{table}[tbph]
\centering

\parbox{2.825in}{\caption{\textbf{Main caption.}}
\label{tab:thistable}}\\
\vspace{-0.8em}
\begin{tabular}{lSS}
\toprule
Covariates & \multicolumn{1}{c}{Model 1} & \multicolumn{1}{c}{Model 2} \\
\midrule
A covariate       &  1.0  & -2.0  \\
                  & (0.2) & (0.1) \\
Another covariate &  1.1  &  3.0  \\
                  & (0.4) & (1.2) \\
\midrule
$N$    &  \multicolumn{1}{c}{123}  & \multicolumn{1}{c}{99}   \\
s.e.r.            &  0.05 &  0.10 \\
\bottomrule
\addlinespace[0.15em]
\multicolumn{3}{p{2.7in}}{\small Additional details.  This
  portion may wrap around to multiple lines.}
\end{tabular}
\end{table}
```

Code for Figure 1

```
\begin{figure}[tbp]
  \begin{center}
   \includegraphics[width=5.10in,angle=0]{marriedFDRRcrop.pdf}
   \caption[This is the version of the caption to appear in tables of
   contents]{\emph{This is the main part of the caption, in italics.}
    This is additional caption information.  For a graphic like that
    above, this paragraph should explain way the data show was
    obtained (if the plot explores new data) or the way the data was
    calculated (if the plot investigates a model presented in the
    paper).  The caption should be terse, yet sufficiently detailed
    that an expert flipping through the paper could mostly or entirely
  understand the figure without reading the main text.  Any essential
  assumptions needed to replicate the results shown in the figure
  should be highlighted, often in precise numerical detail.}
    \label{fig:shortrefname}
  \end{center}
\end{figure}
```

Code for Figure 2

```
\begin{figure}[tbp]
  \begin{center}
   \includegraphics[width=4.25in,angle=0]{marriedRRcrop.pdf}
   \caption[This is the version of the caption to appear in tables of
   contents]{\emph{A second figure, with a single large plot.}
    Note that this figure has a width of only 4.25 inches; Figure
    \ref{fig:shortrefname} was wider, at 5.10 inches.  Setting the
    graphic above to a wider width would make the graphic comically large.}
    \label{fig:anotherexample}
  \end{center}
\end{figure}
```