Best LaTeX practices

Jan Gosmann

March 10, 2017

Why is this hard?

- One of the oldest pieces of software you are using.
- TEX was released 1978, feature complete since 1989.
- LATEX was released 1985.
- Best practices change over time.
- Many recommendations on the Internet are outdated.

Outline

The TEX environment

Why and why not to use LaTeX?

Pro

- Text based format good for version control and collaboration.
- Beautiful typography.
- Semantic markup (focus on content).

Contra

- Horrible language.
- Compile errors hard to track down.
- Sometimes hard to get exactly what you want.

TEX flavours

- TEX: Original “low-level” typesetting system by Donald Knuth.
- LATEX: Abstraction level build on TEX to isolate the user from typesetting decisions.
- ConTeXt: In some ways similar to LATEX, but provides easy access to advanced typographic control. Uses “unified system” instead of individual packages.

Probably best to stick to LATEX because of abstraction level and templates provided by publishers.

LaTeX compilers

- `latex`: Used to be the original LaTeX compiler to DVI, but now defaults to `pdflatex`.
- `pdflatex`: Compiles to PDF and supports special PDF features.
- `xelatex`: Adds support for PDF, UTF-8, and system fonts.
- `lualatex`: Adds support for PDF, UTF-8, system fonts, and Lua scripting.

Recommendations: Use `lualatex` if you can (first stable version was released last year), `xelatex` is also a good choice. Sometimes you have to resort to `pdflatex` (e.g., for the CogSci template or specific `microtype` features). Use `latex` only if you absolutely require specific packages (e.g., `pstricks`) not supported by the other compilers.

How to install LaTeX?

- Via the package manager of your Linux distribution.
- I prefer TeX Live available for all major OS. Yearly releases, gives you *all* the packages in the most recent versions.

Useful tools

- `texdoc`: Quickest way to pull up package documentations.
- `chktex`: Static checker, warns you about things easy to overlook. I recommend using it as an automatic checker in your favourite editor (e.g., with the Syntastic plugin in Vim).
- `latexmk`: Best way to compile LaTeX.

My .latexmkrc

```
$lualatex = 'lualatex -synctex=1 %O %S';
$pdflatex = 'pdflatex -synctex=1 %O %S';
$xelatex = 'xelatex -synctex=1 %O %S';
$pdf_mode = 4;  # 1 for pdflatex, 4 for lualatex, 5 for xelatex
```

Preamble

pdflatex

```
\usepackage[utf8]{inputenc}
\usepackage[T1]{fontenc}
```

xelatex and lualatex

```
\usepackage{fontspec}
```

Also, consider loading the `microtype` package, but you might want to disable protrusion for the table of contents (see section 9 of the manual).

Markup

Semantic markup

- Mark what things are, not what they should look like.
- Allows you to easily adjust formatting.

Example: Common definitions I use

```
\newcommand{\mat}[1]{\bm{#1}}  % matrix
\newcommand{\vc}[1]{\bm{#1}}  % vector
```

Special text styles

- Use `\emph` to emphasize text because it uses italics correction and can be nested: `This is \emph{emphasized with \emph{even more} emphasis}.` produces "This is *emphasized with* even more *emphasis*.".
- Consider the semantic difference between `\emph{apples}, \emph{oranges}, and \emph{bananas}` (three individual items) and `\emph{A, B, and C}` (a single entity like a proper name).
- Use `\text??` commands for formatting instead of `{\?? ...}`, e.g. `\textbf{text}` instead of `{\bf text}`. The `\text??` commands can be nested and `\textit` has italics correction.

Equations

- Use `equation` and `amsmath` environments, not `$$` for display equations.
- Equations are part of sentences.
- Do not forget punctuation.
- Do not introduce paragraph breaks around equations by additional empty lines (if it does not end the paragraph).

Example

```
The input is given by
\begin{equation}  % no empty line before this
    J(x) = \alpha_i e_ x(t) \text{.}
\end{equation}
```

Formatting in equations

- Only variables (and measured physical constants) should be in italics (default).
- Common functions and operators like $\max$, $\cos$ should be made upright by prefixing them with \, e.g. `\max` ($\max$), **not** `max` (max).
- Use `\DeclareMathOperator` from the `amsmath` package to declare new operator names.
- Subscripts etc. that are not a variable should be made upright with `\mathrm` or `\mathsf`, e.g. `\tau_{\mathrm{syn}}` (τ_{syn}), **not** `\tau_{syn}` (τ_{syn}), but `a_i,\ 0 < i < 4` ($a_i,\ 0 < i < 4$).
- Latex treats each letter as a single variable. Enclose multi-letter variables with either `\mathit` or `\mathsfit` to ensure proper spacing.
- The `commath` package provides some useful commands and make it easy to correctly set differentials.

Special characters

Spaces

- Use non-breaking space ~ where you would never want a linebreak. For example, `Dr.~Who`, `Figure~\ref{fig:a}`, or `(a)~this, or (b)~that`.
- Use either non-breaking space ~ or explicit normal length space `\␣` after periods that do not end a sentence because the intersentence space in English can be larger than the interword space.
- Use intersentence spacing when sentence ends in all caps word. For example, `Independent accumulator is abbreviated with IA\@.` (Chktex warns about this.)

Quotes

- Use ``text'' to produce actual quotes: “text”.
- **Not** "text" which gives ”text”.
- Same for single quotes.
- Or use \enquote from the csquotes package.

Horizontals bars aka dashes

Hyphen	-	-	connects words, e.g., good-hearted
en dash	–	--	span or range of numbers, e.g., chapters 5–9
em dash	—	---	denotes break in sentence or sets off source of a quote
Minus	−	$-$	or \textminus
Plus	+	+	(here for comparison to minus)

- Vertical alignment comparison: - – — − +.
- Minus has same height and width as the horizontal bar of the plus.
- The em dash for sentence breaks is traditionally set without (or only tiny) spaces around it.

Package recommendations

References

- Use `biblatex` package with `biber` backend if possible (most modern package, most features, UTF-8 support).
- Templates provided by journals often use older packages like `natbib` and require the old `bibtex` backend.
- Use appropriate citation commands, e.g. `\parencite` vs `\textcite` with `biblatex`.
- Avoid parenthesis in parenthesis (might require some manual piecing together with different lower level citation commands).
- Using reference management software can be a good idea. (I use Zotero with the "Better Bib(La)TeX" plugin, others are Papers for macOS and Mendeley.)

Tables

- Never, ever use vertical rules.
- Never use double rules.
- Caption goes above table, not below (in contrast to figures).
- Align numeric columns on period.
- Use `booktabs` package and read its documentation.

Item		
Animal	Description	Price ($)
Gnat	per gram	13.65
	each	0.01
Gnu	stuffed	92.50
Emu	stuffed	33.33
Armadillo	frozen	8.99

Some further package recommendations

- `nag` warns about usage of outdated packages and commands (load with `\usepackage[l2tabu,orthodox]{nag}`, consider adding the `abort` option).
- `amsmath` provides a number of useful equation environments and related commands.
- `graphicx` (it is more modern and has more functionality than `graphics`)
- `siunitx` provides configurable formatting for numbers and quantities with units.
- `tikz` allows to create great figures, but has a steep learning curve.
- `komascript` is a collection of feature-rich document classes and packages.
- Some like `memoir` (for book-style documents).
- `komascript` vs `memoir`

Grab bag

Collaboration

- `overleaf.com`
  - Pros: web interface, Git access
  - Cons: version tracking is lacking, only LaTeX inline comments
- `github.com`
  - Pros: PRs allow discussion threads in code, good version tracking
  - Cons: more complicated to use?
- `sharelatex.com` (have not tried it yet)
- Use one sentence per line. (You might want to set your editor to soft wrap mode.)

Forward and inverse search

- Jump from tex-file to corresponding spot in the PDF (forward).
- Jump from the PDF to the corresponding spot in the tex-file (backward).
- Requires to compile tex with `-synctex=1`.
- Further setup depends on editor and PDF viewer.

Further reading

- https://www.olivierverdier.com/posts/2013/07/15/modern-latex/
- http://practicaltypography.com/
- `texdoc l2tabuen`
- https://jakubmarian.com/hyphen-minus-en-dash-and-em-dash-difference-and-usage-in-english/
- http://tex.stackexchange.com/questions/7742/what-are-the-strengths-and-weaknesses-of-koma-script-and-memoir