

Latex Project

Livia Dewaele

December 5, 2019

1 INTRODUCTION

1.1 WHAT IS LATEX?

- LaTeX (*lay-tech*) is a method of creating documents using plain text, stylized using markup tags similarly to HTML/CSS or Markdown.
- LaTeX is based on TEX, a typesetting system that operates at a low level and which consequently is difficult to use.
- LaTeX was developed to make it easier.
- LaTeX is not a word processor - it doesn't spell check documents or allow you complete control over formatting. Rather than manually changing the style like in Word, you write code in plain text that is compiled into a final document at the end. Several output formats are available - most common form is PDF.
- As you type, you mark the document structure with tags (eg title, chapters, lists, etc).
- Benefits are: **stylistic uniformity, bibliography support, sophisticated structuring abilities, reference tracking, highly extendable capabilities.**
- With a word processor, changing the formatting means you have to change each instance individually. With LaTeX, you just have to redefine the commands.

1.2 FIRST STEPS

In order to use LaTeX, you need to install a LaTeX editor. It is free and open source.

- For Mac: can be downloaded from here <https://www.tug.org/mactex/morepackages.html>
- For Windows: <https://miktex.org/download>
- For Linux: in repository.

Download and install.

Open TexStudio. Save new document as a **.tex** file.

2 DOCUMENT STRUCTURE

2.1 THE BASICS

Like in R, there are commands and comments in LaTeX. Commands start with a backslash and comments start with a %.

Here is an example of how you would begin making a LaTeX document:

```
\documentclass[a4paper,12pt]{article}
\begin{article}
A sentence of text.
\end{article}
```

What are all of these elements?

2.1.1 Declarations

At the start of every LaTeX document, you need to specify which LaTeX template you want to use. This is selected using `documentclass`.

This is a declaration: it is stated once, takes effect until further notice, and can be optionally constrained.

Declarations can have required arguments and optional arguments.

2.1.2 Arguments

Required arguments are in curly brackets and must be included. For example, for `*documentclass*` these could be `book`, `report`, `article`, `letter`, `beamer`.

Optional arguments are in square brackets and can be left out - in this case they set the paper size to

2.1.3 Environments

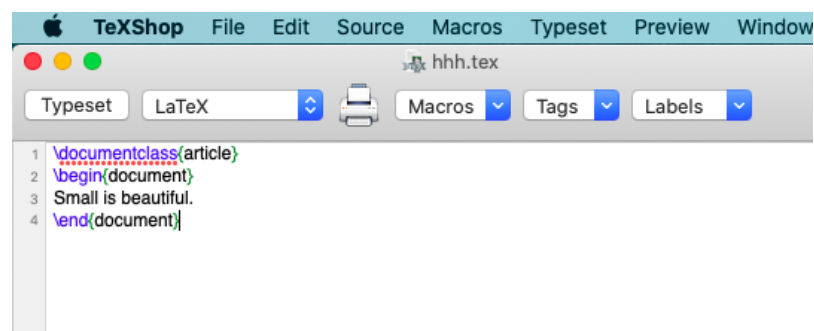
You must also include environments, which are matching begin and end declarations:

```
\begin{document}
...
\end{document}
```

These commands enclose the text and commands that make up your document. Anything written before *begin* is known as the preamble and will affect the whole document, and anything after *end* will be ignored.

2.1.4 Creating the document

To create the PDF, click on 'Typeset' in the left corner: this will create a PDF document.



2.2 PACKAGES

Packages allow you to further customize your LaTeX document. The command for this is:

```
\usepackage{name}
```

Packages should be included in the preamble.

There are many many packages - they can be found online, and some are on the cheat sheet <https://wch.github.io/latexsheet/>, but here is a sample of some common packages:

- **hyperref**: automatically adds links and bookmarks to your document. The table of contents, references, URLs and citation all become clickable in the resulting PDF.
- **csquotes**: provides “advanced facilities for inline and display quotations”. I mainly use the `enquote` command to put its argument between quotation marks. Alternatively you could use ligatures, two back-ticks and single quotes for opening and closing quote respectively. However, because `enquote` is context-sensitive, it will manage nested quotations for you.
- **subfiles**: When working on a large document, it is beneficial to split your document into different files. In contrast to working with the default `input` or `include`, the `subfiles` package lets you create files that can be compiled independently of the main document.
- **booktabs**: Default tables in LaTeX aren’t exactly good looking. The `booktabs` package adds horizontal rules with additional spacing, tables look clean and professional.
- **geometry**: provides a easy yet powerful interface to defining page dimensions. Depending on the document you might want to change the margins of the document, which can be set with `top`, `bottom`, `outer` and `inner`. The `heightrounded` option rounds the text height to prevent “underfull vboxes”. The package offers much more options detailed in the manual.
- **glossaries**: a powerful package with supports for creating (multiple) glossaries and a list of acronyms. You are required to run the `makeglossaries` script, but fortunately you don’t really need to change your workflow as this is only necessary to make the alphabetically sorted list.

2.3 CREATING A TITLE

The

```
\maketitle
```

`\maketitle` command creates a title. You need to specify the title of the document. If the date is not specified today’s date is used. Author is optional.

For example:

```
\begin{document}
  \title{My First Document}
  \author{My Name}
  \date{\today}
  \maketitle
\end{document}
```

Would print a header like this:

My First Document

My Name

December 5, 2019

2.4 CREATING SECTIONS

The following sectioning commands are available for the article class:

```
\section{...}  
\subsection{...}  
\subsubsection{...}  
\paragraph{...}  
\subparagraph{...}
```

The title of the section replaces the dots between the curly brackets. With the report and book classes we also have

```
\chapter{...}
```

For example:

```
\section{Introduction}  
This is the introduction.  
  \section{Methods}  
  \subsection{Stage 1}  
  The first part of the methods.
```

It would print like this:

3 Introduction

This is the introduction.

4 Methods

4.1 Stage 1

The first part of the methods.

4.2 CREATING LABELS

You can label any of the sectioning commands so they can be referred to in other parts of the document. Label the section with *label*, then *ref*, like this:

```
\label{labelname}  
\ref{labelname} %or  
\pageref{labelname}
```

4.3 CREATING TABLES OF CONTENTS

If you use sectioning commands it is very easy to generate a table of contents. Type

```
\tableofcontents
```

where you want the table of contents to appear in your document — often directly after the title page.

You may also want to change the page numbering so that roman numerals (i, ii, iii) are used for pages before the main document starts. This will also ensure that the main document starts on page 1. Page numbering can be switched between arabic and roman using

```
\pagenumbering{...}
```

Type the following after *maketitle*:

```
\pagenumbering{roman}  
\tableofcontents  
\newpage  
\pagenumbering{arabic}
```

It would print the contents of this document, like this:

Contents

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5 TYPESETTING

5.1 FONT EFFECTS

Here are a few different commands for different font effects:

```
\textit{words in italics}  
\textsl{words slanted}  
\textsc{words in smallcaps}  
\textbf{words in bold}  
\texttt{words in teletype}  
\textsf{sans serif words}  
\textrm{roman words}  
\underline{underlined words}
```

EG:

words in italics *words slanted* WORDS IN SMALLCAPS **words in bold** words in teletype sans serif words
roman words underlined words

5.2 COLORED TEXT

For colored text, you need to use a package. Use the *xcolor* package in the preamble.

The basic color names that this package recognises are: black, red, green, blue, cyan, magenta, yellow and white.

For example:

```
\documentclass{article}  
\usepackage{xcolor}  
\begin{document}  
  \title{My First Document}  
  \maketitle  
\textcolor{red}{fire}  
\end{document}
```

Looks like:

```
\begin{document}
```

My First Document

My Name

December 5, 2019

fire

The word appears in color.

5.3 FONT SIZE

Here are some commands for font size:

```
{\tiny tiny words}
{\scriptsize scriptsize words}
{\footnotesize footnotesize words}
{\small small words}
{\normalsize normalsize words}
{\large large words}
{\Large Large words}
{\LARGE LARGE words}
{\huge huge words}
```

{tiny words} {scriptsize words} {footnotesize words} {small words} {normalsize words} {large words} {Large words} {LARGE words} {huge words} {normalsize words}

5.4 ALIGNMENT

Specify alignment in the brackets for *begin* and *end*:

```
\begin{center/flushright/flushleft}
...
\end{center/flushright/flushleft}
```

5.5 SPACING

Margins:

The default is between 1.5 inches and 1.875 inches.


```
\usepackage[margin=0.5in]{geometry}
```

Paragraphs and other breaks:

Paragraphs are separated by a blank line. To force a new page, use

```
\newpage %or  
\clearpage
```

```
\usepackage[margin=0.5in]{geometry}
```

5.6 LISTS

There are two main types of lists.

Bulleted lists:

```
\begin{itemize}  
  \item Text  
  \item Text  
\end{itemize}
```

- Text
- Text

And numbered lists:

```
\begin{enumerate}  
  \item Text  
  \item Text  
\end{enumerate}
```

1. Text
2. Text

5.7 SPECIAL CHARACTERS

The following symbols are reserved characters which have a special meaning in LATEX: *# \$ % ^ & _ { } ~ *

All of these apart from the backslash can be inserted as characters in your document by adding a prefix backslash:

```
\# \ $ \% \^{} \& \_ \{ \} \~{}
```

6 TABLES

6.1 STARTING A TABLE

The `tabular` command is used to typeset tables.

By default, LATEX tables are drawn without horizontal and vertical lines — you need to specify if you want lines drawn.

LaTeX determines the width of the columns automatically.

This code starts a table, where the dots between the curly brackets are replaced by code defining the columns::

```
\begin{tabular}{...}
```

6.2 COLUMN ALIGNMENT

- `l` for a column of left-aligned text (letter `el`, not number one).
- `r` for a column of right-aligned text.
- `c` for a column of centre-aligned text.
- `|` for a vertical line.
- For example, `lll` (i.e. left left left) will produce 3 columns of left-aligned text with no vertical lines.
- `/l/r/` (i.e. |left|left|right|) will produce 3 columns — the first 2 are left-aligned, the third is right-aligned, and there are vertical lines around each column.

EG:

```
\begin{tabular}{...}  
|l|l|r|  
\end{tabular}
```

6.3 COLUMN LINES

- The table data follows the *begin* command:
- `&` is placed between columns.
- `\` is placed at the end of a row (to start a new one).
- `hline` inserts a horizontal line.
- `cline{1-2}` inserts a partial horizontal line between column 2.
- The command `end{tabular}` finishes the table. Examples of `tabular` code and the resulting tables:

```
\begin{tabular}{|l|l|}  
Apples & Green \\  
Strawberries & Red \\  
Oranges & Orange \\  
\end{tabular}
```

Apples	Green	
Strawberries	Red	
Oranges	Orange	

7 FIGURES

To insert an image into your LaTeX document, you need to use the *graphicx* package.

Remember: packages appear before the *begin* command, and are written like this:

```
\usepackage{graphicx}
```

Images should be PDF, PNG, JPEG or GIF files. The following code will insert an image called *myimage*:

```
\usepackage{graphicx}
\begin{document}
\begin{figure}[h]
\centering
\includegraphics[width=1 in]{myimage}
\caption{Here is my image}
\label{image-myimage}
\end{figure}
```

- *h* is the placement specifier. *h* means put the figure approximately here (if it will fit).
- *centering* centres the image on the page, if not used images are left*aligned by default.
- *includegraphics* is the command that actually puts the image in your document. The image file should be saved in the same folder as the .tex file.
- *width=1 in* is an optional command that specifies the width of the picture.
- *caption* defines a caption for the figure. If this is used LATEX will add “Figure” and a number before the caption.
- *label* creates a label to allow you to refer to the table or figure in your text (section 2.5, page 7).

8 REFERENCES

LaTeX comes bundled with an auxiliary tool called BibTeX.

BibTeX provides for the storage of all references in an external, flat*file database. This database can be referenced in any LaTeX document, and citations made to any record that is contained within the file.

This is often more convenient than embedding them at the end of every document written; a centralized bibliography source can be linked to as many documents as desired.

9 BIBTEX FILE

Your BibTeX file contains all the references you want to cite in your document. It has the file extension .bib. It should be given the same name as and kept in the same folder as your .tex file. The .bib file is plain text it can be edited using Notepad or your LaTeX editor (e.g. TeXworks). You should enter each of your references in the BibTeX file in the following format:

```
@article{
Birdetal2001,
Author = {Bird, R. B. and Smith, E. A. and Bird, D. W.},
Title = {The hunting handicap: costly signaling in human foraging strategies},
Journal = {Behavioral Ecology and Sociobiology},
Volume = {50},
Pages = {9-19},
Year = {2001} }
```

Each reference starts with the reference type (@article in the example above). Other reference types in

After the reference type there is a curly bracket, then the citation key. Each reference's citation key must be unique - you can use anything you want, but a system based on the first author's name and year (as in the example above) is probably easiest to keep track of.

The remaining lines contain the reference information in the format

```
Field name = {field contents}
```

Surround any letters in a journal article title that need to be capitalized with curly brackets `{...}`. BibTeX automatically uncapitalizes any capital letters within the journal article title. For example, "Dispersal in the contemporary United States" will be printed as "Dispersal in the contemporary united states", but "Dispersal in the contemporary *U*nited *S*tates" will be printed as "Dispersal in the contemporary United States".

You can type the BibTeX file yourself, or you can use reference management software such as EndNote to create it (guide here: <https://www.wiki.ed.ac.uk/x/sZpKBg>).

9.1 INSERTING BIBLIOGRAPHY

Type the following where you want the bibliography to appear in your document (usually at the end):

```
\bibliographystyle{plain}
\bibliography{Doc1}
```

9.2 CITING REFERENCES

Type

```
\cite{citationkey}
```

where you want to cite a reference in your .tex document.

To include a page number in your in-text citation put it in square brackets before the citation key:

```
\cite[p. 215]{citationkey}
```

To cite multiple references include all the citation keys within the curly brackets separated by commas:

```
\cite{citation01, citation02,citation03}
```

9.3 STYLES

9.3.1 Numerical citations

LaTeX comes with several styles with numerical in-text citations, these include:

- **Plain** The citation is a number in square brackets (e.g. [1]). The bibliography is ordered alphabetically by first author surname. All of the authors' names are written in full.
- **Abbrv** The same as plain except the authors' first names are abbreviated to an initial.
- **Unsrtd** The same as plain except the references in the bibliography appear in the order that the citations appear in the document.
- **Alpha** The same as plain except the citation is an alphanumeric abbreviation based on the author(s) surname(s) and year of publication, surrounded by square brackets (e.g. [Kop10]).

9.3.2 Author-Date citations

Use the **natbib** package if you want to include author-date citations.

Natbib uses the command

```
\citep{...}
```

for a citation in brackets (e.g. [Koppe, 2010]).

Use:

```
\citet{...}
```

for a citation where only the year is in brackets (e.g. Koppe [2010]). There are lots of other ways that you can modify citations when using the **natbib** package * see the package's reference sheet for details (<http://mirror.ctan.org/macros/latex/contrib/natbib/natnotes.pdf>).

It comes with three bibliography styles: **plainnat**, **abbrvnat** and **unsrtnat**. These format the bibliography in the same way as the plain, abbrv and unsrtd styles, respectively.

10 ADDING EQUATIONS

One of the main reasons for writing documents in LaTeX is because it is really good at typesetting equations. Equations are written in 'math mode'.

You can enter math mode with an opening and closing dollar sign $\$$. This can be used to write mathematical symbols within a sentence — for example, typing

```
 $1+2=3$ 
```

$1 + 2 = 3$

If you want a “displayed” equation on its own line use

```
$$...$$.
```

For example:

$$1 + 2 = 3$$

For a numbered displayed equation, use

```
\begin{equation}  
a + b = c  
\end{equation}.
```

For example:

$$a + b = c \tag{1}$$

For more information about mathematical symbols etc go to the Mathematics chapter in the LaTeX Wikibook (<https://en.wikibooks.org/wiki/LaTeX/Mathematics>).

11 MAKING PRESENTATIONS

LaTeX is also useful for making presentations. You can do this using *beamer*.

You start with:

```
\documentclass{beamer}  
\begin{document}
```

Inside the document environment, you specify a new frame environment for each new slide in your presentation:

```
\begin{document}  
  \begin{frame}  
    \frametitle{This is the first slide}  
    %Content goes here  
  \end{frame}  
  \begin{frame}  
    \frametitle{This is the second slide}  
    \framesubtitle{A bit more information about this}  
    %More content goes here  
  \end{frame}  
  % etc  
\end{document}
```

11.1 TITLE PAGES

First, you give information about authors, titles and dates in the preamble. (Here is an example from TeXShop:

```

\documentclass{beamer}

\title[Crisis] %(Optional, only for long titles)
{The Economics of the Financial Crisis}
\subtitle{Evidence from India}
\author[Author, Anders] %(Optional, for multiple authors)
{F.-Author\inst{1}\and S.Anders\inst{2}}
\institute[Universities Here and There] %(Optional)
{
  inst{1}%
  Institute of Computer Science\
  University Here
  \and
  \inst{2}%
  Insitute of Theoretical Philosophy\
  University There
}
\date[KPT 2004] %(Optional)
{Conference on Presentation Techniques, 2004}
\subject{Computer Science}

```

Then add the title page in the document:

```

\begin{document}
\frame{\titlepage}
\begin{frame}

```

11.2 TABLES OF CONTENTS

The table of contents, with the current section highlighted, is displayed by:

```

\begin{frame}
\frametitle{Table of Contents}
\tableofcontents[currentsection]
\end{frame}

```

11.3 SECTIONS AND SUBSECTIONS

As in all other LaTeX files, it is possible to structure the document using:

```

\section[Section]{My section}
\subsection[Subsection]{My subsection}
\subsubsection[Subsubsection]{My subsubsection}

```

12 OTHER FORMATS AND POSSIBILITIES

There are many possible types of document that can be produced, apart from articles and presentations, which have been the main focus of this introduction. For more information on everything covered here and far more, visit the Wikibooks page: <https://en.wikibooks.org/wiki/LaTeX/Introduction>

13 BIBLIOGRAPHY

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