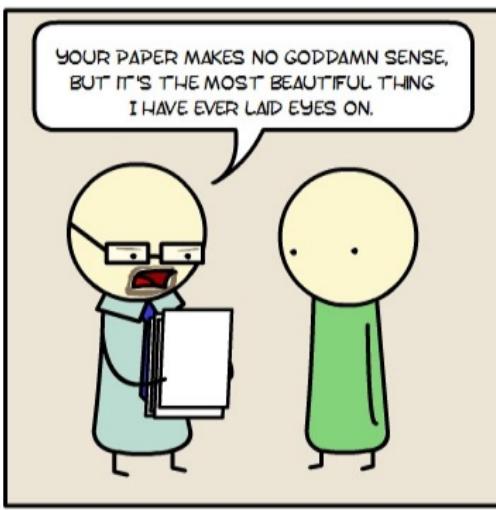


LATEX

Coding club @Chimay 24-09-2024

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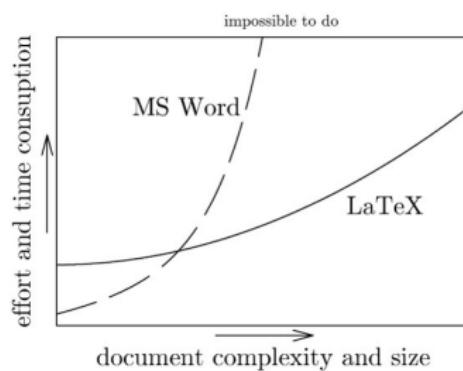


Overview of this coding club

- 1 What is LATEX?
- 2 Create your first doc
- 3 Typesetting
- 4 Maths
- 5 Tables & Figures
- 6 References in LATEX
- 7 Further tips & tricks

What is LATEX?

- Document preparation system / Markup language (cfr MS Word, HTML,...)
- OpenSource, free, coded/command-based, platform independent, (beautiful)
- Focus on content & professional typesetting
- Not *wysiwyg* but *wysiwym* (presentational vs. descriptive markup)
- Can have a steep learning curve...



e.g. automated numbering, sections, figures, intradoc ref...

Word vs. LATEX

LATEX is especially famous for its mathematical typesetting

$$K(d_s) = \frac{1}{\lambda} \sum_{i=1}^N \sum_{j=1}^N \frac{\delta_{ij}(|x_i - x_j| \leq d_s)}{N}$$

$$K(d_s) = \frac{1}{\lambda} \sum_{i=1}^N \sum_{j=1}^N \frac{\delta_{ij}(|x_i - x_j| \leq d_s)}{N}$$

What is LATEX?

Other benefits for academics

- Many journals/publishers except latex formats, provide own template (PNAS, BES journals, Elsevier, Springer...)
- Mathematical formulas
- Especially larger documents: (MSc and/or PhD) thesis, course books,...

Disadvantage: collaborative editing, but see initiatives like [Overleaf](#)

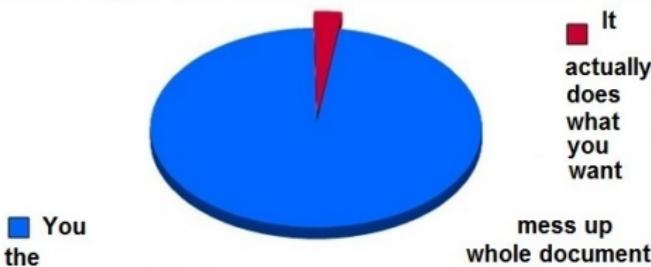


Should you use LATEX?

Depends on different factors

- Complexity of the envisioned document
- Your own experience, taste/preference
- What your collaborators use
- The timing x personal comfort zone (e.g. a PhD to finish...)

Moving a picture in Microsoft Word



Workflow & Aim

Suggested (future) workflow:

- ① Get yourself familiar with basic concepts and syntax
- ② Start your documents with available templates (see further)! and adjust according to your needs
- ③ Get coding help from your LATEX editor, wikibooks, Overleaf, Google, ChatGPT,...

So start with available **templates**!

Aim of this coding club

Get you acquainted with format and syntax

If this is too easy for you, there is a challenge on Github!

TeX editors

Allow you to compile your TeX-file and build pdf

Help you with inserting symbols/equations, auto-completion and setting up your document

- [TeXworks](#) (MikTeX), cfr R



- [TeXstudio](#) cfr Rstudio



- [TeXnicCenter](#) cfr extra alternative Rstudio



Detailed comparison of editors:

<https://beebom.com/best-latex-editors/>

→ Editors give hints about your coding or flag if something seems off (highlights in orange/red...)

General syntax rules

- Concept: label (through commands) all the parts of your document (title, chapters, sections, figures, tables, formula, enumerations,...)
- A **command** begins with \: \begin{figure}, \section{...}
- The object of your command (variable/input) comes directly after the command-name enclosed by **curly brackets {}**. Sometimes extra 'set-ups' are done with square brackets []
- **Float**: a container for things that cannot be broken apart: figure with caption, table.
- \usepackage{} is like library() in R
- comments are added with %, like # in R
- \\ is enter

Exercise 1.0

Open TeXstudio (or TeXworks) & type

```
\documentclass[a4paper, 12pt]{article}
\begin{document}
My first \LaTeX{} document! Yeay!
\end{document}
```

Build & View

Exercise 1.1a

Add a title page

```
\title{My First Document}  
\author{Your name}  
\date{\today} %or specify  
\maketitle
```

Excercise 1.1b

Change type of the DOCUMENTCLASS now to REPORT, what is the difference?

```
\clearpage
```

More info on document structure in LATEX:

https://en.wikibooks.org/wiki/LaTeX/Document_Structure

Exercise 1.2

Add sections to your document

```
\section{Introduction}  
This will be the intro  
\subsection{First part of introduction}  
\subsubsection{...}  
\paragraph{...}  
\ subparagraph{...}
```

What is the difference between PARAGRAPH and SECTION? Try CHAPTER (documentclass report and book)

Exercise 1.3

Make a template for today's exercises with sections Typesetting, Maths, Tables & Figures, References. In these sections you can make subsections Exercise 1 etc.

Exercise 1.4

Add table of contents after the titlepage

```
\tableofcontents
```

compare how this would work out in a large document in word...

Typesetting in LATEX

Start a new line

```
\\\\  
\noindent (but specify your standard in document set-up)  
\indent
```

Fonts

\textit{italics}	<i>italics</i>
\textsc{smallcaps}	SMALLCAPS
\textbf{bold}	bold
\underline{underlined}	<u>underlined</u>

<https://en.wikibooks.org/wiki/LaTeX/Fonts>

Typesetting in LATEX

Fontsize

```
{\tiny tiny words}                                     tiny words
{\footnotesize footnotesize words}                   footnotesize words
{\small small words}                                small words
{\large large words}                               large words
{\LARGE LARGE words}                            LARGE words
{\huge huge words}                                huge words
```

Colors

```
\usepackage{xcolor} %(cfr library() in R)
{\color{colour_name} text}
red, green, blue, cyan, magenta, yellow
https://en.wikibooks.org/wiki/LaTeX/Colors
```

Typesetting in LATEX

Exercise 2

Try to imitate this paragraph in your introduction

This is my **introduction**, I want to tell you something really,
really, really, **really** incredible.

My article is AMAZING.

It's **great**, just great.

*Believe me, we're going to make the **TEREC** great again!*

Symbols

Text symbols

are added in your text with command-symbol

Some have a special name

`\"{}{o}, \% \textless, \textgreater\`

ö, % <, >

Mathematical symbols

Some are mathematical symbols, they have to be added in between \$-signs

`α, ∞, \pm, ${}^{\circ}$`

α , ∞ , \pm , ${}^{\circ}$

https://en.wikibooks.org/wiki/LaTeX/Special_Characters

https://oeis.org/wiki/List_of_LaTeX_mathematical_symbols

Lists

Default has 4 levels (more can be added with use of packages)

```
\begin{enumerate}  
\item My 1st point  
\item My 2nd point  
\end{enumerate}
```

1. My 1st point
2. My 2nd point

```
\begin{itemize}  
\item My 1st point  
\item My 2nd point  
\end{itemize}
```

- My 1st point
- My 2nd point

More tips & tricks on how to easily **change your enumeration signs** or make **nested lists** etc:

<https://www.latex-tutorial.com/tutorials/lists/>

Exercise 3

Try to make the following nested enumeration

1. Wybouw/Bonte retreat 2024

- Where?
 - Near Chimay!
 - Rue du Calvaire 2, Rance
- When?
 - Monday 23th to Friday 27th of September

2. Planned activities

- * Scientific sessions
 - Lab day part 1 & 2
 - This L^AT_EX coding club!
 - ... and much more!
- * Fun activities
 - Hiking or Parcours
 - Visit to Chimay abbey
 - Moth trapping
 - Quiz
 - ... and much more!

Equations

Three ways

- In your text: $\$ a + b = 5 \$$

...a set of equations, such as $a + b = 5$ and $a = \frac{b}{2}$ are easily solved...

- displayed equation: $\$\$ \int \frac{\sin(x)}{x} \$\$$

$$\int \frac{\sin(x)}{x}$$

- numbered equation: $\begin{aligned} &\text{\backslash begin\{equation\}... \backslash end\{equation\}} \end{aligned}$

$$\int \frac{\sin(x)}{x} \tag{1}$$

Let your editor help you get to learn the code!

Use of numbered equations

With these numbered equations (and figures and tables, see later), you can easily cross reference inside your document.

- ① Give your equation/figure/table a **label**{ } with \label (e.g. eq:Euler, tab:fruits, fig:map, sec:typesetting). Label inside your 'float'.
- ② When you want to **refer to it in your text** (see Figure X) or in formula (1), you just say ...see formula \ref{int-sinx}

Advantage over Word?

Exercise 4

Create following equation and refer to it in a sentence introducing the equation

...equation 2 was used to calculate this metric.

$$K = \sum_{i=0}^{i=n} \frac{\sqrt{\alpha}}{\delta_{ij}} \quad (2)$$

Floats

Tables & figures are floats, which means that latex will choose the best possible presentation for them (you don't have to worry about them how they will jump while you complete your text).

But you don't always agree with \LaTeX , that's why **placement specifiers** exist.

h, t, b, p, !, H (package float)

here, top, bottom, separate page, force it a bit please, HERE

Tables

```
\begin{table}[ht]
\caption{Fruits and their properties}
\begin{tabular}{|l||c|r}
Fruit & Colour & Shape\\
\hline
Apples & Green & Nearly round\\
Strawberries & Red & Triangle\\
\end{tabular}
\end{table}
```

Table 1: Fruits and their properties

Fruit	Colour	Shape
Apples	Green	Nearly round
Strawberries	Red	Triangle

Exercise 5

Try to imitate this table

City	Year		
	2006	2007	2008
London	45.000	46.000	51.000
Berlin	35.000	33.000	30.000
Paris	50.000	51.000	52.000

More useful stuff on tables:

<https://nl.wikibooks.org/wiki/LaTeX/Tabellen>

Figures

Put figures in the same map as or in a subdirectory of your .tex-file

```
\usepackage{graphicx}
\begin{figure}
  \centering
  \caption{Cartoon about \LaTeX{}}
  \includegraphics[width=0.25\textheight]{cartoon.jpg}
\end{figure}
```

Figure 1: Cartoon about LATEX



Exercise 6

Download [this figure](#) (or get it from the github page) and include it in your document. Make sure you can refer to it in your text.



Figure 2: What an amazing digger wasp!

More tips & tricks about figures on [wikibooks](#)

- wrapping a figure in your text
- side captions
- adding subfigures
- ...

Trick from Cesare for tables:

<https://tableconvert.com/excel-to-latex>

Bibliography and references

- References are stored in an auxiliary file/database: a BibTeX-file (*.bib)
- You can export a bib-file from Zotero, Mendeley or Endnote. Put this file in the same directory as your tex-file.

Citing

'Cite key' in standard LATEX is numbered

```
\cite{Manel2003}
```

Other styles with `\usepackage[round]{natbib}` (put this before the `\begin{document}` command)

<code>\citet{goossens93}</code>	Goossens et al. (1993)
<code>\citep{goossens93}</code>	(Goossens et al., 1993)
<code>\citet*{goossens93}</code>	Goossens, Mittlebach, and Samarin (1993)
<code>\citep*{goossens93}</code>	(Goossens, Mittlebach, and Samarin, 1993)
<code>\citeauthor{goossens93}</code>	Goossens et al.

Insert bibliography

```
\bibliographystyle{plain} % set style  
\bibliography{MyExportedLib} % build the bibliography
```

Exercise 7

- ① Export your bibliography from Zotero/EndNote/Mendeley. If you don't have this, there is an example bib-file in the repo.
- ② Use two citations in a sentence. e.g 'Tengö *et al.* mention that a digger wasp needs \pm 12 days to finish a nest cycle, provisioning its single larva with flies (Nielsen, 1945).'
- ③ Insert your bibliography in a separate section at the end of your document.

Biological bibliography styles

Standard bibliography styles are always mathematics/physics like (year at the back, beginning with first name...).
apalike comes closest.

Items are cited: *The L^AT_EX Companion* book [Goossens et al., 1993], the Einstein journal paper [Einstein, 1905], and The L^AT_EX related items are [Goossens et al., 1993, Knuth,].

References

[Einstein, 1905] Einstein, A. (1905). Zur Elektrodynamik bewegter Körper. (German) [On the electrodynamics of moving bodies]. *Annalen der Physik*, 322(10):891–921.

[Goossens et al., 1993] Goossens, M., Mittelbach, F., and Samarin, A. (1993). *The L^AT_EX Companion*. Addison-Wesley, Reading, Massachusetts.

[Knuth,] Knuth, D. Knuth: Computers and typesetting.



Biological bibliography styles

Biological styles can be downloaded from [this \(ugly\) site](#).

Put the .bst file of your preferred style (e.g. ecol_let.bst or pnas.bst) in the same directory as your .tex-script.

```
\usepackage[round]{natbib}
```

```
\bibliographystyle{ecol_let}  
\bibliography{ExampleExport}
```

Exercise 8

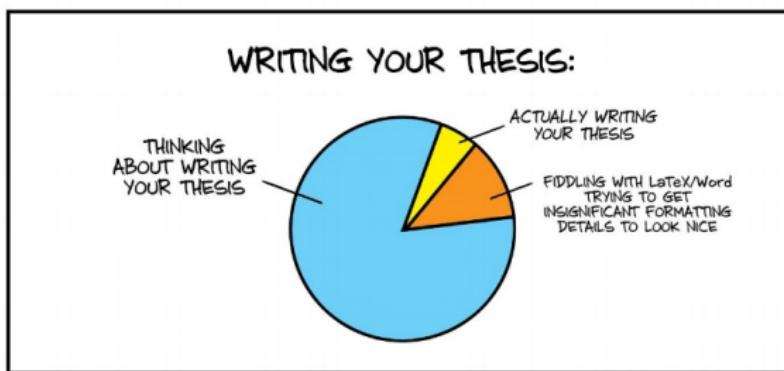
Make your bibliography look like one of the biological journals listed on the site.

Helplines

- **Google** is your friend!

How to... 'make margins bigger in LATEX', 'do X with a table', '...'
 ∞'

- **ChatGPT** is your friend too! (Apparently, language models can be good in coding as well...)
- There are often **multiple solutions** possible (twocolumn, \twocolumn, \usepackage{multicol},...)



Templates

- <https://www.latextemplates.com/>
- <https://www.overleaf.com/latex/templates>
- TEREC examples:
<https://github.com/FemkeBatsleer/TEREC-coding-club>