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**UNIVERSITÄT  
BERN**

# L<sup>A</sup>T<sub>E</sub>X for scientists

**Julien Riou**

13 February 2019

# Plan

- What is L<sup>A</sup>T<sub>E</sub>X?
- Writing and compiling L<sup>A</sup>T<sub>E</sub>X code
- Basic formatting
- Advanced topics
- L<sup>A</sup>T<sub>E</sub>X templates for scientists:
  - cover letter
  - scholarly article
  - journal submission
  - presentation

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Different from a “*what you see is what you get*” word processor:

- **program** the structure and contents of a document
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Very good for:

- professional-looking documents with a **pre-specified format**
- structure, reproducibility
- maths, cross-referencing, bibliographies

Less good for:

- creating highly personalized documents

# Writing and compiling L<sup>A</sup>T<sub>E</sub>X code

*In principle*, you only need a text editor and a L<sup>A</sup>T<sub>E</sub>X compiler:

- write your code and save it as a `.tex` file
  - e.g. with notepad in Windows
- compile the `.tex` file into an output file (generally `.pdf`)
  - e.g. with MiK<sub>T</sub>E<sub>X</sub> for Windows or T<sub>E</sub>X Live for MacOS and Linux



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*In practice*, it is easier to use an integrated development environment:

- installed on your computer: **T<sub>E</sub>XStudio** ([www.texstudio.org](http://www.texstudio.org))
  - but you still need to install a compiler!
- online: **Overleaf** ([www.overleaf.com](http://www.overleaf.com))

# Commands

L<sup>A</sup>T<sub>E</sub>X commands start with `\` and are of two kinds:

## Declarations

- Are stated once and take effect until further notice

e.g. `\centering`, `\textit{}`

## Environments

- Have matching begin and end declarations

e.g. `\begin{itemize} ... \end{itemize}`

**Beware**, forgetting closing braces or end declarations will give an error!

# Arguments

## Required arguments...

- Are contained in curly braces
- Must be included

e.g. `\documentclass{letter}`

## Optional arguments...

- Are contained in square brackets
- Can be left out
- Give you more control over the commands

e.g. `\documentclass[12pt]{letter}`

# A basic .tex file

1. Declare the type of document you want (book, article, letter, report...) with `\documentclass`
2. Declare additional options or packages (float, amsmath, geometry...) with `\usepackage`
3. Write your content within a document environment

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3. Write your content within a document environment

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

# Hello, world!

Let's try a simple “Hello, world!” example with L<sup>A</sup>T<sub>E</sub>X and Overleaf:

- Go to `www.overleaf.com` and log in with your credentials
- Create a new project, then an empty document named `helloworld.tex`
- Create a letter that says “Hello, world!”

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- Go to `www.overleaf.com` and log in with your credentials
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## Solution

```
\documentclass{letter}
%\usepackage{}
\begin{document}
    Hello, world!
\end{document}
```

# Basic formatting

- font styles
- special characters
- lists
- sectioning
- figures
- cross-referencing
- bibliography
- equations



# Font style

## Font face:

`\textit{Text}`, `\textbf{Text}`, `\texttt{Text}`, `\textsc{TEXT}` ...

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## Font size:

`\tiny{Text}`, `\scriptsize{Text}`, `\footnotesize{Text}`,  
`\small{Text}`, `\large{Text}`, `\Large{Text}`, `\huge{Text}`

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`\tiny{Text}`, `\scriptsize{Text}`, `\footnotesize{Text}`,  
`\small{Text}`, `\large{Text}`, `\Large{Text}`, `\huge{Text}`

## Alignment:

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

# Special characters and commands

## Special commands

`\ or ~` → extra single space

`\\` → new line

`\hspace{1cm}` or `\vspace{5mm}` → custom space

`\clearpage` → new page

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`\ or ~` → extra single space

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## Non-standard characters:

`\%` → % (used for commenting out)

`\&` → & (used for separations)

`\{` → { (used in commands)

`\textbackslash` → \ (used in commands)

*and lots of other symbols: ♠,  $\phi$ ,  $\Re$ ,  $\mathcal{R}$ ,  $\dagger$ ,  $\lll$ ,  $\notin$ ,  $\triangle$ ... (try detexify)*

# Lists

## Bullet list:

```
\begin{itemize}  
  \item Text  
  \item[-] Text  
\end{itemize}
```

- Text
- Text

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- Text
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## Numbered list:

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

1. Text
2. Text

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

1. Text
2. Text

Note: Lists can be nested within other lists.



# Sectioning

L<sup>A</sup>T<sub>E</sub>X can **organize, number, and index** sections of document:

```
\section{Introduction}
```

**1 Introduction**

```
\subsection{Context}
```

**1.1 Context**

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## Layers of sectioning

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\part{} \chapter{} \section{} \subsection{} \subsubsection{} \paragraph{}
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For the unnumbered version, add an asterisk:

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\section*{Introduction}
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**Introduction**

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```
\part{} \chapter{} \section{} \subsection{} \subsubsection{} \paragraph{}
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For the unnumbered version, add an asterisk:

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**Introduction**

Note: Add a table of contents with `\tableofcontents`

# Figures

Figures must be added as **independent files** in the same repertory.

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```
\begin{figure}[h]  
  \centering  
  \includegraphics[width=2cm,height=3cm]{cat.png}  
  \caption{This is my cat.}  
\end{figure}
```

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## Placement options:

- h: approximately at the same point it occurs in the code
- t/b: at the top/bottom of the page
- p: on a special page for figures only
- H: *precisely* at the same point in the code (requires a package: `\usepackage{float}`)

# Cross-referencing

L<sup>A</sup>T<sub>E</sub>X handles all references using **unique identifiers**.

- place a label after something (section, figure caption...)

```
\begin{figure}[ht]
  \centering
  \includegraphics{cat.png}
  \caption{This is my cat.}
  \label{refcat}
\end{figure}
```



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  \caption{This is my cat.}
  \label{refcat}
\end{figure}
```

- then refer to the same identifier at any point in the text

My cat is very cute (see Fig.\ref{refcat}).

→ My cat is very cute (see Fig. 1).

# Bibliography I

Same principle for citing books or articles, except that the information must be placed in a **separate bibT<sub>E</sub>X file** in the same repertory.

- use the `\cite` command instead:

My cat is the product of evolution\cite{darwin1859origin}.

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- use the `\cite` command instead:

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- place the corresponding information in a separate `foo.bib` file:

```
@book{darwin1859origin,  
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  author={Darwin, Charles},  
  year={1859} }
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```

- add a reference to the `foo.bib` file at the end of the source file:

```
\bibliographystyle{plain}  
\bibliography{foo}
```

# Bibliography II

Several basic **styles** are included (apalike, unsrt, abbrv) and journal-specific styles can be added.

The bibT<sub>E</sub>X file can be created:

- manually
- copied from e.g. <https://scholar.google.ch/>

[LIVRE] On the **origin of species**, 1859

[C Darwin](#) - 2004 - [taylorfrancis.com](https://www.taylorfrancis.com)

Darwin began writing this book while on holiday at Sandown in the Isle of Wight on Tuesday, 20 July 1858. 1 He had been working for nearly twenty years on his big idea, in notebooks2 begun on HMSBeagle and continued afterwards on his return to England. 3 In 1842 he ...

☆ 99 Cité 42653 fois Autres articles Les 164 versions »»

- directly from Zotero or Endnote (export as bibtex)

# Equations I

L<sup>A</sup>T<sub>E</sub>X allows you to typeset any sort of equations with **reliability**.

## Using math mode

Inline math mode:  $\dots$

Consider subject  $i \in \{1, \dots, n\}$ ...

Numbered equations:  $\begin{equation} \dots \end{equation}$

$$\text{logit } E(Y) = \alpha + \beta x \tag{1}$$

# Equations II

Some commands:

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$$180^\circ\mathrm{C} \quad \$180^\circ\mathrm{C}\$$$

# Advanced topics

## Tables I

Creating tables manually can be **tricky**.

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

Trial	n	t
1	23	2
2	15	10
3	100	20

```
\end{table}
```



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## Tables II

Beyond simple tables it is preferable to use **dedicated tools**:

- online convertors (e.g. <https://tablesgenerator.com/>)
- R package: `xtable`
- Stata function: `esttab`

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From simple to more difficult (but more powerful):

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`\textcolor{red}{SAD!}`

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```
- highlighting modifications using `latexdiff`
- version control: paid overleaf account, `svn`, `git`

# LaTeX templates for scientists

Templates to fill the needs of scientists:

- scholarly article
- journal submission
- letters (cover letter, answer to reviewers)
- presentation

Download the files from:

[https://github.com/jriou/LaTeX\\_for\\_scientists](https://github.com/jriou/LaTeX_for_scientists)

# L<sup>A</sup>T<sub>E</sub>X templates for scientists

## Scholarly article

Creating **professional-looking** articles with the same methods used by journal publishers.

Very important for **directly published** academic documents:

- preprints (e.g. for bioRxiv)
- supplementary appendices

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Very important for **directly published** academic documents:

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### How to use it

- upload all 3 files in /scholarly\_article to Overleaf
- select `scholarly_article.tex` and hit the “recompile” button

# L<sup>A</sup>T<sub>E</sub>X templates for scientists

## Journal submission

Some academic journals provide L<sup>A</sup>T<sub>E</sub>X templates for submissions (e.g., PLoS Medicine [here](#)).



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### How to use it

- upload all 2 files in `/plos_submission_template` to Overleaf
- select `plos_latex_template.tex` and hit the “recompile” button

# L<sup>A</sup>T<sub>E</sub>X templates for scientists

## Cover letter

Provided by the University ([here](#))

Especially useful for **cover letters** and **responses to reviewers**

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### How to use it

- open the /cover\_letter repertory
- open the .clo file in any editor to modify the personal settings
- comment out the 5th line (starting with “\PackageError”)
- upload all 5 files to Overleaf
- start your letter from the .tex file
  - options in \documentclass[] : english/german, color/bw...
  - recipient address, subject, opening, main text, closing

# L<sup>A</sup>T<sub>E</sub>X templates for scientists

## Presentation

**Surprise** (?) this presentation was made in L<sup>A</sup>T<sub>E</sub>X!

There is a document class called **beamer** that allows to do presentations (a template is provided by the University [here](#)).

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### How to use it

- upload all 4 files in /beamer to Overleaf
- select `unibern-demo.tex` and hit the “recompile” button

# Acknowledgments

- MIT Introduction to L<sup>A</sup>T<sub>E</sub>X ([link](#))
- Peter Flom, L<sup>A</sup>T<sub>E</sub>X for academics and researchers who (think they) don't need it. ([link](#))
- L<sup>A</sup>T<sub>E</sub>X wikibook ([link](#))