Introduction to LaTeX using Overleaf

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Computational Biology Skills Seminar

*Not an expert, I did this presentation using PowerPoint and not Beamer!

Outline

- LaTeX
  - Introduction: What, Why?
  - Basic document structure
  - Environment format: Equation, Table, Figures, …
  - Reference, Citations
  - Your own commands!
- Overleaf
  - Overview of Overleaf features : shared documents, comments
  - Templates available
  - Try it!

What is LaTeX ?

- Pronounced «Lah-tech» or «Lay-tech»
- Is a document preparation system for high-quality typesetting (journal articles, technical reports, books, and slide presentations,…).
  - You will need to choose your type of document; LaTeX takes care of the rest!
  - General rule ‘LaTeX knows what is best’.
- Free
- Latex implementations exists for all platforms
  - Linux: already installed on most Linux computers
  - Mac: http://www.tug.org/mactex/
  - Windows: http://www.tug.org/protext/

Why LaTeX ?

- Control over large documents containing sectioning, cross-references, tables and figures.
- Typesetting of complex mathematical formulas.
- Automatic generation of bibliographies and indexes.
- Multi-lingual typesetting.
- Can create your own commands, own packages.
- Huge online community.

LaTeX files

- .tex files : contained the main code and text, can be edited with all text editors
  - Need at least one, but can use multiple ones ! (Introduction.tex, Chapter1.tex …)
- .bib files: contained bibliography in bibtex format.
- Images format supported: pdf, png, jpg and eps (may need to import special packages).

→All will be compiled into one PDF

.tex structure

- Document Class
  - Predefined Formats (article, report, book,..).
- Packages used
  - Added Functionality (graphics, reference style,...).
- Main Body
  - Text and Bibliography References.

.tex structure

- A basic document:

```
\documentclass[11pt, twocolumn]{article}
\usepackage{amsmath, graphicx}
\begin{document}
%document contents go here
\end{document}
```

- Notice:
  - *\begin* and *\end* (these define “environments”)
  - *{ }* and *[ ]* around parameters to commands
  - Commands typically start with backslash

Formatting text

- Emphasis and size

\textbf{bold text} \emph{italic text} \underline{underlined text}
{\large Some large text.} {\Large Larger text.}{\small Small text.}

- Spacing
  - Many spaces = one space
  - Use \\ for newline
  - Hit return twice for a new paragraph
  - *\newpage*
- Quotes are done with ``and ‘‘, not “
- Add comments %*comment text until end of line*
- Like any language, some characters are special. For example, *\ $ { } %* cannot be written alone. Use \\ or *\$* or …

Document format

- Sections
  - \section{…} = 1. Latex is Great
  - \subsection{…} = 1.1 Why Latex is Great
  - \subsubsection{…} = 1.1.1 Reason One
  - \appendix
  - \chapter{…}
  - \paragraph \subparagraph (not numerated)
- Titles, Authors and others
  - \title{…}
  - \author{…}
  - \footnote{…}

Environments

- Something between

  \begin{name}

  \end{name}
- Many command, for example \small affect the text until the end of environment
- Many kind of environments, in this presentation : lists, equations, table, figures, …

Environment - List

- Source

```
\begin{itemize}
  \item First item of the list
   \item Second item of the list
\end{itemize}
```

- Source

```
\begin{enumerate}
   \item First item of the list
   \item Second item of the list
\end{enumerate}
```

- Result

  - First item of the list
  - Second item of the list

  1. First item of the list
  2. Second item of the list

Package - Math

\usepackage{amsmath}

- To enter inline math mode, use *$* and *$*
- For standalone math lines, use *\[* and *\]*
- Subscript and superscripts: *x^2* and *x_2*
- White space is typically ignored
- Fractions: *\frac{a}{b}* Radical: *\sqrt{x + y}*
- Operators and relations:
- *\ge, \le, \in, \subset, \equiv,\sim, \rightarrow\forall, \exists*

$$\geq, \leq, \in, \subset, \equiv, \sim, \rightarrow \forall, \exists$$

- Greek letters: *\lambda \pi \Pi*
- *\sum_{i=0}^{\infty} i \prod_{i = 0}^{n} i*
- Binomial coefficient: *{x \choose y}*

- Source

  $E[T_{total}]=2\sum^{n-1}_{i=1}\frac{1}{i}$

$$E[T_{total}] = 2\sum_{i=1}^{n-1} \frac{1}{i}$$

\[E[T_{total}]=2\sum^{n-1}_{i=1}\frac{1}{i}\]

$$E[T_{total}] = 2\sum_{i=1}^{n-1} \frac{1}{i}$$

$\hat\theta_w= \frac{M}{a_n}$

$$\hat{\theta}_w = \frac{M}{a_n}$$

Environment - Equations

- To have multiple lines equations
- Numerated (use equation* to enable numeration)
- Source

```
\begin{equation}
   L(x_1,x_2,\dots,x_n \vert \theta)=\prod_{i=1}^n L(x_i \vert \theta).
\end{equation}
```

$$L(x_1, x_2, \ldots, x_n|\theta) = \prod_{i=1}^{n} L(x_i|\theta). \qquad (1)$$

Environment - Table

- Tabular environment
- Columns
  - (l: left justify, c: centered, r: right justify)

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

- Rows

  & - Split text into columns

  \\ - End a row

  \hline - Draw line under row

- Source

```
\begin{tabular}{l|c|r}
   This & is & a test  \\
   \hline
   oh  & one & more !
\end{tabular}
```

This	is	a test
oh	one	more !

Environment - Code

- Package \usepackage{listings}
  - Also minted
- Can directly import code file

\lstinputlisting{source_filename.py}

- Can import only part of the code

\lstinputlisting[language=Python, firstline=37, lastline=45]{source_filename.py}

- A lot of Language supported, possibily to define style, colors….

- Source (in C)

```
\begin{lstlisting}
int triple(int nombre)
{
   return 3 * nombre;
}
\end{lstlisting}
```

```c
int triple(int nombre)
{
    return 3 * nombre;
}
```

Environment - Figures

\begin{figure}[placement specifier]

... figure contents ...

\end{figure}

- Placement specifier:
  - h: Place the float *here*, i.e., *approximately* at the same point it occurs in the source text (however, not *exactly* at the spot)
  - t: Position at the *top* of the page. (b: bottom)
- Source

```
\begin{figure}
\caption{A picture of a gull.}
\centering
\includegraphics[width=0.5\textwidth]{gull}
\end{figure}
```

Figure 1: A picture of a gull.

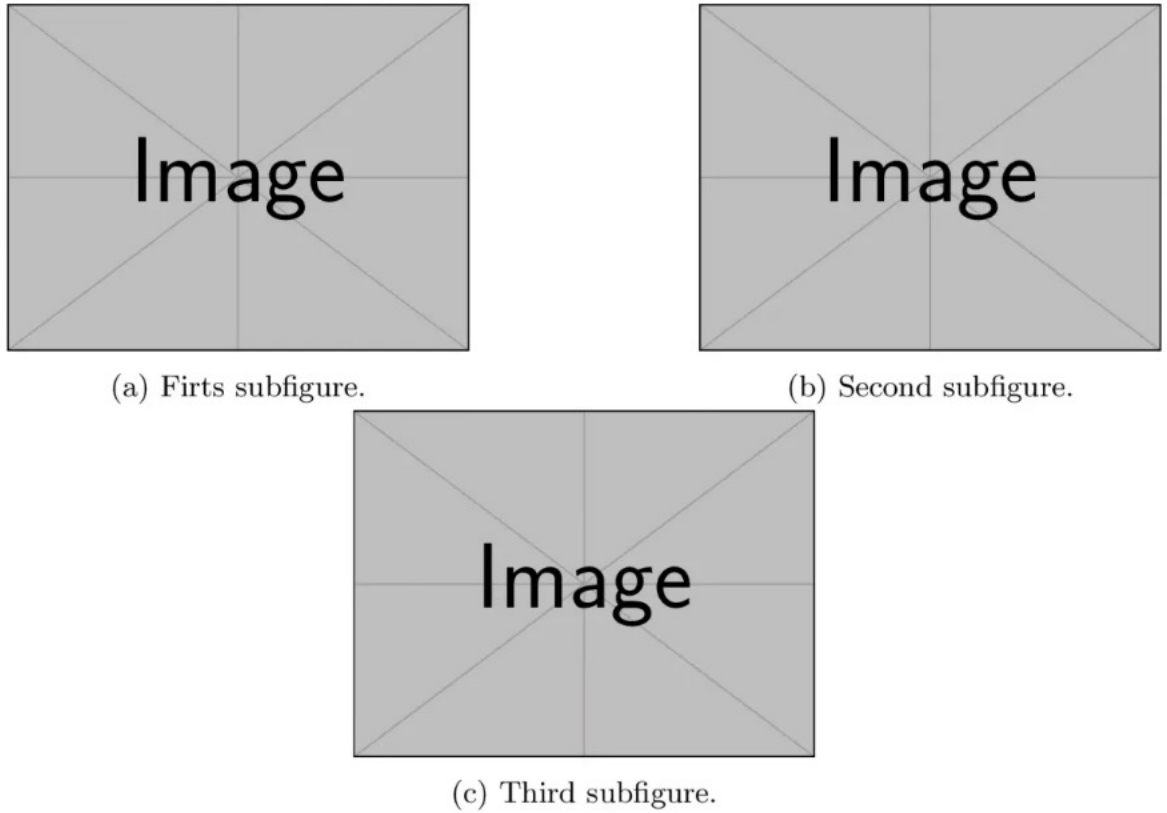
Environment - SubFigures

- To have multiple figures in one:

```
\usepackage{subcaption}

\begin{figure}
\centering
\begin{subfigure}{0.4\textwidth}
   \includegraphics[width=\textwidth]{example-image}
   \caption{Firts subfigure.}
\end{subfigure}
\hfill
\begin{subfigure}{0.4\textwidth}
   \includegraphics[width=\textwidth]{example-image}
   \caption{Second subfigure.}
\end{subfigure}
\hfill
\begin{subfigure}{0.4\textwidth}
   \includegraphics[width=\textwidth]{example-image}
   \caption{Third subfigure.}
\end{subfigure}

\caption{Creating subfigures in \LaTeX.}
\label{fig:figures}
\end{figure}
```



(a) Firts subfigure. (b) Second subfigure.

(c) Third subfigure.

Figure 1: Creating subfigures in LaTeX.

References

\maketitle - Display Title and Author

\tableofcontents - generates TOC

\listoftables - generates LOT

\listoffigures - generates LOF

- Labels : Use labels and references to automatically insert reference numbers (for section, figures, tables….)
  - \label{*marker*} - Marker in document.
  - \pageref{*marker*} - Displays page no. of marker.
  - \ref{*marker*} - Displays section location of marker.
- Example

\subsection{The first subsection}

\label{arbitrarylabel}

Some text.

\subsection{Next subsection}

The previous subsection was \ref{arbitrarylabel}.

Citations

- Bibliography information is stored in a *.bib file, in Bibtex format.
- Includebibliogrpahy package
  - \usepackage{}
- Set referencing style
  - \bibliographystyle{}
- Create reference section by
  - \bibliography{bibfile with no extension}
- Citing references in text

  \cite{cuc98} = (Cuce 1998)

  \citeN{cru98} = Crud (1998)

  \shortcite{tom98} = (Tom, et. al. 1998)

Your own commands

- Although LaTeX is shipped with a huge number of commands it often becomes necessary to define your own special commands to simplify your work, reduce repetitive tasks or perform some complex formatting.
- \newcommand{new command}{old command}
- in the document preamble
- Can take parameters:
  - \newcommand{\plusbinomial}[3]{(#2 + #3)^#1}
    - \plusbinomial is the name of the new command.
    - [3] is the number of parameters the command will take, in this case 3.
    - (#2 + #3)^#1 is what the command does. In this case it will put the second and third parameters in a "binomial format" to the power represented by the first parameter.

Overleaf

- https://www.overleaf.com/
- provide full support for direct LaTeX editing, and automatically compile your document for you on their servers (so there's nothing to install).
- A free version
  - Premium version in available using our Berkeley account
- Possibility to share documents, add comments
- In free version, only one collaborator unlimited collaborators
- Other premium features: Sync with Dropbox and GitHub, Full document history, Track changes

Menu | Test | Review | Share | Submit | History | Layout | Chat

main.tex

Source | Rich Text | Ω

```
1  \documentclass{article}
2  \usepackage[utf8]{inputenc}
3
4  \title{Test}
5  \author{Elise Kerdoncuff}
6  \date{October 2022}
7
8  \begin{document}
9
10 \maketitle
11
12 \section{Introduction}
13
14 \end{document}
15
```

Recompile

File outline

Introduction

Test

Elise Kerdoncuff

October 2022

1 Introduction

Menu | Manuscrit_These | Review | Share | Submit | History | Layout | Chat

Source | Rich Text | Ω | Recompile | 15

- Figures
  - D0D1
  - Introduction
  - SFS_MLD
  - USFS
- Conservation-genetics:...
- demored-tau.png
- sections
  - Annexes.tex
  - D0D1.tex
  - Discussion.tex
  - Introduction.tex
  - SFS_MLD.tex
  - USFS.tex
- image_72192707.JPG
- kerdoncuff2020.pdf
- LD_in_a_fixed_tree-v2.pdf
- Logo_Sorbonne_Université...

File outline

```
65  \begin{document}
66  \dominitoc %TOC
67
68  \input{titling_page}
69
70  \input{merci}
71  \thispagestyle{plain}
72
73  \pagestyle{mystyle}
74  \mainmatter
75  \clearpage
76  \vspace*{-4cm}
77  \tableofcontents
78
79  \subfile{sections/Introduction}
80
81  \subfile{sections/SFS_MLD}
82
83  \subfile{sections/D0D1}
84
85  \subfile{sections/USFS}
86
87  \subfile{sections/Discussion}
88
89  \subfile{sections/Annexes}
90
91
92  % Full bibliography
93  \bibliographystyle{plainnat}
94  \bibliography{manuscrit_bib.bib}
95
96  \end{document}
97
```

SORBONNE UNIVERSITÉ — MUSÉUM NAL HIST NATURELLE

École Doctorale 227
Sciences de la nature et de l'Homme : évolution et écologie

SMILE, CIRB, Collège de France.
ABI, ISYEB, Muséum National d'Histoire Naturelle.

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Templates

- Institution Templates
  - University of California, Berkeley
- Templates
  - Academic Journal
  - Book
  - Formal Letter
  - Homework Assignment
  - Poster
  - Presentation
  - Project / Lab Report
  - Résumé / CV
  - Thesis

Let’s look at it!

https://www.overleaf.com/