Using LaTeX with Overleaf

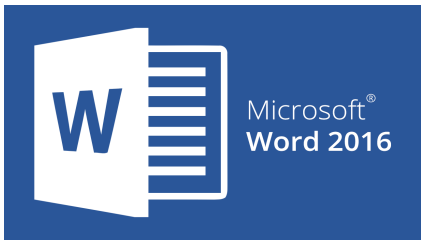
Xi Chen

Algorithms in Bioinformatics, ZBIT
University of Tübingen

Mar 2020, Vorkurs

Word processors and plain-tex

A modern graphical word processor



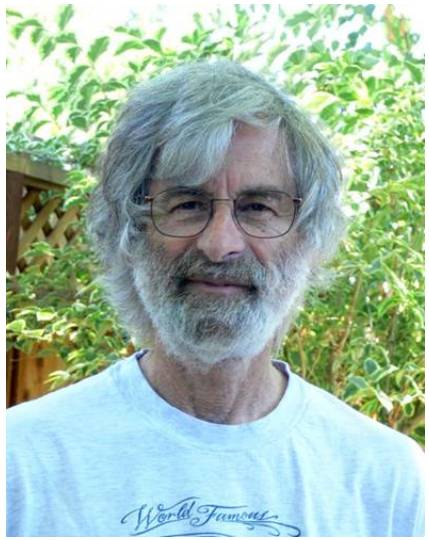
And the familiar problems...

TEX and LATEX

- TEX
  - designed by Donald E. Knuth in 1978
  - a typographical system that does typesetting (tex core)
  - set up stuff like how to place a graph or insert bibliographies (plain-tex)

Dr. Donald. E. Knuth

- LATEX
  - written by Leslie Lamport, released in 1983
  - a generalised set of macros built on top of TEX



Dr. Leslie Lamport

EBERHARD KARLS
UNIVERSITÄT
TÜBINGEN

The bare minimum

The recipe:

1. write source code in my favorite text editor
2. execute source code: `latex source_code.tex`
3. if I prefer .PDF: `dvipdf theDVI.dvi thePDF.pdf`

The bare minimum

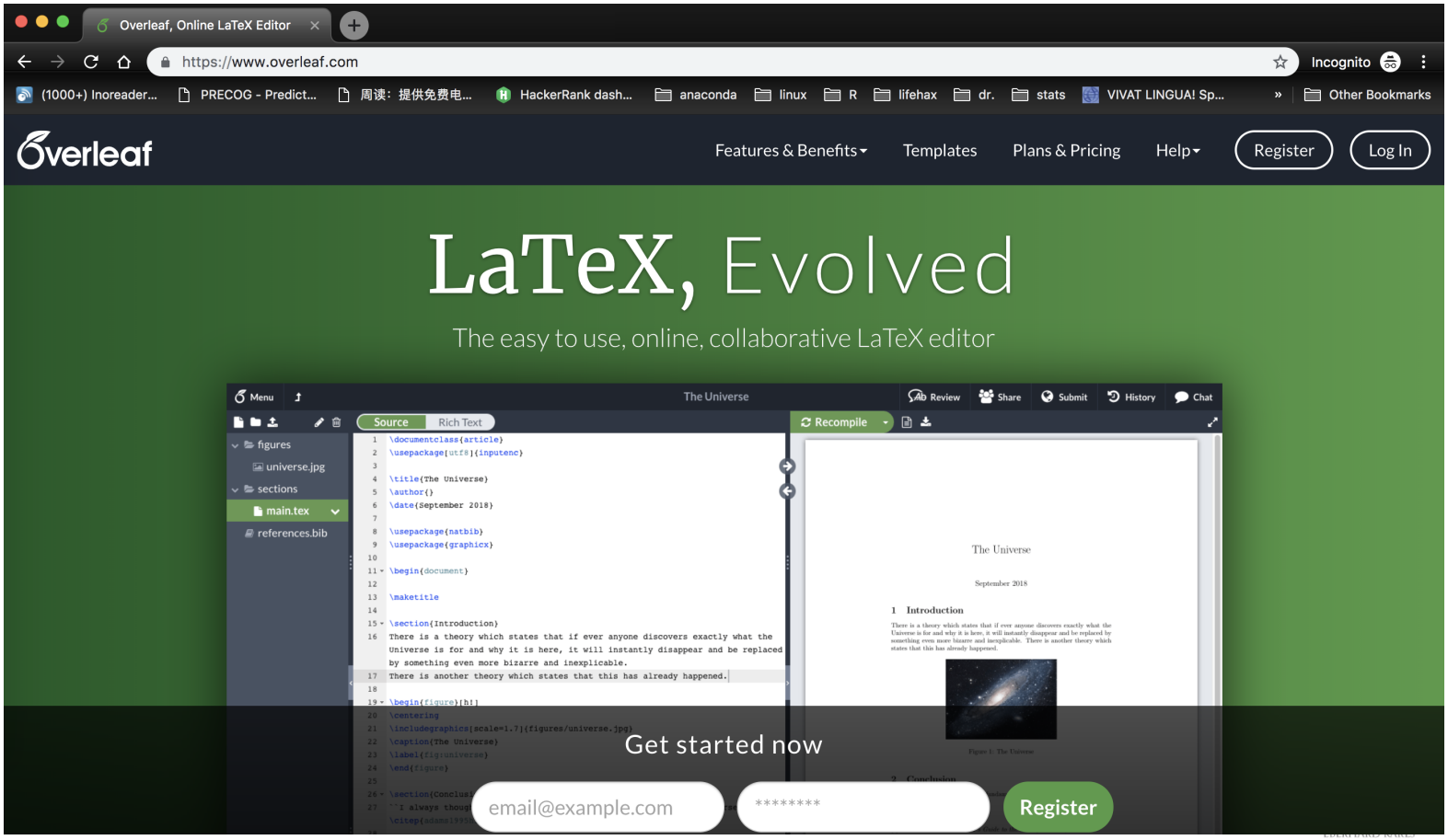
The recipe:

1. write source code in my favorite text editor
2. execute source code: `latex source_code.tex`
3. if I prefer .PDF: `dvipdf theDVI.dvi thePDF.pdf`

Things we won't do later on...

Use Overleaf

Steps: 1) click in the website and register 2) start a new project



Hello World in Overleaf

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

\ here goes the command

% here comes the comment.

{} mandatory arguments;
tell LaTeX this is a group

`\begin{...}`
...
`\end{...}`
delimit an environment

Hello World (con'd): *document* environment

%Preamble

```
\documentclass{article}
\usepackage[utf8]{inputenc}
\pagestyle{empty}
```

```
\begin{document}
```

%Top matter

```
\title{Tardis User Manual}
\author{Dr. Who}
\date{October 2019}
\maketitle
```

```
\end{document}
```


Tardis User Manual

Dr. Who

April 2019

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

1

Exercise 01

Simple.tex

make the simplest document with title and author info

Structure of an article

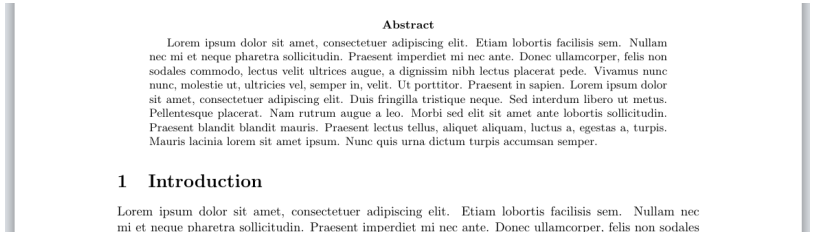
In principle, all elements of a document can be controlled with commands.
In an article:

- Abstract
- Paragraphs. Maybe hierarchical
- Tables, figures
- Bibliography
- Page layout like headers, footers, margins

Structure of an article (con'd)

Abstract delimited as an environment

```
\begin{abstract}
Insert text here.
\end{abstract}
```



Abstract

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in sapien. Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Praesent blandit blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

1 Introduction

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales

What can be changed:

- title of abstract (default: Abstract)
- text alignment
- margin

Structure of an article (con'd)

About text conjuction

- LaTeX ignores leading and trailing whitespaces/tabs
- line break is triggered by this command `\\`, not by pressing ENTER
- new paragraph command `\par`
- new line $\neq$ new paragraph

Paragraph Sectioning

- `\section{Title here}`
  No need to markup the block like it in *Abstract*.
- sections are numbered
  use `\section*{Title here}` to un-number.

Structure of an article (con'd)

Section hierarchy

1	section
1.1	subsection
1.1.1	subsubsection

All these levels are above paragraph. Subparagraph is below paragraph (visible differences in indention).

Not all sectioning are implemented in a certain document type. e.g., most of the above are not in letters.

Exercise 02

Article.tex

make an article with abstract and sectioning

Dummy text can be generated from package `blindtext` or `lipsum`
`\lipsum[1-3]` or `\blindtext`

Paragraph formatting

Capabilities

- text alignment
- indentation
- spacing between lines
- spacing between paragraphs

Specially...

1. First itemtext
2. Second itemtext
3. Last itemtext
4. First itemtext

First itemtext
Second itemtext
Last itemtext
First itemtext

- First itemtext
- Second itemtext
- Last itemtext
- First itemtext

blandit mauris. Praesent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

$$\int_0^\infty e^{-\alpha x^2}\mathrm{d}x = \frac{1}{2}\sqrt{\int_{-\infty}^{\infty} e^{-\alpha x^2}\mathrm{d}x \int_{-\infty}^{\infty} e^{-\alpha y^2}\mathrm{d}y} = \frac{1}{2}\sqrt{\frac{\pi}{\alpha}}$$

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie

Paragraph formatting (con'd)

text alignment

- justified, ragged; to the left/right/center.
- Normally paragraphs are *flushed* on both ends, i.e. left and right *justified*
- change alignment using an environment or `\raggedright{}` command

```
\begin{flushleft}
content here.
\end{flushleft}
```

```
\raggedright{content here.}
```

- Centering: `\centering{content here.}`, or

```
\begin{center}
content here.
\end{center}
```

Paragraph formatting (con'd)

Spacing

- local changes: `\vspace{size}`, `\smallskip` `\medskip` `\bigskip`
- Aiming at a larger scope:
  put the commands inside an environment.
  It will take effect where its source code is written, and end with this environment

```
\setlength{\parskip}{6pt}   % space between paragraph = 6pt
\renewcommand{\baselinestretch}{2}  % space between lines twice
                                    the current size
```

- global changes: override default in the preamble

Paragraph formatting (con'd)

Indentation

- LaTeXdoesn't care how many whitespaces you typed at the beginning of a line.
- Implementation of indention varies among doc types and environments
- Override the default: in the same manner as *spacing*

  Add some horizontal space: `\hspace{length}`
  Change settings: `\setlength{\parindent}{length}`

Paragraph formatting (con'd): Listing

1. First itemtext
2. Second itemtext
3. Last itemtext
4. First itemtext

First itemtext
Second itemtext
Last itemtext
First itemtext

- First itemtext
- Second itemtext
- Last itemtext
- First itemtext

Types: *enumerate*, *description*, *itemize*

```
\begin{enumerate}
\item item_1
\item item_2
\item item_3
\end{enumerate}
```

```
\begin{description}
\item [item_1] about item_1
\item [item_2] about item_2
\item [item_3] about item_3
\end{description}
```

```
\begin{itemize}
\item item_1
\item item_2
\item item_3
\end{itemize}
```

Exercise 03

Paragraph.tex

Format paragraphs. Change indentation, spacing, add some bullet points.

LaTeX measurement units

Absolute measurements

Abbreviation	Definition
pt	a point is 1/72.27 inch, that means about 0.0138 inch.
mm	a millimeter
cm	a centimeter
in	inch
ex	roughly the height of an 'x' **in the current font**
em	roughly the width of an 'M' (uppercase) **in the current font**

Predefined lengths

```
\parskip    \parindent
\smallskip  \bigskip    \medskip
\textwidth  \linewidth  \columnwidth
```

- More flexible when fitting figures and tables
- relative measurements

Text formatting

Capabilities

font size font styles

color éñçødîng

$pe©ial ch$\alpha$rac†ers

Only the basics are discussed here. Packages are available for more advanced text tuning.

Scope: an example

Tell the difference:

```
\centering
content here.\par
other stuff here.\par
More and more.
```

```
{\centering
content here.\par
other stuff here.\par}
More and more.
```

{} can be used to delimit a group

Text formatting (con'd): Font Style

Font families

- `\textrm{content}` Roman
- `\textsf{content}` Sans Sarif
- `\texttt{content}` `Monospace`

Shapes

- `\textit{content}` *Italic*
- `\textbf{content}` **Bold**
- `\textsl{content}` *Slanted* (difference to italic is visible in Roman font)
- `\emph{content}` *Emphasized*

Use packages like *fontspec* for advanced font customization.

Scope: just *content*

Text formatting (con'd): Font Size

In practice, 2 options for built-in font sizes:

- Absolute sizes in `\documentclass[xpt]{article}`
  options: 10pt, 11pt, 12pt for *article*, *report*, *book*
- Built-in font size command

```
\tiny  \scriptsize  \footnotesize  \small
                \normalsize
\large  \Large  \LARGE  \huge  \Huge
```

Scope: Till the end of its environment if not delimited

For arbitrary font size, use
`\fontsize{cur_font_size}{line_spacing_size}`.

Text formatting (con'd): color

`\usepackage{xcolor}`

- preceded by package `color`, which is less flexible.
- basic command: `\color{what_color}{content_to_color}`
  `\textcolor{}{}`: same except that it does not allow nesting environments

built-in colors *black white blue red gray green yellow...*

Scope To the end of current environment

Mix your own color

```
\definecolor{name}{model}{how_to_make_in_cur_model}
\definecolor{prettyorange}{HTML}{FF7F00}
```

Text formatting (con'd): special characters

Capabilities

- Characters to *escape*
  % \ {} $ _ >
- The untypeable
  † £ ™ § ¿
- Math
  $\forall$ ∞ $\neq$ $\subset$ $\supset$
- Encoding-related
  å ß *ü*

How-to

- As command in text mode:
  `\%` `\textbackslash` `\pounds`
- As command in math mode:
  `$\forall$` `$\subset$` `$\neq$`
- Google for commands
- One symbol might have several implementations in basic LaTeX and extended packages

Exercise 04

TextFormat.tex

Format: `YOU` are Being Wαt©hed

Bibliography

Structure of a citation

1) reference information; 2) position in the main text.
Connected by reference number (*key*).

Information needed by LaTeX in order to cite

1) reference information; 2) position in the main text
Given a reference alias as *key*.
Reference numbering is already implemented.

Capabilities

Bibliographic style

Bibliography(con'd)

Reference information embedded

- `thebibliography` environment keeps reference information
- bibliographic entry: `\bibitem{thekey}`;
  main text: `\cite{thekey}`
- manually set the format of references

Import from external .bib files

Tool: *BibTex*
Overleaf simplified the procedure to be:

1. Import: `\bibliography{file_path_no_need_extension}`
2. Set style: `\bibliographystyle{style_name}`
3. Cite

Bibliography(con'd): *.bib* file

They can be separated: `\bibliography{file1,file2,file3}`

Or one file containing information of several references

```
@article{thekey,
  title={Full Title},
  author={Vorname1, Name1 and Vorname2, Name2 and Vorname3, Name3},
  journal={Journal Name},
  volume={number},
  number={number},
  pages={page_number},
  year={2019},
  publisher={Publisher Name}
}

@book{thekey,
    ...
    ...
    ...
}
```

Bibliography(con'd): Choose citation style

Styles in *BibTex*:
`unsrt`, `plain`, `abbrv`, `acm`, `alpha`, `apalike`

Package natbib

- modified `\cite{}` to work with both author–year and numerical citations
- basic command `\citet{}` and `\citep{}`.
- add $*$ to list all authors in the main text.

`\citet{jon90}`	⇒	Jones et al. (1990)
`\citet[chap.~2]{jon90}`	⇒	Jones et al. (1990, chap. 2)
`\citep{jon90}`	⇒	(Jones et al., 1990)
`\citep[chap.~2]{jon90}`	⇒	(Jones et al., 1990, chap. 2)
`\citep[see][]{jon90}`	⇒	(see Jones et al., 1990)
`\citep[see][chap.~2]{jon90}`	⇒	(see Jones et al., 1990, chap. 2)
`\citet*{jon90}`	⇒	Jones, Baker, and Williams (1990)
`\citep*{jon90}`	⇒	(Jones, Baker, and Williams, 1990)

Exercise 05

Bibliography.tex

Import citation via *BibTex*; customize style with `natbib`

Insert images

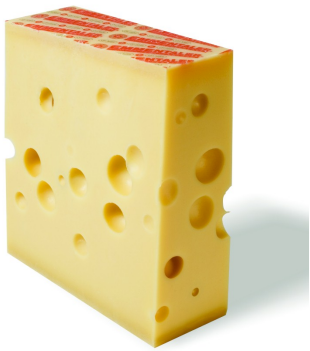
`\usepackage{graphicx}`

- Package `graphics` extended
- inform LaTeX where is the image file:
  `\graphicspath{dir}` (default: pwd)
- include it in the document:
  `\includegraphics[size_param]{imagefile}`

Insert images (con'd): Problems

- Positioning among text
- Positioning at a page break
- Caption, cross-reference...

A casual image:



A scientific figure:

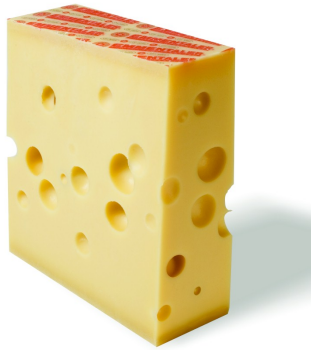


Figure 1: Spongebob Squarepants

Insert images (con'd): Size and positioning

```
\includegraphics[height=3cm, width=5cm, scale=1.2, angle=45]{pic.png}
```

- Built-in length measurements are all acceptable
- Positions correspondent to source code
- No captions attached

Insert images (con'd): *figure* environment

```
\begin{figure}[pos_options]
% position options: h (here), b (bottom), t (top), p (put in a page)

    \centering
    \includegraphics[scale=0.3]{pic.png}
    \caption{Caption this}
    \label{fig:my_label} % a key for in-text referencing

\end{figure}
```

Wrap text around figures: `\usepackage{wrapfig}{alignment}{size}`

Floats

Definition: anything within a document that cannot be broken over a page. Or roughly, tables and figures.

LaTeX's solution

- If running out of space in current page, float the float to the next page
- Fill current page with body text
- `\begin{figure}[p]` Gather figures to a float-only special page.

Add tables

elements formatting a table

- Float-related properties like figures (positioning, size)
- Interior design: layout
  - number of columns and rows
  - line styles
  - text adjusting

Add tables(con'd): *tabular* environment

```
\begin{tabular}{ l || c | r | }
  \hline
  Table & Col_1 & Col_2 \\ \hline
  Row_1 & 34 & 41 \\ \hline
  Row_2 & 0.25 & 0.08 \\
  \hline
\end{tabular}
```

- Column delimiter: `&`
- Alignment: `l c r`
- Vertical line: `|` horizotal line: `\hline`

```
\begin{tabular*}{\textwidth}{ | l | r | }
\hline
col_1 & col_2 \\
\hline
item_1  & item_2 \\
\hline
\end{tabular*}
```

A subtle extension:

- Specifying table width is allowed
- Adjusting column width to fit in the fixed table width is allowed

Add tables(con'd): More customization

table environment Same as *figure* env. For better placement of the table.

Package *array* For width adjustment.

Package *multirow* To merge rows in some columns.

Package *longtable* For tables across pages.

Exercise 05

FloatingElements.tex

Thanks!