

Using L^AT_EX with Overleaf

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https://github.com/Sim19/vorkurs_informatik_latex

Word processors and plain-tex

A modern graphical word processor



... and its best friend



And the familiar problems...



College Student
@CollegeStudent

using microsoft word

moves an image 1 mm to the left

all text and images shift. 4 new pages
appear. in the distance, sirens.

T_EX and L^AT_EX

• T_EX

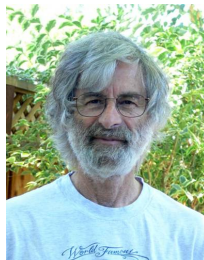
- designed by Donald E. Knuth in 1978
- a typographical system that does typesetting (tex core)
- set up stuff like how to place a graph or insert bibliographies (plain-tex)



Dr. Donald. E. Knuth

• L^AT_EX

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



Dr. Leslie Lamport

The bare minimum

The recipe:

- 1 write source code in my favorite text editor
- 2 execute source code: `pdflatex source_code.tex`

The bare minimum

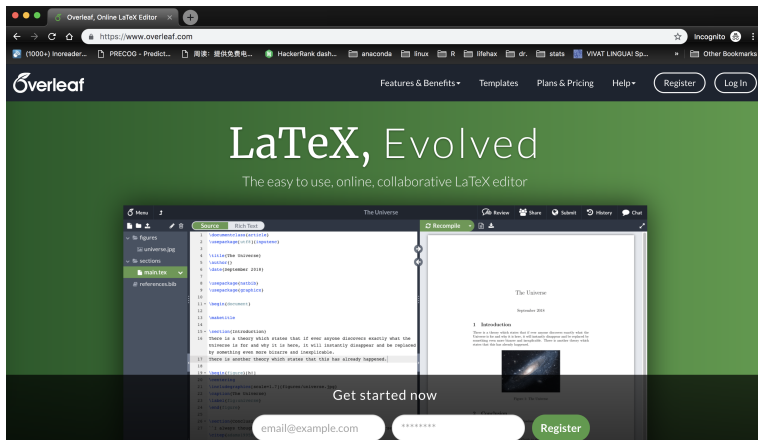
The recipe:

- 1 write source code in my favorite text editor
- 2 execute source code: `pdflatex source_code.tex`

Things we won't do later on...

Use Overleaf

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



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

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

1



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, consectetur adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et turpis pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sedibus ornamenti, lectus velit ultrices augue, a dignissim nisl lectus placerat pede. Vivamus nunc nunc, malesuada ut, ultricies vel, semper in, velit. Ut porttitor. Praesent in augue. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Duis fringilla tristique semper. Sed interdum libero ut nunc. Pellentesque placerat. Nunc varius augue a leo. Maeculis est sit amet ante lobortis sollicitudin. Praesent bibendum bibendum nunc. Praesent lectus tellus, aliquet aliquam, lectus a, egetas a, turpis. Maeculis lectus lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

1 Introduction

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

What can be changed:

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

Structure of an article (con'd)

About text conjunction

- \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 indentation).

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

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

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

Specially...

First itemtext

- First itemtext

Second itemtext

- Second itemtext

Last itemtext

- Last itemtext

First 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.

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

Lorem ipsum dolor sit amet, consectetur 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.           \raggedright{content here.}
\end{flushleft}
```

- 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

- \LaTeX doesn't care how many whitespaces you typed at the beginning of a line.
- Implementation of indentation 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 | First itemtext | • First itemtext |
| 2. Second itemtext | Second itemtext | • Second itemtext |
| 3. Last itemtext | Last itemtext | • Last itemtext |
| 4. First itemtext | First 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}
```

Paragraph.tex

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

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 éñçøðîng

\$pe©ial chαrαctєrs

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

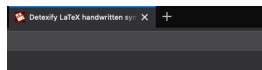
- Characters to *escape*
`% \ {} $ _ >`
- The untypeable
`† £ ™ § ¿`
- Math
`∀ ∞ ≠ ⊂ ⊃`
- Encoding-related
`å ß ü`

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 L^AT_EX and extended packages

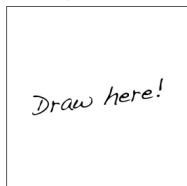
Text formatting (con'd): special characters - life hack

visit <https://detexify.kirelabs.org/classify.html> and draw symbol



Detexify

classify symbols



Detexify

classify symbols



α	Score: 0.12379000033526026 <code>\alpha</code> mathmode
\propto	Score: 0.12404781060002196 <code>\propto</code> mathmode
\upalpha	Score: 0.12564666275607672 <code>\usepackage{ upgreek }</code> <code>\upalpha</code> mathmode
α	Score: 0.1344159365728212 <code>\usepackage{ amssymb }</code>

TextFormat.tex

Format: YOU are Being Wat©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.

<code>\citet{jon90}</code>	\Rightarrow Jones et al. (1990)
<code>\citet[chap.~2]{jon90}</code>	\Rightarrow Jones et al. (1990, chap. 2)
<code>\citep{jon90}</code>	\Rightarrow (Jones et al., 1990)
<code>\citep[chap.~2]{jon90}</code>	\Rightarrow (Jones et al., 1990, chap. 2)
<code>\citep[see]{jon90}</code>	\Rightarrow (see Jones et al., 1990)
<code>\citep[see][chap.~2]{jon90}</code>	\Rightarrow (see Jones et al., 1990, chap. 2)
<code>\citet*{jon90}</code>	\Rightarrow Jones, Baker, and Williams (1990)
<code>\citep*{jon90}</code>	\Rightarrow (Jones, Baker, and Williams, 1990)

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}`

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.

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: | horizontal 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.

FloatingElements.tex

Thanks!

