\textbf{\LaTeX-Workshop}

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Introduction

What is \LaTeX?
Introduction

- What is $\text{\LaTeX}$?
- What is it used for?
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- What is it used for?
- What is it NOT?
Introduction

- What is \LaTeX? 
- What is it used for? 
- What is it NOT? 
- Why do we need to use it?
Syntax

- Designed to focus on writing
- Text will be output as text
  - White space is ignored (including newlines)
  - Empty line signifies end of paragraph
  - \LaTeX{} automagically does hyphenation and outlining
  - “Magical” characters:
    - \# $ \% \^ \& \_
    - Cannot use these in running text
- Comments start with a %
Syntax

- Commands start with a `\`:
  \texttt{\textbackslash somecommand[optional]{required}}

- Groups start with \{ and end with \}
  - Useful if command influences all following text
    This \{\textbf{text is bold} but this it not
    This \textit{text is bold} but this it not

- Environments start with \texttt{\textbackslash begin\{envname\}} and end with \texttt{\textbackslash end\{envname\}}
  - Define new commands that only work in environment
  - Change flow of text
  - Introduce special elements (i.e. non-text) in document
Compilers

- Different \LaTeX\ compilers or engines
- Most get installed with \TeX\live or MiKTeX on Windows
- Different engines:
  - latex: Based on initial implementation by Knuth, outputs dvi
  - pdflatex: Updated version, outputs PDF
  - xelatex: Can use system fonts, outputs PDF
  - lualatex: Can use system fonts and has embedded Lua, outputs PDF
  - hevea: Outputs HTML (there are more of these)
- Several other programs:
  - bibtex: Used for incorporating references to papers
  - makeindex: Used for generating an index
latexmk

- \LaTeX{} needs different programs in different situations
- Can be a headache to manage
- Solution?
\textbf{latexmk}

- \LaTeX needs different programs in different situations
- Can be a headache to manage
- Solution?
- \texttt{latexmk}!
- Analyses the output of \texttt{latex} and calls other programs to fix errors
- Easiest program to use for compilation
  - \texttt{latexmk -pdf} Compile file to PDF
  - \texttt{latexmk -c} Remove extra files
  - \texttt{latexmk -pvc -pdf} Compile file to PDF and watch for changes
Editors

- TeXworks for Linux, Windows and macOS
- TeXShop for macOS
- TeXStuido for all
- Overleaf for web
- Normal editors with plugin (Notepad++, Sublime, geany, Atom, . . .)
Document Structure

- Document consists of two parts:
  - Preamble
  - Content
- Further forces \LaTeX\’s focus on content
The preamble

- Set up for the document
  - Documentclass
  - Loading packages
  - Document wide settings
  - New commands/environments
  - Meta information (title, author, etc.)
- Allows us to change anything about the document
  - Also paper size, margins, etc
  - After preamble no longer possible
The document class

- Every document has a document class.
- Specifies general settings like paper size, margins, headers, footers, etc.
- Is set by the `\documentclass` command:
  ```latex
  \documentclass[a4paper, 10pt]{article}
  ```
- Different types of document classes:
  - `article`
  - `beamer`
  - `report`
  - `book`
  - `letter`
  - `cover-article`
  - ...
Importing packages

- \LaTeX{} files with commands/environments
- Can also be used to set setting (i.e. geometry)
- Extends \LaTeX{}’s usual capabilities.
- Imported with `\usepackage`
  `\usepackage[hidelinks]{hyperref}`
- Contains all kinds of stuff:
  - hyperref for making hyperlinks
  - graphicx for importing images
  - amsmath for even better math support
  - colorx for changing colors
  - tikz for drawing figures in \LaTeX{}
  - coffee for adding coffee stains
  - enigma for confusing the allied forces
Setting settings

- Settings depend on packages used and needs of author
- \texttt{\textbackslash title\{}\}, \texttt{\textbackslash author\{}\} and \texttt{\textbackslash date\{}\} are quite common
The content

- Content goes into document environment:
  \begin{document}
  ...
  \end{document}

- Normally starts with a title: \texttt{maketitle}

- For longer documents a table of contents: \texttt{tableofcontents}
Document structure

- Layout is done by \LaTeX, structure is important
- Different kinds of headings:
  - \texttt{\texttt{\textbackslash chapter}} only in book and report
  - \texttt{\texttt{\textbackslash section}}
  - \texttt{\texttt{\textbackslash subsection}}
  - \texttt{\texttt{\textbackslash subsubsection}}
  - \texttt{\texttt{\textbackslash paragraph}} typeset in running text
  - \texttt{\texttt{\textbackslash subparagraph}}
  - Also a starred version to disable numbering: \texttt{\texttt{\textbackslash section\*\{}\} }
- \texttt{\texttt{\textbackslash appendix}} changes number to appendix numbering
Text flow

- \LaTeX\ ignores white space
- Works by splitting text up into tokens and paragraphs
- Tokens are separated by whitespace or punctuation
- Empty line ends paragraph
- Sometimes you want to force a space or newline
- For space, the non-breaking space:  ~
- For newline:  \\
  - Warning! This does not start a new paragraph
Simple formatting

- **Changing text size:**
  - `\tiny`
  - `\scriptsize`
  - `\footnotesize`
  - `\small`
  - `\normalsize`
  - `\large`
  - `\Large`
  - `\LARGE`
  - `\huge`
  - `\Huge`

- **Bold text:**
  - `\textbf{text}` \{ `bf text` \}

- **Italic text:**
  - `\textit{text}` \{ `it text` \}

- **Emphasised text:** `\texttt{text}` \{ `tt text` \}

- **Underlined text:** `\underline{text}`

- **Monotype text:**
  - `\textbf{text}`
  - `\textit{text}`
  - `\texttt{text}`
Lists

- Three kinds of list:
  1. itemize bulleted list like the outer list
  2. enumerate numbered list like this one
  3. description list of definitions

- All lists are environments

- New items are added with \texttt{\textbackslash item}

- Lists can be nested up to five levels deep

- Numbering happens automatically
Referencing

- \LaTeX numbers a lot of stuff
- Referring back to parts of document is easy
- Name object with \texttt{\label{name}}
- Get number with \texttt{\ref{name}}
- Get the page number of object with \texttt{\pageref{name}}
- (With \texttt{hyperref}) Get name, number, and link
  \texttt{\autoref{name}}
- Can be used to refer to:
  - Sections, subsections, etc…
  - Items in an enumeration
  - Equations
  - Figures
  - Tables

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What are floats?

- \LaTeX\ tries to structure text for optimal flow
- Does not work if we include figures and tables
- Solution: Floats
- Float is a container that cannot be broken over pages
- \LaTeX\ moves floats through document for optimal placement
- Works good for images, tables, pseudocode, and other blocks
- Allows us to enrich content
  - Captions
  - Subfigures
- Can also define our own floats
Controlling float placement

- LaTeX tends to move floats all over the place
- Two ways to control floats:
  - Placement specifiers
  - Float barriers
- For reports: pictures at end is fine, lots of empty space is not
Controlling float placement

- \LaTeX{} tends to move floats all over the place
- Two ways to control floats:
  - Placement specifiers
    - Optional argument to the float
    - Does not always work “correctly”
    - Pictures still float
    - \texttt{h} I want my float here
    - \texttt{H} Force float here (requires \texttt{float} package)
    - \texttt{t} I want my float at the top of the page
    - \texttt{b} I want my float at the bottom of the page
    - ! I really want this
    - \texttt{h!} tells \LaTeX{} you really want the float here
  - Float barriers
    - For reports: pictures at end is fine, lots of empty space is not
Controlling float placement

- \LaTeX{} tends to move floats all over the place
- Two ways to control floats:
  - Placement specifiers
  - Float barriers
    - Stops floats from moving past a point
    - Useful to keep floats within section
    - Require the `placeins` package
    - Created with command `\FloatBarrier`
    - Automatic float barriers at sections: `\usepackage[section]{placeins}`
- For reports: pictures at end is fine, lots of empty space is not
Working with images

\begin{figure}[htb]
\includegraphics[width=\textwidth]{path/to/file}
\caption{Something sensible about this image}
\label{fig:my_image}
\end{figure}

- \texttt{[htb]} is placement specifier
- \texttt{\includegraphics} for importing of the image
- \texttt{\caption} for text below image and numbering
- \texttt{\label} so we can refer later
Working with tables

\begin{table}
  \caption{Caption above table}
  \label{tbl:square}
  \begin{tabular}{|c|c|c|}
    \hline
    2 & 7 & 6 \\ 
    \hline
    9 & 5 & 1 \\ 
    \hline
    4 & 3 & 8 \\ 
    \hline
  \end{tabular}
\end{table}

Table: Caption above table

\begin{tabular}{|c|c|c|}
  \hline
  2 & 7 & 6 \\
  \hline
  9 & 5 & 1 \\
  \hline
  4 & 3 & 8 \\
  \hline
\end{tabular}

Three useful sites:

- en.wikibooks.org/wiki/LaTeX/Tables
- www.latex-tables.com
- www.tablesgenerator.com
Working with floats

- \LaTeX{} knows the best way to position floats
- Bunch of pictures at the end of report not bad
  - Graders know why
  - Large sections of white space are more annoying
- For figures: changing the width so two pictures fit on page
- Text on both sides of float help with positioning
  - More text $\Rightarrow$ more things for \LaTeX{} to play with
- Float barriers can help if document is broken up in logical sections
  - E.G. all the figures for exercise 1 stay with exercise 1
Most of the following commands need the package amsmath
$ ... $ or \(( ... \)) short hand for inline math
\[ ... \] short hand for separate equation environment
The equation environment displays numbered equations
The align environment is used to arrange equations over multiple lines. \(
\) denotes a new line and & indicates a point where the equations should be aligned
Spaces are derived from the expressions, $2−3$ and $2 – 3$ both print to $2 – 3$
Common commands

- \texttt{\times} is $\times$
- \texttt{\sqrt{}}\{a\} is $\sqrt{a}$
- \texttt{\frac{}}\{a\}{\{b\}} is $\frac{a}{b}$
- \texttt{a^{}\{b\}} is $a^b$
- \texttt{a_{}\{b\}} is $a_b$
- All greek letters are available. \texttt{\Delta} is $\Delta$ and \texttt{\delta} is $\delta$
- Text can be added to the equation with \texttt{\text{}}. 
  
  $2 - 3 \text{\{} \text{hallo} \} 3 \text{\{} \times \text{\{} 4$ is $2 - 3 \text{hallo} 3 \times 4$
Operators

- \( \cos (2\pi) \) is \( \cos(2\pi) \)
- \( \sin \theta \) is \( \sin^2(2\theta) \)
- \( \tan (2) \) is \( \tan(2) \)
- \( \lim_{x \to \infty} \exp(-x) = 0 \) is \( \lim_{x \to \infty} \exp(-x) = 0 \)
- \( x \equiv a \pmod{b} \) is \( x \equiv a \pmod{b} \)

https://en.wikibooks.org/wiki/LaTeX/Mathematics lists more commands

detexify.kirelabs.org can identify a latex symbol from a drawing
Source Code

- \LaTeX\ can be used to format source code
  - Requires listings package
- Can include (parts of) document, snippets, and lines
- Automatic syntax recognition
- Allows different styles
  - Most languages have settings online
- \texttt{\lstinputlisting{file}} to include file
- \texttt{\begin{lstlisting}} and \texttt{\end{lstlisting}} for snippets
- \texttt{\lstinline{code}} for inline code
listings offers several settings for each command, can be set globally using `$\texttt{\lstset{}}$`

<table>
<thead>
<tr>
<th>Setting</th>
<th>Values</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>breaklines</td>
<td>true/false</td>
<td>If code should be broken over lines</td>
</tr>
<tr>
<td>breakatwhitespace</td>
<td>true/false</td>
<td>If code can only break at whitespace</td>
</tr>
<tr>
<td>language</td>
<td>string</td>
<td>The language the code is written in</td>
</tr>
<tr>
<td>numbers</td>
<td>none/left/right</td>
<td>Where to position the line numbers</td>
</tr>
<tr>
<td>stepnumber</td>
<td>number</td>
<td>The numbers in between two steps</td>
</tr>
</tbody>
</table>
Useful package for referencing sources.

- Stores references in separate ".bib" file.
  - Set style with \texttt{\textbackslash bibliographystyle\{plain\}}
  - Include bib file with \texttt{\textbackslash bibliography\{filename\}}
  - These should be placed in this order at the location you want the reference list to be printed

- \texttt{\textbackslash cite\{\}} to cite the references in the bib file

## General

<table>
<thead>
<tr>
<th>Package</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>enumerate</td>
<td>Changes the symbols used in enumerations</td>
</tr>
<tr>
<td>babel</td>
<td>For writing text in languages that are not English</td>
</tr>
<tr>
<td>fancyhdr</td>
<td>For making headers and footers</td>
</tr>
<tr>
<td>tikz</td>
<td>For the creation of drawings in \LaTeX</td>
</tr>
<tr>
<td>moderncv</td>
<td>For making a résumé</td>
</tr>
</tbody>
</table>
## Linguistics

<table>
<thead>
<tr>
<th>Package</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>tipa</td>
<td>For symbols from the IPA</td>
</tr>
<tr>
<td>qtree</td>
<td>For drawing (syntactic) trees</td>
</tr>
<tr>
<td>tikz–qtree</td>
<td>For drawing (syntactic) trees with tikz</td>
</tr>
<tr>
<td>gb4e</td>
<td>For glosses and the likes</td>
</tr>
<tr>
<td>phonrule</td>
<td>For phonological rules</td>
</tr>
</tbody>
</table>