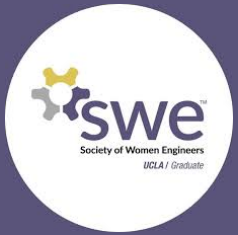

Technical TeXt with LaTeX

Vedasri Godavarthi
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Table of Contents

Why LaTeX

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- Best for typesetting technical content: figures, equations ($E = mc^2$!), tables, etc.,

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- Best for typesetting technical content: figures, equations ($E = mc^2$!), tables, etc.,
- Have to cite a lot of references? No worries! LaTeXcan automate to suite your chosen style.
- Can easily produce table of contents, indexes, list of figures etc. with a single command *\tableofcontents*
- Can facilitate version control and also suitable for collaboration (Git users!)

Getting started with LaTeX

How to get started?

- Local installation in your computer
  - TeXMaker, TeXStudio, TeXWorks, MiTeX.....

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- Local installation in your computer
  - TeXMaker, TeXStudio, TeXWorks, MiTeX.....

- Or you can skip all that and use Overleaf
  - https://www.overleaf.com/
  - Free account for single user

Document structure

Document writing

- Creating title, author, affiliations

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- Sections, subsections, subsubsections

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Document writing

- Creating title, author, affiliations
- Sections, subsections, subsubsections
- Labeling the sections to refer to them again
- Table of contents
- Font sizes, colors, page layouts

Basic Syntax: Creating a document

- Everything that begins.. ends!

```
%    \documentclass[12pt,a4paper]{article}
% creates an article on a4 size with 12 pt. font size
%    \begin{document} % need begin and end while creating the document
%    \end{document}
```

Basic Syntax: Creating a document

- Everything that begins.. ends!

```
%    \documentclass[12pt,a4paper]{article}
%    \title{Typesetting with \latex}
%    \author{Vedasri Godavarthi}
%    \begin{document} % need begin and end while creating the document
%    \maketitlepage
%         Content appears here
%    \end{document}
```

Margins, sections, subsections...

- Everything that begins.. ends!

```
%    \documentclass[12pt,a4paper]{article}
%    \usepackage[margin=1in]{geometry}
%    \title{Typesetting with \latex}
%    \author{Vedasri Godavarthi}
%    \begin{document}
%    \maketitlepage
%    \section{Section 1}
%    \subsection{Subsection 1.1}
%    \section*{Section without numbering}
%    \subsection*{Subsection without numbering}
%    \end{document}
```

Font colors, styles

- Everything that begins.. ends!

```
%    \section{Section : Font fomatting}
%    \subsection{Subsection : Colors}
%    \textcolor{red}{this is red}
%    \textcolor{blue}{Let's make this blue}
%    \subsection{Subsection : Styles}
%    \textbf{This is red}
%    \textit{Let's make this italic}
%    \textbf{\textit{Italic and Bold}}
%    \section*{Section without numbering}
%    \subsection*{Subsection without numbering}
```

Equations

Equations

$$f(x) = \frac{1}{2\pi} \int_{-\infty}^{\infty} e^{-ix\xi} \left(1 + \frac{\sin(\xi)}{\xi}\right) d\xi$$[1]

- Ease of embedding complicated equations in a text.

[1] I asked ChatGPT: Example of most complicated equation in latex

Equations

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- Ease of embedding complicated equations in a text.
- What should we do?

```
\begin{?}..\end{?}
```

[1] I asked ChatGPT: Example of most complicated equation in latex

Equations

$$f(x) = \frac{1}{2\pi} \int_{-\infty}^{\infty} e^{-ix\xi} \left(1 + \frac{\sin(\xi)}{\xi}\right) d\xi^2$$

- Ease of embedding complicated equations in a text.
- What should we do?

```
\begin{equation} < Place equation here >\end{equation}
```

[2] I asked ChatGPT: Example of most complicated equation in latex

Equations

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- Ease of embedding complicated equations in a text.
- What should we do?

```
\begin{equation} < Place equation here >\end{equation}
```

- Inline:

```
$$ <Equation $$
```

[2] I asked ChatGPT: Example of most complicated equation in latex

Equations

$$f(x) = \frac{1}{2\pi} \int_{-\infty}^{\infty} e^{-ix\xi} \left(1 + \frac{\sin(\xi)}{\xi}\right) d\xi^2$$

- Ease of embedding complicated equations in a text.
- What should we do?

```
\begin{equation} < Place equation here >\end{equation}
```

- Inline:

```
$$ <Equation $$
```

- Multiple equations:

```
\begin{align} x&=1\\ y&=2\\ x+y &=3 \end{align}
```

[2] I asked ChatGPT: Example of most complicated equation in latex

Figures

Figures

(a) Small Meme

(b) Large Meme

Figure 1: LaTeX meme

Figures: Background

- Let's look at the syntax

  ```
  \begin{?} <Details> \end{?}
  ```

Figures: Background

- Let's look at the syntax

```
\begin{figure}
\centering % Justification
\includegraphics[width=0.8\textwidth]{fig.png}
% includes graphics with 80% textwidth
%\includegraphics[height=]%includegraphics[scale=]
\caption{Meme} %caption
\label{fig:meme} % can refer to figure in the text using this label
\end{figure}
```

Figures: Subfigures

- Packages: **subcaption**, **graphicx** and we add these before \begin{document}
- **usepackage**{**subcaption**}

First subfigure

```
 \begin{figure}[t!]
\centering
\begin{subfigure}[t]{0.5\textwidth}
    \centering
    \includegraphics[width=]{fig.png}
    \caption{Small Meme}
\end{subfigure}%
```

Second subfigure

```
    \begin{subfigure}[t]{0.5\textwidth}
        \centering
        \includegraphics[width=]{fig.png}
        \caption{Large Meme}
    \end{subfigure}
    \caption{\LaTeX\: meme}
\end{figure}
```

Cross referencing

Cross referencing

- Cross referencing is important when referring to equations, tables, figures etc., in the text.

Labeling figure

```
\begin{figure}
\centering
\includegraphics{fig.png}
\caption{Meme} %caption
\label{fig:meme} %label
\end{figure}
```

Labeling equation

```
\begin{equation}
E=mc^2
\label{eq:energy_mass} %label
\end{equation}
```

Cross referencing

- Cross referencing is important when referring to equations, tables, figures etc., in the text.
- The readers can point to eq.(2) instead to writing it again.

Labeling figure

```
\begin{figure}
\centering
\includegraphics{fig.png}
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\end{figure}
```

Labeling equation

```
\begin{equation}
E=mc^2
\label{eq:energy_mass} %label
\end{equation}
```

Cross referencing

- Cross referencing is important when referring to equations, tables, figures etc., in the text.
- The readers can point to eq.(2) instead to writing it again.
- We use \label and \ref, such as \label{fig:meme} to label inside \begin{figure}.. and in the text as \ref{fig:meme} to refer to Fig. 1.

Labeling figure

```
\begin{figure}
\centering
\includegraphics{fig.png}
\caption{Meme} %caption
\label{fig:meme} %label
\end{figure}
```

Labeling equation

```
\begin{equation}
E=mc^2
\label{eq:energy_mass} %label
\end{equation}
```

External citations

References: External

- Use any source of citations: Google scholar, Mendeley, journal
- We obtain the bibtex from the above locations.
- Place them in a .bib file, say references.bib and we can use it cite.

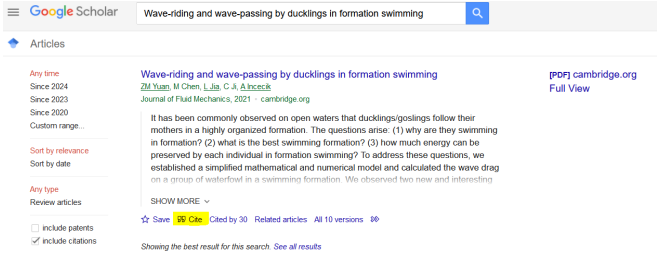

Figure 2: Search in google scholar

References: External

- Use any source of citations: Google scholar, Mendeley, journal
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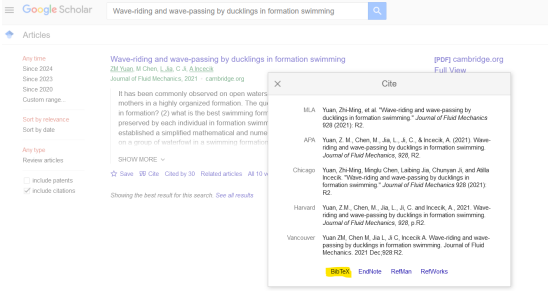

Figure 3: Citation formats

References: External

- Use any source of citations: Google Scholar, Mendeley, journal
- We obtain the BibTeX from the above locations.
- Place them in a .bib file, say references. bib and we can use it cite.

```
@article{yuan2021wave,
  title={Wave-riding and wave-passing by ducklings in formation swimming},
  author={Yuan, Zhi-Ming and Chen, Minglu and Jia, Laibing and Ji, Chunyan and Incecik, Atilla},
  journal={Journal of Fluid Mechanics},
  volume={928},
  pages={R2},
  year={2021},
  publisher={Cambridge University Press}
}
```

Figure 4: .bib file → copy and paste this in .bib

- This reference can be cited as \cite{yuan2021wave} [1].

Syntax

Syntax

Command	Function	Command	Function
\title{}	Title	\author{}	Author
\affiliation{}	Affiliation	\maketitlepage	creates titlepage
\date{}	Today is the default date	\date{yesterday}	Yesterday or can specify
\section{}	Numbered section	\subsection{}	Numbered subsection
\section*{}	Unnumbered section	\subsection*{}	Unnumbered subsection
\textbf*{}	Bold text	\textit*{}	Italic text
\textrm*{}	Normal text	\textcolor*{}	Colored text with specific color
\newpage	Inserts a new page	\pagebreak	Splits the page
\centering	Centers	\caption	Caption for figure
\label{}	label for object	\ref{}	Refers the object
\cite{}	Citation as number	\citep{}	Citation with authors
%	Comment a line	\%	%
\{ \}	{}	$ $	can create math equations inline

Table 1: Most used commands

Syntax

Command	Function
`\begin{document} .... \end{document}`	Creates document
`\begin{abstract} .... \end{abstract}`	Creates abstract
`\begin{figure} .... \end{figure}`	Creates figure environment
`\includegraphics{}`	Includes figure inside environment
`\begin{equation} .... \end{equation}`	Creates equation environment
`\begin{itemize} .... \end{itemize}`	Creates lists/items environment
`\item`	Creates a bullet point inside itemize
`\begin{verbatim} .... \end{verbatim}`	Creates environment that can display code

Table 2: Basic environments

Packages

Command	Function
`\usepackage{graphicx}`	Package for figures
`\usepackage{subcaption}`	Package for subfigures
`\usepackage{xcolor}`	Package for using colors in objects
`\usepackage{hyperref}`	Package for URLs
`\hyperref{url here}{text here}`	Command for hyperrefs

Table 3: Most used packages

Other resources

Other resources

- Overleaf: https://www.overleaf.com
- Latex primer: https://www.colorado.edu/aps/latex-primer
- Overleaf documentation: https://www.overleaf.com/learn
- Beamer: Fun with beamer by Prathik Naidu and Adam Pahlavan
- Stack Overflow

Bibliography I

[1] Z.-M. Yuan, M. Chen, L. Jia, C. Ji, and A. Incecik, "Wave-riding and wave-passing by ducklings in formation swimming," *Journal of Fluid Mechanics*, vol. 928, R2, 2021.