



Technical TeXt with \LaTeX

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- Why \LaTeX
- Getting started with \LaTeX
- Document structure
- Equations
- Figures
- Cross referencing
- External citations
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Why \LaTeX

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

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- Have to cite a lot of references? No worries! L^AT_EX can 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

- Creating title, author, affiliations

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- Sections, subsections, subsubsections

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

- 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}
```

- 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}
```

- 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}
```

- 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

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

- Ease of embedding complicated equations in a text.

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

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

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

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

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

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- What should we do?

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

- Inline:

`$$ <Equation $$`

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

- 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}
```

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

Figures

Word User: "Why is the text moving all over the place when I insert an image!"



(a) Small Meme

Word User: "Why is the text moving all over the place when I insert an image!"



(b) Large Meme

Figure 1: \LaTeX meme

- Let's look at the syntax

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

- 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}
```

- 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 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 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}  
\caption{Meme} %caption  
\label{fig:meme} %label  
\end{figure}
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Labeling equation

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

- 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

- 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.

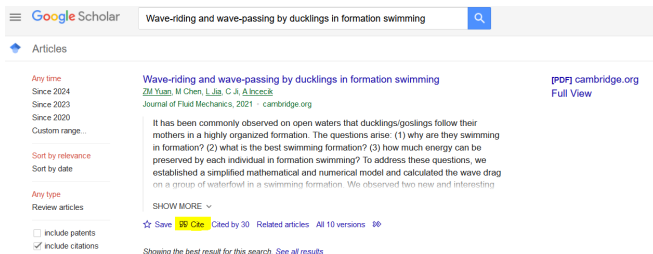


Figure 2: Search in google scholar

- Use any source of citations: Google scholar, Mendeley, journal
- We obtain the bibtex from the above locations.
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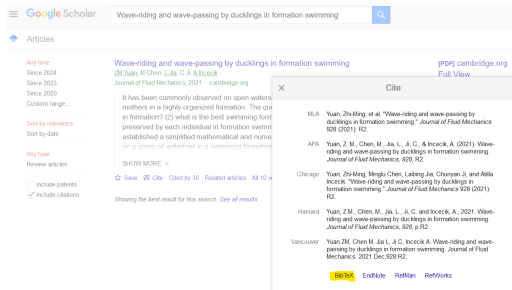


Figure 3: Citation formats

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

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

Table 1: Most used commands

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

Table 2: Basic environments

Command	Function
<code>\usepackage{graphicx}</code>	Package for figures
<code>\usepackage{subcaption}</code>	Package for subfigures
<code>\usepackage{xcolor}</code>	Package for using colors in objects
<code>\usepackage{hyperref}</code>	Package for URLs
<code>\hyperref[url here]{text here}</code>	Command for hyperrefs

Table 3: Most used packages

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

- [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.