

How to use LATEX

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Why LATEX ?

An extremely good philosophical question.

- ► Microsoft Office Word and PowerPoint are boring.
- ► LATEX is elegant, charming, or whatever...
- Excellent for mathematical typesetting.
- ► Powerful, lots and lots of power for you to extend it, be it theses, papers, slides (using Beamer), spreadsheets...
- ► Free and portable, supported by most OS platforms.



What LATEX can do

- ► Write scientific papers
- ▶ Write theses
- ► Typeset books and publications
- Write typeset letters
- ▶ Play around with mathematical formulae
- Make presentation slides
- Beautify your CV
- and many more



Useful resources

Books list



Figure 1: LATEX Beginner's Guide



Figure 2: LATEX: A Document Preparation System: User's Guide and

Reference Manual



Useful resources

Learn LATEX in one video : https://www.youtube.com/watch?v=VhmkLrOjLsw

Mr Daoming Dong is also a good resource. He is nice and helpful. Zhihu: @DDMichael



A brief history

In the mid 1970s, Donald Knuth, a Stanford CS geek and the academic world equivalent of Martin (the author of GOT), developed TEX in SAIL to typeset his "The Art of Computer Programming" (TAOCP). First public release in 1978. He reimplemented it in Pascal in the mid 80s (WEB, literate programming). Leslie Lamport, the genius, wrote LATEX in early 80s by porting the orginal TEX.

What is the relationship between TEX and LATEX? LATEX uses the TEX typesetting programme to compile and generate its output. LATEX focuses on the content while TEX is the main programme for setting up the layout.



LATEX version and more

The first LATEX version available is 2.09 (strange number and strange version control). Later in 1994, LATEX $2_{\mathcal{E}}$ replaced the old version, and remained ever since.

LATEX 3 is a long-term research project, which started from the 1990s.

LATEX, unlike Microsoft Office Word, is not **WYSIWYG** (what you see is what you get), and it allows the user to focus on the content and structure of the text. Lots of strange syntax and commands are present in the LATEX source file.



How to pronounce LATEX ?

First and foremost, the pronunciation of LATEX. According to the father of TEX:

'English words like 'technology' stem from a Greek root beginning with the letters $\tau \epsilon \chi ...$; and this same Greek word means art as well as technology. Hence the name TeX, which is an uppercase form of $\tau \epsilon \chi$.

Insiders pronounce the χ of TeX as a Greek chi, not as an 'x', so that TeX rhymes with the word blecchhh. It's the 'ch' sound in Scottish words like loch or German words like ach; it's a Spanish 'j' and a Russian 'kh'. When you say it correctly to your computer, the terminal may become slightly moist.'

Donald Knuth



How to pronounce LATEX ?

Another quote from the father of LATEX:

'One of the hardest things about LaTeX is deciding how to pronounce it. This is also one of the few things I'm not going to tell you about LaTeX, since pronunciation is best determined by usage, not fiat. TeX is usually pronounced teck, making lah-teck, and lay-teck the logical choices; but language is not always logical, so lay-tecks is also possible.' Leslie Lamport



Installation

We would highly recommend the following LATEX distributions.

- ► For Windows users
 - ► TeX Live
 - ► MiKTeX
- ► For MacOS users
 - ► TeX Live
 - MacTeX

Note that the TeX Live distribution contains yearly updates, and the update installation must be done manually. TeX Live 2019 is scheduled to release by the end of this April.



Editors

There are in fact numerous ways for you to write up a LATEX document.

- ► TeXStudio (behold, the beamer template we used for this tutorial cannot be built using this editor)
- TeXShop
- ► Notepad / Notepad++
- ▶ Sublime
- ▶ Visual Studio Code
- ► Vi / Vim
- ▶ Word !!!
- ► Overleaf (the online editor)

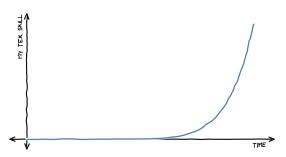
In fact, any plain-text editor shall suffice.



How to use

We have to remind you that learning LATEX (might be) very hard 1

THE ULTIMATE TEX LEARNING CURVE CREDIT: YOUCHAO





How to use



²These arrows are plotted using a package called tikz



Some common knowledge

- ► Since LATEX is a package implemented in the TEX **typesetting language**, we should consider the TEX input syntax when use it.
- ► TEX reads *.tex files and with lots of interesting background procedures, outputs *.pdf files.



Some common knowledge

- ▶ The effect of typing multiple spaces is the same as one space.
- ► The effect of typing multiple line feeds is the same as one line break.
- ► If you don't know how and when to use \ (backslash), then you are doomed.
- ▶ Be aware of the use of \xspace and whatever that follows the backslash after the "mark, e.g., "\ref.
- ▶ \(white space), this forces normal space, \@, this indicates that the next punctuation ends the sentence. Try out the differences by yourselves.



Some common knowledge

- ► Special meta characters as part of the TEX language syntax:
 - ▶ # \$ % ^ & _ { } ~ \
- ▶ To use them you have to do the following

\# \\$ \% \^ \& _ \{ \} \textasciitilde \textbackslash



Changing fonts and styles

You may either use (1) lexical declarations or (2) commands. *Contents* are referenced from the slides for a course held at the Computer Lab, Cambridge.

\mdseries	\textmd{text}	Medium series
\bfseries	\textbf{text}	Boldface series
\rmfamily	\textrm{text}	Roman family
\sffamily	\textsf{text}	Sans-serif family
\ttfamily	\texttt{text}	Typewriter famil
\upshape	\textup{text}	Upright shape
\itshape	\textit{text}	Italic shape
\slshape	\textsl{text}	Slanted shape
\scshape	\textsc{text}	SMALL CAPS SHAPI
\n	\textnormal{text}	Normal style



E

Changing fonts and styles

In order to properly apply the font and style settings to your text, you will need to use curly braces { and } for grouping.

- ▶ Using the commands and macros grouped by the curly braces.
 - E.g.
 - This is to demonstrate the textbf {bold} statement.
 - This is to demonstrate the **bold** statement.
- ► Setting up the lexical scope using the curly braces.
 - E.g.
 - This is to demonstrate the {\bfseries bold} statement.
 - This is to demonstrate the **bold** statement.



How to use dashes

There are, in fact, **en dashes**, **em dashes**, **hyphens** and **minus signs**.

```
corresponds to - hyphen
corresponds to - en dash
corresponds to - em dash
corresponds to - minus sign
```

For example, line-breaks (*hyphen*), Figures 1–4 (*en dash*), people—like me—love to use LATEX (*em dash*).

In terms of how to properly use them, try searching the internet for answers. **Metaphysics** it is.



How to use quotation marks

One of the (out of many) mistakes that you will definitely make throughout your LATEX journey is the use of quotation marks. Unlike Word, TEX uses single quotation mark (') and the grave accent (') to encode the differences.

```
corresponds to ' left quote
corresponds to ' right quote
corresponds to " left double
corresponds to " right double
```



Starting a report and title page

```
documentclass { article }
\begin{document}
\begin{titlepage}
  \begin{center}
    \line(1,0){300}\\
    [0.25in]
    \huge{\textbf{ CSSA \LaTeX\ Notes
         1111
    [2mm]
    \line(1,0){200}\\
    [1.5cm]
    \textsc{\LARGE University of
         Cambridge } \\
    \textsc{\LARGE Using \LaTeX\ to
         Write a Simple Report}\\
    [8cm]
  \end{center}
  \begin{flushright}
    \textsc{\large CSSA. \\ A Latex
         Hser\\
    20th Apr 2019}
  \end{flushright}
\end{titlepage}
\end{document}
```

```
CSSA LATEX Notes
      UNIVERSITY OF CAMBRIDGE
USING LATEX TO WRITE A SIMPLE REPORT
```



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Sections

```
\section{Introduction}
    This is the first line of the report.
         This report will show you how to
         use \LaTeX\\\
    % Text holder: show one paragraph of
         \lipsum
    \lipsum[1]
    % Text holder: show one paragraph of
         \lipsum
    \section{Second section}
    This is the second section of this
         report.
    \subsection{Sub section 1}
    This is the first sub section in this
         report.
    \subsection{Sub section 2}
11
    This is the second sub section in this
          report.
12
    \subsubsection{Sub sub section}
13
    This is a sub sub section. Replace
         text here when you write your
         report.
```

1 Introduction

I INTOGRECION
This is the first in of the sport. This sport will show you have to use DEPAC
Lemm is goon show of a new, connections subjecting the U. Ity mare fill, worlder
Non-lemm is the sport of the state of the sport of the state of the sport of the state of the sport of th

2 Second section

This is the second section of this report

2.1 Sub-section 1

This is the first sub-section in this report.

2.2 Sub section 2

This is the second subsection in this report 2.2.1 Sub sub section

This is a sub sub-section. Replace text here when you write your report



Margins, page number

```
documentclass { article }
    \usepackage{lipsum}
    % geometry package, control the margin
          of the article
    \usepackage[margin = 1 in, left = 1.5
         in, includefoot]{geometry}
    % Header and Footer Stuff
    \usepackage{fancyhdr} % fancyhdr
         package
    \pagestyle{fancy}
    % Clear previous head and foot style
    \fancyhead{}
10
    \fancvfoot{}
11
    % Position the page number RHS of the
          footer
12
    \fancvfoot[R]{ \thepage\ }
13
    % Clear the header line
14
    \renewcommand{\headrulewidth}{Opt}
15
    % Keep the footer line
    \renewcommand{\footrulewidth}{1pt}
16
```

1 Introduction

This is the first line of the report. This report will show you how to use IFRX ac, mills. Cumbitur sector segmer mills. Doner varies one eest rieus. Dais nibb mi, conese eu.

2 Second section

2.1 Sub section 1

This is the first sub-section in this report

This is the second subsection in this report



Lists

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```
% Normal bullet point: itemized
\begin{itemize}
  \item This is our first line
  \item This is our second line and I
       am making it longer so that you
        can see how text wraps around
       automatically in \LaTeX
  \begin{itemize}
    \item A bullet within a bullet!
    \begin{itemize}
      \item More deeper
    \end{itemize}
  \end{itemize}
  \item [Title] blah blah blah
  \item [This is a longer title] blah
       blah blah
  \begin{enumerate}
    % Numberd lists
    \item \lipsum[1]
    % Just try to make the PDF looks
         okav for this presentation
    \item \lipsum [2]
  \end{enumerate}
\end{itemize}
```

```
3 Lists
   . This is our first line
   . This is our second line and I am making it longer so that you can see how text wrans around
    automatically in DTgX
       - A bullet within a bullet
       2. Nam dai ligula, fringilla a, enismod sodales, sollicitudin vel, wiei. Morbi austor lorem
```



Figures and tables

```
\usepackage{graphicx}% Import images \usepackage{float} % Control float
```

```
\section{Figures and Tables}
\subsection{Figures}
\begin{figure}[H]
  \ centering
  \includegraphics[width = \textwidth
       1{Figures/space.png}
  \caption{My desktop background}
       \label{fig}
\end{figure}
\subsection{Tables}
\begin{table}[H]
  \centering \label{tab}
  \caption{This is a very simple table
  \begin{tabular}{l | c r}
    Name & University & Department
         \\\hline
    CSSA & Cambridge & Engineering \\
  \end{tabular}
\end{table}
Figure \ref{fig}. Table \ref{tab}.
```





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Math equations

```
\section{Math equation}
     Fractions, inline equation: $d = v it
           + \frac{1}{2} \cdot at^2$\\
     Brackets:
     $$ \left(\frac{1}{2}\right) \cdot 2 =
     \$ \left | -7 \right | = 7$$
     $$x^{2^3}$$
     \begin{eqnarray*}
          \sqrt{4} &\neq& 5 \\
         \pi &\approx& 3 \\
10
         \pi &\times& \sqrt{4} < 15
11
     \end{eqnarray*}
12
     \begin{equation}
       U(\alpha, \beta) = \frac{e^{jkz}}{j
13
              \lambda z}e^{j\frac{k(\alpha^2+
              \beta^2) \{2z\}\iint \left \{U(x, y
             e^{j \frac{k(x^2+y^2)}{2z}}
              \left\langle right \right\rangle e^{-i} \left\langle frac \left( 2 \right\rangle \right| 
             \lambda z\(\alpha x+\beta y)\)
             dxdv
       \label{eq:Fresnel}
14
15
     \end{equation}
```

```
5 Math equation
 Fractions, in
line equation: d = v_i t + \frac{1}{4} \cdot at^2
                                                                                    \binom{1}{8} \cdot 2 = 1
                              U(\alpha,\beta) = \frac{e^{jkz}}{1-\alpha}e^{j\frac{k(\alpha^2+\beta^2)}{2\alpha}} \int \int \left\{U(x,y)e^{j\frac{k(\alpha^2+\beta^2)}{2\alpha}}\right\}e^{-j\frac{kz}{2\alpha}(\alpha+\beta)\rho}dxdy
```

References: set up

- ► LHS: Journal paper
- ► RHS: Conference paper

```
@article{GaborHolography.
      author = {D. Gabor},
       journal = {Nature},
      number = \{161\}.
      pages = \{777 - -778\},
      publisher = {Nature},
      title = {A new microscopic principle
      volume = {161},
      month = {May},
10
      vear = \{1948\}.
      url = {https://www.nature.com/
11
            articles /161777a0}.
12
      doi = {https://doi.org
            /10.1038/161777a0},
13
```

```
@inproceedings{HardReview_84,
     author = {M. Lucente and Galyean, T.
 3
     title = {Rendering Interactive
           Holographic Images},
     booktitle = {Proceedings of the 22Nd
           Annual Conference on Computer
           Graphics and Interactive
           Techniques},
 5
     series = {SIGGRAPH '95}.
     vear = \{1995\},\
     isbn = \{0-89791-701-4\},
     pages = \{387 - -394\},
 9
     numpages = \{8\},
10
     url = {http://doi.acm.org
           /10.1145/218380.218490}.
11
     doi = \{10.1145/218380.218490\}.
12
     acmid = \{218490\},\
13
     publisher = {ACM}.
14
     address = {New York, NY, USA}.
15
```

References: use

```
% Reference setup
    \ cleardoublepage
 3
 4
    \section{How to use references}
    \lipsum[1]
    \textbf{I'm citing a journal article}
          \cite{GaborHolography}.\\
    \lipsum[2]
    \textbf{I'm now citing a conference
          article} \cite{HardReview 84}.
10
    \bibliographystyle { IEEEtran }
11
12
    \ cleardoublepage
13
    \bibliography{References/references.
          bib}
    \addcontentsline{toc}{section}{
14
          \numberline{}References}
```

```
% .bibtex file use google
```

6 How to use refernces

Lerror, layers shift will sent, consecution alloying the Dr. Dynare sile, worthful nor, a pleasant ϕ_{ij} , and policy that ϕ_{ij} . Solic Carollar's often spreads source, Norme us 1000es, normeroper test (in Applicate ϕ_{ij} , normeroper test (in Applicate ϕ_{ij} , normeroper test (in Applicate ϕ_{ij}), and the surface of the same rating opens. It has the to the or the tests making the same rating opens. It has the to the other tests making gravity appeared to the One tests making gravity appeared. Happy couples only locally in printing spice, there are, same Prosest age tests which the will be sufficient the same former of the day with ϕ_{ij} the same ϕ_{ij} the same of the same o

For deling a journal article [1] and the property of the prope



Appendix

```
\ cleardoublepage
    \appendix
    \section{Appendix -1}
    This is the first appendix.
    \lipsum[1]
    \section{Appendix -2}
    This is the second appendix.
    \begin{figure}[H]
       \begin{subfigure}{0.5\linewidth}
10
         \includegraphics [width =
               \textwidth | { Figures / Cubic
              aperture.png}
         \caption{cubic aperture}
11
12
         \label{cubicAperture}
13
       \end{subfigure}
14
       begin{subfigure}{0.5 \ linewidth}
         \includegraphics[width =
15
              \textwidth]{Figures/Circular_
              aperture.png}
         \caption{circular aperture}
16
         \label{circularAperture}
17
       \end{subfigure}
18
19
       caption{Two figures}
    \end{figure}
20
```

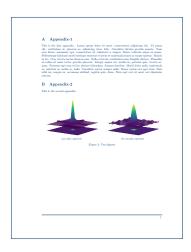


Table of contents, list of figures, list of tables

```
\end{titlepage}
\cleardoublepage
% Table of contents stuff
\pagenumbering{roman}
\tableofcontents
% \cleardoublepage
% List of figures, list of tables
\listoffigures
\listoftables
\thispagestyle { empty }
\addcontentsline{toc}{section}{
     \numberline{}List of Figures}
\addcontentsline{toc}{section}{
     \numberline{}List of Tables}
\ cleardoublepage
% Main body stuff
\pagenumbering{arabic}
\setcounter{page}{1}
\ cleardoublepage
\section{Introduction}
```

```
Contents
 List of Figures
4 Figures and Tables
List of Figures
List of Tables
```



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Templates

We will demonstrate some useful LATEX templates.

However, keep in mind that before you use templates, you should make yourself comfortable with the basic LATEX commands.



The last session: Q and A

Hopefully, hopefully and hopefully we will be able to answer your questions.

Thank you!

