



剑桥中国学生学者联谊会  
Chinese Students and Scholars Association in Cambridge

# How to use $\text{\LaTeX}$ : A gentle walk into the world of typesetting

Youchao Wang (& Daoming Dong)

CMMPE, Engineering, University of Cambridge

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# Why L<sup>A</sup>T<sub>E</sub>X ?

An extremely good philosophical question.

- ▶ Microsoft Office Word and PowerPoint are boring.
- ▶ L<sup>A</sup>T<sub>E</sub>X 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 L<sup>A</sup>T<sub>E</sub>X 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

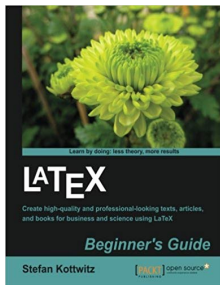


Figure 1: L<sup>A</sup>T<sub>E</sub>X Beginner's Guide

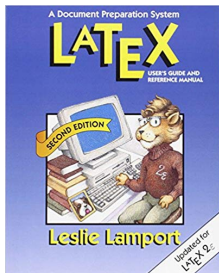


Figure 2: L<sup>A</sup>T<sub>E</sub>X: A Document Preparation System: User's Guide and Reference Manual

# Useful resources

Learn  $\text{\LaTeX}$  in one video :

<https://www.youtube.com/watch?v=VhmkLrOjLsw>

Overleaf: <https://www.overleaf.com>

The easy to use, online, collaborative editor. Templates and tutorials are available.

## 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  $\text{T}_{\text{E}}\text{X}$  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  $\text{\LaTeX}$  in early 80s by porting the original  $\text{T}_{\text{E}}\text{X}$ .

What is the relationship between  $\text{T}_{\text{E}}\text{X}$  and  $\text{\LaTeX}$ ?

$\text{\LaTeX}$  uses the  $\text{T}_{\text{E}}\text{X}$  typesetting programme to compile and generate its output.  $\text{\LaTeX}$  focuses on the content while  $\text{T}_{\text{E}}\text{X}$  is the main programme for setting up the layout.

# $\text{\LaTeX}$ version and more

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

$\text{\LaTeX}$  3 is a long-term research project, which started from the 1990s.

$\text{\LaTeX}$ , 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  $\text{\LaTeX}$  source file.

# How to pronounce L<sup>A</sup>T<sub>E</sub>X ?

First and foremost, the pronunciation of L<sup>A</sup>T<sub>E</sub>X. According to the father of T<sub>E</sub>X:

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

*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 L<sup>A</sup>T<sub>E</sub>X ?

Another quote from the father of L<sup>A</sup>T<sub>E</sub>X:

*'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  $\text{\LaTeX}$  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  $\text{\LaTeX}$  document.

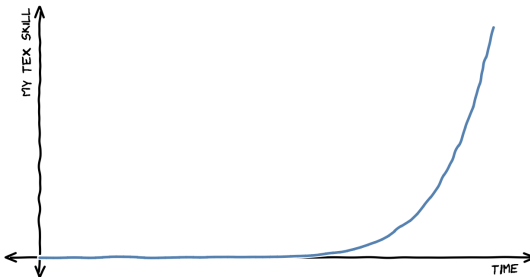
- ▶ TeXStudio (one that I use to build the beamer slides)
- ▶ TeXShop
- ▶ Notepad / Notepad++
- ▶ Sublime
- ▶ Visual Studio Code
- ▶ Vi / Vim
- ▶ *Word* !!!
- ▶ Overleaf (the online editor)

In fact, any plain-text editor shall suffice.

# How to use

We have to remind you that learning  $\text{\LaTeX}$  (*might be*) very hard <sup>1</sup>

THE ULTIMATE TEX LEARNING CURVE  
CREDIT: YOUCHAO



# How to use

We have to remind you that learning  $\text{\LaTeX}$  (*might be*) very hard <sup>2</sup>

Newbie

Give up

Master

USUALLY

WANT THIS



---

<sup>2</sup>These arrows are plotted using a package called tikz

# Some common knowledge

- ▶ Since  $\text{\LaTeX}$  is a package implemented in the  $\text{\TeX}$  **typesetting language**, we should consider the  $\text{\TeX}$  input syntax when use it.
- ▶  $\text{\TeX}$  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 T<sub>E</sub>X 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 family

`\upshape`

`\textup{text}`

Upright shape

`\itshape`

`\textit{text}`

*Italic shape*

`\slshape`

`\textsl{text}`

*Slanted shape*

`\scshape`

`\textsc{text}`

SMALL CAPS SHAPE

`\normalfont`

`\textnormal{text}`

Normal style

# 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  $\text{\LaTeX}$  (*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  $\text{\LaTeX}$  journey is the use of quotation marks. Unlike Word,  $\text{\TeX}$  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

# Surviving from using tables

Tables! Many have tried to survive, many then failed.

In general, there are:

- ▶ the normal table, `\table` (then `\tabular`),
- ▶ the table that can span over several pages, `\longtable`

# Starting a report and title page

```
1 \documentclass{article}
2 \begin{document}
3 \begin{titlepage}
4   \begin{center}
5     \line(1,0){300}\\
6     [0.25in]
7     \huge{\textbf{ CSSA \LaTeX\ Notes
8       }}\\
9     [2mm]
10    \line(1,0){200}\\
11    [1.5cm]
12    \textsc{\LARGE University of
13      Cambridge}\\
14    \textsc{\LARGE Using \LaTeX\ to
15      Write a Simple Report}\\
16    [8cm]
17    \end{center}
18    \begin{flushright}
19      \textsc{\large CSSA. \A Latex
20        User\\
21        20th Apr 2019}
22    \end{flushright}
23  \end{titlepage}
24 \end{document}
```

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CSSA ~~La~~TeX Notes

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UNIVERSITY OF CAMBRIDGE  
USING ~~La~~TeX TO WRITE A SIMPLE REPORT

CSSA.  
A LATEX USER  
20TH APR 2019

## 1 Introduction

## 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

```
1 \documentclass{article}
2 \usepackage{lipsum}
3 % geometry package, control the margin
  of the article
4 \usepackage[margin = 1 in, left = 1.5
  in, includefoot]{geometry}
5 % Header and Footer Stuff
6 \usepackage{fancyhdr} % fancyhdr
  package
7 \pagestyle{fancy}
8 % Clear previous head and foot style
9 \fancyhead{}
10 \fancyfoot{}
11 % Position the page number RHS of the
  footer
12 \fancyfoot[R]{ \thepage \ }
13 % Clear the header line
14 \renewcommand{\headrulewidth}{0pt}
15 % Keep the footer line
16 \renewcommand{\footrulewidth}{1pt}
```

## 1 Introduction

This is the first line of the report. This report will show you how to use `lATEX`. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing elit, id. Cras bibendum magna. Nam arcu libero, nuncius eget, consetetur et, vulputate a, magna. Donec veloribus augue eu tempus. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Maecis et leo. Cras viverra, nuncius duioribus. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus et amet turpis gravida placerat. Integer sapien est, laoreet in, pretium quis, viverra ac, sem. Praesent eget sem vel leo ultrices lobortis. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, nulla ac, nulla. Cras bibendum augue nulla. Donec varius arcu eget risus. Duis nulla mi, augue eu, accumsan duioribus, sagittis quis, diam. Duis eget arcu sit amet arcu dignissim rutrum.

## 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.



### 3 Lists

- This is our first line
- This is our second line and I am adding it longer so that you can see how text wraps around automatically in HTML.
- A bullet within a bullet?
- More deeper

Title line link link

This is a longer title link link link link

1. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut tamen est, vestibulum ut, placerat ac, adipiscing vitae, fides. Quoniam dictum gravida mauris. Nam acen libero, acummyt eget, consectetur id, volutpat a, magna. Donec vehicula nuncper eu tempus. Pellentesque habitant mattis tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra accumsan inceptos eu. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu volutpat sit amet turpis gravida placerat. Integer necper nisl, nulla in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices lobortis. Aenean faucibus. Morbi dolor nulla, nuncnunc nunc, pulvinar ac, nulla ac, nulla. Crasdictum accumsan necper nulla. Donec velnisi acci eget risa. Duis nulla nisl, tempus nisl, accumsan dicitnisi, acipit quis, diam. Duis eget acci sit amet acci dignissim rutrum.
2. Nam dui ligula, fringilla a, velnisi nuncnisi, sollicitudin vel, vici. Morbi nuncper lorem nunc justo. Nam lacus libero, pretium ut, lobortis vitae, ultricies et, tulla. Donec aliquet, turpis vel accumsan lobortis, nisl ligula aliquet nuncper, vitae orare dui nunc a, nisl. Morbi ac acci et dui hendrerit nulla. Suspendisse et massa. Cras leo ante. Pellentesque a nulla. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Aliquam tincidunt urna. Nulla ullamcorper vestibulum tincidunt. Pellentesque cursus luctus nuncnisi.

# Figures and tables

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

```
1 \section{Figures and Tables}
2 \subsection{Figures}
3 \begin{figure}[H]
4 \centering
5 \includegraphics[width = \textwidth]{Figures/space.png}
6 \caption{My desktop background}
7 \label{fig}
8 \end{figure}
9 \subsection{Tables}
10 \begin{table}[H]
11 \centering \label{tab}
12 \caption{This is a very simple table}
13 \begin{tabular}{l | c r}
14 Name & University & Department \\
15 \hline
16 CSSA & Cambridge & Engineering \\
17 \end{tabular}
18 \end{table}
19 Figure \ref{fig}. Table \ref{tab}.
```

## 4 Figures and Tables

### 4.1 Figures



Figure 1: My desktop background

### 4.2 Tables

Table 1: This is a very simple table

Name	University	Department
CSSA	Cambridge	Engineering

Figure 1: Table 1.

# Math equations

```

1 \section{Math equation}
2 Fractions, inline equation:  $d = v_{it}$ 
   +  $\frac{1}{2} \cdot \text{at}^2$ 
3 Brackets:
4  $\left(\frac{1}{2}\right) \cdot 2 = 1$ 
5  $|-7| = 7$ 
6  $x^2 = 3$ 
7 \begin{eqnarray*}
8 \quad \sqrt{4} & \neq & 5 \\
9 \quad \pi & \approx & 3 \\
10 \quad \pi & \times & \sqrt{4} < 15 \\
11 \end{eqnarray*}
12 \begin{equation}
13 \quad U(\alpha, \beta) = \frac{e^{jkz}}{\lambda^2} \iint \left\{ U(x, y) e^{jk(x^2+y^2)} \right. \\
\quad \left. \right\} e^{-j\frac{2\pi}{\lambda}(x\alpha + y\beta)} dx dy \\
14 \quad \text{\label{eq:Fresnel}} \\
15 \end{equation}

```

## 5 Math equation

Fractions, inline equation:  $d = v_{it} + \frac{1}{2} \cdot \text{at}^2$

Brackets:

$$\left(\frac{1}{2}\right) \cdot 2 = 1$$

$$|-7| = 7$$

$$x^2 = 3$$

$$\sqrt{4} \neq 5$$

$$\pi \approx 3$$

$$\pi \times \sqrt{4} < 15$$

$$U(\alpha, \beta) = \frac{e^{jkz}}{\lambda^2} \iint \left\{ U(x, y) e^{jk(x^2+y^2)} \right\} e^{-j\frac{2\pi}{\lambda}(x\alpha + y\beta)} dx dy \quad (1)$$

# References: set up

- ▶ LHS: Journal paper
- ▶ RHS: Conference paper

```
1 @article{GaborHolography,  
2   author = {D. Gabor},  
3   journal = {Nature},  
4   number = {161},  
5   pages = {777--778},  
6   publisher = {Nature},  
7   title = {A new microscopic principle  
8     },  
9   volume = {161},  
10  month = {May},  
11  year = {1948},  
12  url = {https://www.nature.com/  
13    articles/161777a0},  
14  doi = {https://doi.org  
15    /10.1038/161777a0},  
16 }
```

```
1 @inproceedings{HardReview_84,  
2   author = {M. Lucente and Galyean, T.  
3     A.},  
4   title = {Rendering Interactive  
5     Holographic Images},  
6   booktitle = {Proceedings of the 22Nd  
7     Annual Conference on Computer  
8     Graphics and Interactive  
9     Techniques},  
10  series = {SIGGRAPH '95},  
11  year = {1995},  
12  isbn = {0-89791-701-4},  
13  pages = {387--394},  
14  numpages = {8},  
15  url = {http://doi.acm.org  
16    /10.1145/218380.218490},  
17  doi = {10.1145/218380.218490},  
18  acmid = {218490},  
19  publisher = {ACM},  
20  address = {New York, NY, USA},  
21 }
```

# References: use

```
1 % Reference setup
2 \cleardoublepage
3
4 \section{How to use references}
5 \lipsum[1]
6 \textbf{I'm citing a journal article}
   \cite{GaborHolography}.\
7 \lipsum[2]
8 \textbf{I'm now citing a conference
   article} \cite{HardReview_84}.
9
10
11 \bibliographystyle{IEEEtran}
12 \cleardoublepage
13 \bibliography{References/references.
   bib}
14 \addcontentsline{toc}{section}{
   \numberline{}References}
```

```
1 % .bibtex file
2 use google
```

## 6 How to use references

Leten ipsum dolor sit amet, consectetur adipiscing elit. Ut porro elit, vestibulum ut, phasellus ac, adipiscing vitae, felis. Cras ultricies dictum gravida mauris. Nam arcu libero, semper eget, convallis ut, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Maeculis ut leo. Cras viverra metus rhoncus enim. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida phasellus. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dicit nulla, malesuada eu, pulvinar et, nulla ac, nulla. Cras ultricies metus neque nulla. Donec varius orci eget tunc. Duis nulla nec, neque eu, accumsan dui, dapibus quis, diam. Duis eget orci sit amet orci dignissim rutrum.

*For citing a journal article [1]:*

Nam dui ligula, fringilla a, vulputate sodales, efficitur vel, wisi. Morbi auctor lorem non justo. Nam lacus libero, pretium et, lobortis vitae, ultricies et, tellus. Donec aliquet, tortor sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a wisi. Morbi ac orci et wisi hendrerit nulla. Suspendisse ut massa. Cras nec ante. Pellentesque a nulla. Cum exilis autogae proculibus et tempore de parturient montes, nascetur ridiculus wisi. Aliquam tincidunt urna. Nulla ullamcorper vestibulum tristique. Pellentesque cursus lacinia mauris.

*For now citing a conference article [2].*

# 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}
\includegraphics[width =
\textwidth]{Figures/Cubic_
aperture.png}
\caption{cubic aperture}
\label{cubicAperture}
\end{subfigure}
\begin{subfigure}{0.5\linewidth}
\includegraphics[width =
\textwidth]{Figures/Circular_
aperture.png}
\caption{circular aperture}
\label{circularAperture}
\end{subfigure}
\caption{Two figures}
\end{figure}
```

## A Appendix-1

This is the first appendix. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut porce elit, metusibus ut, phasmat se, adipiscing vitae, fides. Curabitur dictum gravida mauris. Nam acen libero,ummyy eget, consetetur id, vulpate a, magna. Donec volutate augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac tempus aptent. Mauris ut leo. Cuius viverra metus donec sit. Nulla et lectus consetetur tunc fringilla ultrices. Phasellus eu tellus ut auctor tunc gravida phasellus. Integer augue nisi, interdum in, porttitor quis, connea ac, ante. Praesent eget sem vel leo ultrices interdum. Aenean faucibus. Morbi dolor nulla, interdum eu, pulvinar ut, nulla ac, nulla. Curabitur auctor oranger nulla. Donec tunc nisi eget risus. Duis nulla sed, congue eu, acenamus duisand, sagittis quis, diam. Duis eget nisi sit auctor nisi dignissim rutrum.

## B Appendix-2

This is the second appendix.



Figure 2: Two figures

# Table of contents, list of figures, list of tables

```
1 \end{titlepage}
2 \cleardoublepage
3 % Table of contents stuff
4 \pagenumbering{roman}
5 \tableofcontents
6 % \cleardoublepage
7 % List of figures, list of tables
8 \listoffigures
9 \listoftables
10
11 \thispagestyle{empty}
12 \addcontentsline{toc}{section}{
13     \numberline{}List of Figures}
14 \addcontentsline{toc}{section}{
15     \numberline{}List of Tables}
16 \cleardoublepage
17 % Main body stuff
18 \pagenumbering{arabic}
19 \setcounter{page}{1}
20
21 \cleardoublepage
22 \section{Introduction}
```

Contents	
List of Figures	i
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1 Introduction	1
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1 My desktop background	3
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1 This is a very simple table	3

# Templates

I will demonstrate some useful  $\text{\LaTeX}$  templates.

However, keep in mind that before you use templates, you should make yourself comfortable with the basic  $\text{\LaTeX}$  commands.



# The last session: Q and A

Hopefully, hopefully and hopefully I will be able to answer your questions, because  $\text{\LaTeX}$  is HARD.

# Thank you!