

# A (Not So?) Short Introduction to $\text{\LaTeX}$



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# About Me

- PhD student, Texas A&M University
- GNU/Linux user since 2009
- $\LaTeX$  user since 2010
- Author the `beamerthemetamu`  $\LaTeX$  package



- T<sub>E</sub>X:  $\tau\epsilon\chi$  (/ˈtɛx/, /ˈtɛk/)
  - ▶ A typesetting system for beautiful books
  - ▶ Originally developed by Donald E. Knuth in 1978
  - ▶ Latest release: 3.14159265 in Jan 2014
  - ▶ Free software
- L<sup>A</sup>T<sub>E</sub>X (/ˈlɑːtɛx/, /ˈleɪtɛk/)
  - ▶ Originally developed by Leslie Lamport
  - ▶ Based on T<sub>E</sub>X, with higher level abstraction
  - ▶ Extensive packages as addons
  - ▶ Widely adopted in academia, e.g. journal, conference, thesis, etc.



# Why $\LaTeX$ (and why not)?

## Pros

- Users focus on contents
- Beautiful outputs, especially math
- Versatile: letter, manual, slides, chess, etc.
- Stable core

## Cons perhaps...

- Not WYSIWYG
- Not easy to be  $\TeX$ pert

## Single Equation

$$\mathcal{F}(\xi) = \int_{-\infty}^{\infty} f(x)e^{-j2\pi\xi x} dx$$

## Multiple Equations

$$y = d \qquad z = 1 \qquad (1)$$

$$y = cx + d \qquad z = x + 1 \qquad (2)$$

$$y_{12} = bx^2 + cx + d \qquad z = x^2 + x + 1$$

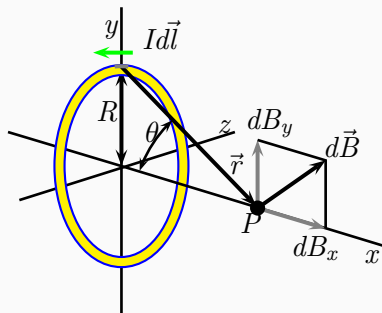
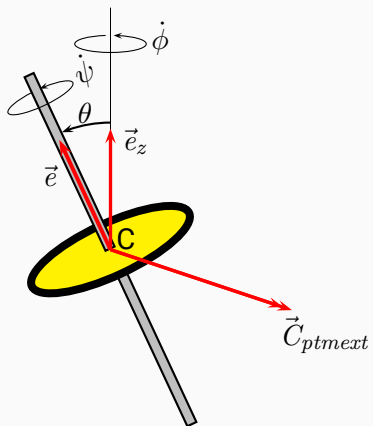
$$y(x) = ax^3 + bx^2 + cx + d \qquad z = x^3 + x^2 + x + 1 \qquad (3)$$

## Showcase: More Math Equations

### Extremely Long Equations

$$\begin{aligned} A &= \lim_{n \rightarrow \infty} \Delta x \left( a^2 + \left( a^2 + 2a\Delta x + (\Delta x)^2 \right) \right. \\ &\quad \left. + \left( a^2 + 2 \cdot 2a\Delta x + 2^2 (\Delta x)^2 \right) \right. \\ &\quad \left. + \left( a^2 + 2 \cdot 3a\Delta x + 3^2 (\Delta x)^2 \right) \right. \\ &\quad \left. + \dots \right. \\ &\quad \left. + \left( a^2 + 2 \cdot (n-1)a\Delta x + (n-1)^2 (\Delta x)^2 \right) \right) \\ &= \frac{1}{3} (b^3 - a^3) \quad (4) \end{aligned}$$

## Showcase: Graphics









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

- T<sub>E</sub>X distro: a comprehensive collection of T<sub>E</sub>X utils
- T<sub>E</sub>X Live
  - ▶ Developed since 1996 by the TeX Users Group (TUG)
  - ▶ Originally for GNU/Linux, now cross-platform
  - ▶ Portable installation on USB
  - ▶ Yearly release: latest T<sub>E</sub>X Live 2017

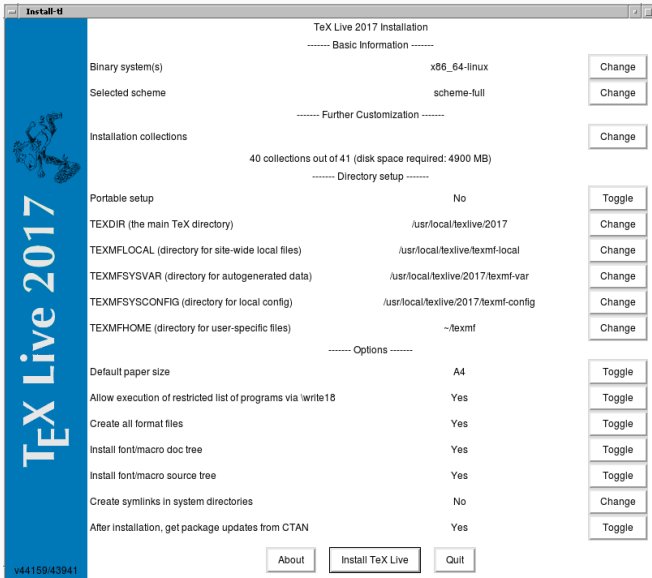
# How to install T<sub>E</sub>X Live?

- OS distro
  - ▶ `sudo dnf install texlive`
- TeX Users Group (TUG)
  - 💰 Be a TUG member and get T<sub>E</sub>X Live on DVD
  - ☹️ Download the huge DVD iso
  - 😊 Net install

- Navigate to <https://tug.org/texlive>
- Follow the “download” link
- GNU/Linux: `install-tl-unx.tar.gz{,.sha256}`
- Verify the archive

```
$ LANG=C sha256sum --check install-tl-unx.  
tar.gz.sha256  
install-tl-unx.tar.gz: OK
```

- GUI: `sudo dnf install perl-Tk`



/usr/local vs. \$HOME?

Installation collections

Select the collections to be installed

- |  |  |  |
|--|--|--|
| <input checked="" type="checkbox"/> Essential programs and files   | <input checked="" type="checkbox"/> Czech/Slovak             | <input checked="" type="checkbox"/> LaTeX fundamental packages                           |
| <input checked="" type="checkbox"/> BibTeX additional styles       | <input checked="" type="checkbox"/> US and UK English        | <input checked="" type="checkbox"/> LaTeX additional packages                            |
| <input checked="" type="checkbox"/> TeX auxiliary programs         | <input checked="" type="checkbox"/> Other European languages | <input checked="" type="checkbox"/> LaTeX recommended packages                           |
| <input checked="" type="checkbox"/> ConTeXt and packages           | <input checked="" type="checkbox"/> French                   | <input checked="" type="checkbox"/> LuaTeX packages                                      |
| <input checked="" type="checkbox"/> Additional fonts               | <input checked="" type="checkbox"/> German                   | <input checked="" type="checkbox"/> Mathematics and science packages                     |
| <input checked="" type="checkbox"/> Recommended fonts              | <input checked="" type="checkbox"/> Greek                    | <input checked="" type="checkbox"/> MetaPost and Metafont packages                       |
| <input checked="" type="checkbox"/> Graphics and font utilities    | <input checked="" type="checkbox"/> Italian                  | <input checked="" type="checkbox"/> Music packages                                       |
| <input checked="" type="checkbox"/> Additional formats             | <input checked="" type="checkbox"/> Japanese                 | <input checked="" type="checkbox"/> Graphics, pictures, diagrams                         |
| <input checked="" type="checkbox"/> Games typesetting              | <input checked="" type="checkbox"/> Korean                   | <input checked="" type="checkbox"/> Plain (La)TeX packages                               |
| <input checked="" type="checkbox"/> Humanities packages            | <input checked="" type="checkbox"/> Other languages          | <input checked="" type="checkbox"/> PSTricks   |
| <input checked="" type="checkbox"/> Arabic                         | <input checked="" type="checkbox"/> Polish                   | <input checked="" type="checkbox"/> Publisher styles, theses, etc.                       |
| <input checked="" type="checkbox"/> Chinese                        | <input checked="" type="checkbox"/> Portuguese               | <input checked="" type="checkbox"/> TeXworks editor; TL includes only the Windows binary |
| <input checked="" type="checkbox"/> Chinese/Japanese/Korean (base) | <input checked="" type="checkbox"/> Spanish                  | <input type="checkbox"/> Windows-only support programs                                   |
| <input checked="" type="checkbox"/> Cyrillic                       |  | <input checked="" type="checkbox"/> XeTeX and packages                                   |

Select All

Deselect All

Ok

Cancel



TeX Live 2015 安装

5/5

```
Installing [0014/3126, time/total: 00:08/25:01]: Type1fonts [516k]
Installing [0015/3126, time/total: 00:09/26:49]: a0poster [119k]
Installing [0016/3126, time/total: 00:09/26:32]: a2ping [48k]
Installing [0017/3126, time/total: 00:10/29:22]: a2ping.win32 [1k]
Installing [0018/3126, time/total: 00:10/29:22]: a4wide [133k]
Installing [0019/3126, time/total: 00:10/29:01]: a5comb [91k]
Installing [0020/3126, time/total: 00:11/31:40]: aastex [1292k]
Installing [0021/3126, time/total: 00:11/28:26]: abbr [4k]
Installing [0022/3126, time/total: 00:12/31:01]: abc [286k]
Installing [0023/3126, time/total: 00:12/30:20]: abntex2 [4493k]
Installing [0024/3126, time/total: 00:14/26:17]: abracas [197k]
Installing [0025/3126, time/total: 00:14/25:59]: abstract [154k]
Installing [0026/3126, time/total: 00:14/25:46]: abstyles [151k]
```





```
running mktexlsr E:/texlive/2014/texmf-var E:/texlive/2014/texmf-config
E:/texlive/2014/texmf-dist ...
running updmap-sys --nohash ...done
re-running mktexlsr E:/texlive/2014/texmf-var E:/texlive/2014/texmf-config
...
setting up ConTeXt cache: running mtxrun --generate ...done
pre-generating all format files, be patient...
running fmtutil-sys --no-error-if-no-engine=luajitex --all ...done
running path adjustment actions
finished with path adjustment actions
running package-specific postactions
finished with package-specific postactions
```

请参考 [E:/texlive/2014/index.html](http://texlive/2014/index.html) 来获得文档链接。TeX Live 官方网站  
(<http://tug.org/texlive/>) 包含所有相关的更新和修正。

TeX Live 是全世界 TeX 用户组的一个合作项目；

请考虑加入合适的 TeX 用户组来支持该项目。从  
<http://tug.org/usergroups.html> 可以获得 TeX 用户组的列表。

欢迎进入 TeX Live 的世界！

取消

完成



## Post Installation Configurations

- Suppose TEXDIR is set to `~/texlive/2017`
- Symlink `~/texlive/current` to `~/texlive/2017`
- Add the following lines into your `~/.bash_profile`:

```
export PATH=$HOME/texlive/current/bin/x86_64
    -linux:$PATH
export MANPATH=$HOME/texlive/current/texmf/
    doc/man:$MANPATH
export INFOPATH=$HOME/texlive/current/texmf/
    doc/info:$INFOPATH
```

- Try `texdoc texlive`

### Use installed sample files:

- `latex sample2e.tex # .tex → .dvi (device independent)`  
`xdvi sample2e.dvi # also try dvipdf sample2e.dvi`
- `try pdflatex sample2e directly`

## Sample T<sub>E</sub>X File

```
\documentclass{article} % or letter, etc.
% Start of preamble.
\usepackage{graphicx} % for graph support
\graphicspath{{fig/}} % set graphics directory
% End of preamble.
\begin{document}
Here are the main contents.
\end{document}
```

- Simple commands

- ▶ `\cmd`      `\LaTeX` ⇒ L<sup>A</sup>T<sub>E</sub>X

- ▶ `\cmd[optional]{mandatory}`

- `\section[Short Title]{An Extremely Long Section Title}`

- ⇒ **Section 1.      An Extremely Long Section Title**

- Environments

```
\begin{equation*}
  a^2-b^2=(a+b)(a-b)
\end{equation*}
```

$$a^2 - b^2 = (a + b)(a - b)$$

# Common L<sup>A</sup>T<sub>E</sub>X Commands

## Simple Commands

<code>\chapter</code>	<code>\section</code>	<code>\subsection</code>	<code>\paragraph</code>
<code>\centering</code>	<code>\emph</code>	<code>\verb</code>	<code>\url</code>
<code>\footnote</code>	<code>\item</code>	<code>\caption</code>	<code>\includegraphics</code>
<code>\label</code>	<code>\cite</code>	<code>\ref</code>	

## Environments

<code>table</code>	<code>figure</code>	<code>equation</code>
<code>itemize</code>	<code>enumerate</code>	<code>description</code>

```
\tableofcontents  
\part{Supervised Learning}  
\chapter{SVM}  
\section{Introduction}  
\subsection{History}  
\subsubsection{Birth}
```

Contents  
Part I Supervised Learning  
Chapter 1 SVM  
1. Introduction  
1.1 History  
1.1.1 Birth

## List Examples

```
\begin{itemize}
  \item foo
  \item bar
  \item baz
\end{itemize}
```

- foo
- bar
- baz

```
\begin{enumerate}
  \item foo
  \item bar
  \item baz
\end{enumerate}
```

- 1 foo
- 2 bar
- 3 baz

## More Lists

```
\begin{enumerate}
\item Why \LaTeX{}?
  \begin{description}
    \item[Useful] Useful to
      prepare documents
    \item[Beautiful] Beautiful
      output
    \item[Free] Free as in
      freedom
  \end{description}
\item What else?
  \begin{itemize}
    \item Another point
    \item One more point
  \end{itemize}
\end{enumerate}
```

### 1 Why $\LaTeX$ ?

**Useful** Useful to  
prepare documents

**Beautiful** Beautiful  
output

**Free** Free as in freedom

### 2 What else?

- ▶ Another point
- ▶ One more point



# Cross References

- Label the figure, table, section, etc. with `\label{name}`
- Refer to the label with `\ref{name}`

```
Figure~\ref{fig:logo} ...  
\begin{figure}[htbp]  
  \centering  
  \includegraphics%  
  [height=.2\textheight]%  
  {lp-logo-in-square}  
  \caption{Logo.}  
  \label{fig:logo}  
\end{figure}
```

Figure 1 ...



Figure 1: Logo.

- Figures/tables float to avoid bad typesetting.
- Use cross references, e.g.  
`Fig.~\ref{fig:logo}`
- `\begin{figure}[placement]`
  - ▶ placement: locations where float is allowed
  - ▶ h (here), t (top), b (bottom), p (page)



## Common Errors

- ! Undefined control sequence.
  - ▶ Typo
  - ▶ Misremember the command
  - ▶ Forgot to `\usepackage{...}`
- Unmatched braces, environments
- Unknown graphics extension ...
  - ▶ Use EPS figure with pdf $\TeX$  without `\usepackage{epstopdf}`
- ... `graphic` ... (no `BoundingBox`).
  - ▶ Bad EPS figure generated by some tools
- !TeX capacity exceeded, sorry [...].
  - ▶ Recursive macro definition
  - ▶ Tune memory setting

- Focus on the content, not the layout
  - ▶ Use well-designed document classes
  - ▶ Packages: `siunitx`, `listings`
  - ▶ Structure: `\section`, `\subsection`, etc.
  - ▶ Semantic: `\emph`, `\label`
- Word counting: `texcount report.tex`
- Big projects: `\input`, `\include`, `latexmk`, Git
- Which TeX Editor? (Vim, Emacs, TeXworks, LyX, etc.)
- Use `texdoc`

- **texdoc**
  - ▶ e.g. `texdoc texlive`, `texdoc symbols`
  - ▶ GUI: `texdoctk`
  - ▶ Web: `texdoc.net`
- **tlmgr**
  - ▶ `tlmgr update --all`
  - ▶ `tlmgr install pkg`
  - ▶ `tlmgr option`
  - ▶ `tlmgr gui`

- LibreOffice: Export to  $\LaTeX$
- Pandoc:  $\LaTeX \leftrightarrow$  odt, md, html etc.

- WikiBooks: <https://en.wikibooks.org/wiki/LaTeX>
- *The Not So Short Introduction to  $\LaTeX 2_{\epsilon}$*  (texdoc lshort)
- *The TeXbook*

- Core: low-level macro language
- Formats: Plain T<sub>E</sub>X, L<sup>A</sup>T<sub>E</sub>X, ConT<sub>E</sub>Xt
- Engines: tex, latex, pdf(la)tex, xe(la)tex, lua(la)tex
- Distros: T<sub>E</sub>X Live, MacT<sub>E</sub>X



- Where to ask?
  - ▶ QA: TeX StackExchange
  - ▶ Forum:  
<https://latex.org/forum/>
  - ▶ Mailing list: T<sub>E</sub>X Live
  - ▶ Google
- How to ask?
  - ▶ Describe your environment, setup
  - ▶ Minimal Working Example (MWE)



# About the Slides

- Slides: <https://pagure.io/textalk>
- Based on:
  - ▶ <https://github.com/alick/fad-texlive-talk>
  - ▶ <https://github.com/tuna/thulib-latex-talk>
  - ▶ <https://github.com/alick/latex-tips>
- License: CC BY-SA 4.0 Unported 

## Figure Sources

- Photos of Donald Knuth and Leslie Lamport: TUNA slides
- Graphics showcase, slides showcase left: ThuThesis User Guide
- Heart shape: TeX StackExchange
- Installation: first two from *The T<sub>E</sub>X Live Guide – 2017*, 2015 one from TUNA slides, 2014 one from myself
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- T<sub>E</sub>X Friendly Zone: TUG

*Thank you!*