

LaTeX Crash-Course

Absolute Beginner's Guide to L^AT_EX Typesetting

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Outline

What will we have today?

- 1 Introduction to \LaTeX
 - history, philosophy
- 2 Installation of Software and first steps
- 3 Generate your first document with \LaTeX
- 4 Common LaTeX commands
 - text, math, tables, graphics, BibTeX, ...

- In 1978, Donald **Knuth**¹ started creating the TEX typesetting system.



- ▶ after being disappointed with the quality of his acclaimed “*The Art of Programming*” series.
- TEX is pronounced /tɛx/ or /tɛk/
 - ▶ abbreviation of τεχνη (technē), Greek for both “art” and “craft”²,
 - ▶ it is also the root of the word: technical.

¹one of the most famous and well respected computer scientists

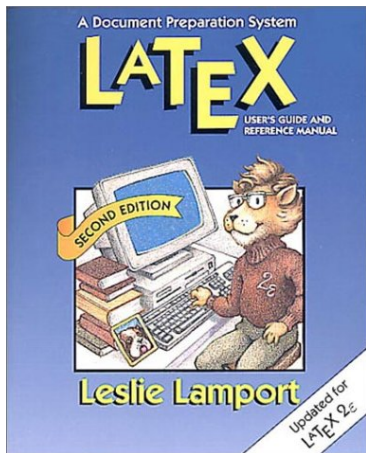
²Donald E. Knuth, *The TeXbook*, Ch. 1: The Name of the Game, p. 1.

- In mid-80s, Leslie **Lamport**³ created a set of macros
 - ▶ abstracted away many of the complexities
 - ▶ allowed for a simpler approach for creating documents
 - ▶ content and style were separate.



- This extension became L^AT_EX (pronounced 'lay-tech')

³one of the most famous computer scientist, best known for his seminal work in distributed systems



LaTeX is not latex!

What is LaTeX?

LaTeX is a **markup**, programming language and **typesetting** system for document preparation to generate high-quality documents for **press**.

- essentially a markup language
 - ▶ analogous to HTML with CSS
- Available for just about any computer system
 - ▶ PC, UNIX, Windows, OsX, Linux, ...
- Current version: $\text{\LaTeX}2\epsilon$

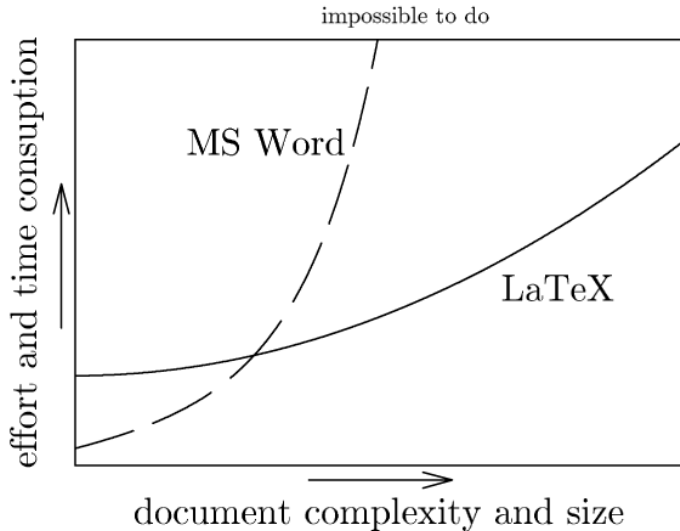
Who is LaTeX for?

- often used for medium-to-large technical, scientific, or mathematically oriented documents
 - ▶ can be used for almost any form of publishing
 - ▶ handouts, reports, letters, theses, articles, books, etc.
- widely used in academia.
 - ▶ recently, as a web standard for displaying mathematics
 - ▶ e.g., Wikipedia, MathJax, WordPress, Coursera, ...

Why LaTeX?

- portability, lightness
- saves time; you focus on content, LaTeX cares about the layout
 - ▶ actual typesetting, structuring, numbering, referencing and cross-referencing, indexing and page formatting
- with many contributed packages and styles
- compile documents in PDF (export to HTML, RTF)
- **almost all** journals and conferences advice using it for submission.
- **easier** than word processors

LaTeX Vs Word



<http://www.pinteric.com/miktex.html>

Installation

MiKTeX


- LaTeX typesetting system for Windows.
 - ▶ comes with easy setup and maintenance program.
 - ▶ includes all the tools you need (latest ver. 2.9).
- get it from: <http://www.miktex.org/2.9/setup>

www.miktex.org/2.9/setup


MiKTeX ...typesetting beautiful documents...

Home About Download Portable DVD Help Contact Give Back


MiKTeX 2.9 Setup

 **Basic MiKTeX 2.9.5872 Installer**
version 2.9.5872, Windows 32-bit
Size: 175.76 MB

To install a basic TeX/LaTeX system, download and run this installer. MiKTeX has the ability to install needed packages automatically (on-the-fly), i.e., this installer is suitable for computers connected to the Internet.

 **Basic MiKTeX 2.9.5872 64-bit Installer**
Version 2.9.5872, Windows 64-bit
Size: 184.43 MB

To install a basic TeX/LaTeX system, download and run this installer. MiKTeX has the ability to install needed packages automatically (on-the-fly), i.e., this installer is suitable for computers connected to the Internet.

 **MiKTeX 2.9.5870 Net Installer**
Version 2.9.5870, Windows 32-bit
Size: 8.46 MB

This installer allows you download all packages and install a complete TeX/LaTeX system.

Installation

Editor

- Any text editor will do (even Notepad)
- Better, get a dedicated one:
 - ▶ **TeXnicCenter** (de facto standard for Windows users)
<http://www.texniccenter.org/download>
 - ▶ **TeXstudio** (my choice) <http://texstudio.sourceforge.net>
 - ▶ **WinEdt** (widely used, not free)
<http://www.winedt.com/download.html>
 - ▶ **Notepad++** (excellent general purpose text editor)
<https://notepad-plus-plus.org>

Installation

Editor – TEXnicCenter

The screenshot displays the TEXnicCenter editor window. The menu bar includes File, Edit, Search, View, Insert, Math, Format, Project, Build, Tools, Window, and Help. The 'Math' menu is open, showing 'Big Operators' selected, with a sub-menu containing Sum, Integral, Contour, Product, and Coproduct. The main editor area shows LaTeX source code for a document titled 'mpman.tex'. The code includes a `\begin{tikzpicture}` environment with a `\draw` command for a polygon. The status bar at the bottom indicates 'Ln 723, Col 41' and 'UNDX OVR READ UP NUM RF'.

The error message in the bottom window reads:

```
(*C:\Program Files\MiKTeX 2.7\tex\latex\oberdiek\refcount.sty*) (mpman.out)
(mpman.out) (*C:\Program Files\MiKTeX 2.7\tex\latex\mlogo\ulogo.fd*)
! LaTeX Warning: File 'manfig-60.mps' not found on input line 97.
! LaTeX Error: File 'manfig-60.mps' not found.
See the LaTeX manual or LaTeX Companion for explanation.
Type H <return> for immediate help.
<< < > > > Build / Find 1 / Find 2 / Parse /
```

First Document with LaTeX

Skeleton of a Document

```
1 \documentclass [ ]{ }
2 \usepackage{ }
3
4 %basic info
5 \title{ }
6 \author{ }
7 \date{ }
8
9 %start of doc
10 \begin{document}
11   \maketitle
12   \tableofcontents
13   \listoffigures
14   \listoftables
15
16   Write stuff here
17
18   \appendix
19
20   \bibliographystyle{ieee}
21   \bibliography{myRefFile}
22 \end{document} %her is the end
```

```
1 \documentclass{article}
2
3 \title{Hello , Cruel World!}
4 \author{Obedient Grad Student}
5
6 \begin{document}
7 \maketitle
8
9 \section{Introduction}
10 This is where you tell people why they should bother reading your
    article.
11
12 \subsection{Literature Review}
13 This is the section that is invariably much longer than it should
    be, and
14 where everyone tries to impress peers about how easy it is to
    locate various
15 references in online databases.
16
17 \subsubsection{Conclusion}
18 Not much of a paper, but it's a start.
19 \end{document}
```

First Document with L^AT_EX

How to get an output

- L^AT_EX is just **text with typesetting commands**.
 - ▶ commands are preceded by `\`
 - ▶ arguments (if any) are usually placed inside curly braces `{ }`.
- text in adjacent lines are considered part of the same paragraph.
- to start a new line, add `\\` to the end of previous line for new paragraph, insert an extra `\↩`
- many document **classes**
 - ▶ article, IEEEtran, proc, report, book, memoir, letter, beamer, ...

First Document with LaTeX

How to generate output

- 1 Save file as “`_..tex`”
 - 2 Compile code by typing “`pdflatex abc.tex`”
 - 3 See the output using any pdf viewer (e.g. Acrobat Reader)
- with **all** LaTeX editors, every thing can be done with a click of a button

Hello, Cruel World!

Obnoxious Grad Student

February 28, 2016

Contents

1	Introduction	1
2	Literature Review	1
2.0.1	Conclusion	1

1 Introduction

This is where you tell people why they should bother reading your article.

2 Literature Review

This is the section that is invariably much longer than it should be, and where everyone tries to impress peers about how easy it is to locate various references in online databases.

2.0.1 Conclusion

Not much of a paper, but it's a start.

This is a line of text. This is more text.
Here comes a new line.
But this is a new paragraph.

Basic Commands

Document Structure⁴

Command	Level	Comment
<code>\part{Part Title}</code>	-1	not in letters
<code>\chapter{Chapter Title}</code>	0	only books and re
<code>\section{section Title}</code>	1	not in letters
<code>\subsection{Subsectionv Title}</code>	2	not in letters
<code>\subsubsection{Subsubsection Title}</code>	3	not in letters
<code>\paragraph{Paragraph Title}</code>	4	not in letters
<code>\subparagraph{Subparagraph Title}</code>	5	not in letters

⁴https://en.wikibooks.org/wiki/LaTeX/Document_Structure

Text Commands

Font Styles

- Use `\textbf{stuff}` to make stuff **bold**
- Use `\emph{stuff}` to italicize *stuff*
- Use `\underline{stuff}` to underline stuff

Font Sizes

`\tiny` `\scriptsize` `\footnotesize` `\small` `\normalsize`
`\large` `\Large` `\LARGE` `\huge` `\Huge`

Example

`\scriptsize{text goes here}` gives: text goes here

These are the different sizes available in order: `\tiny` `\scriptsize` `\footnotesize`
`\small` `\normalsize` `\large` `\Large` `\LARGE` `\huge` `\Huge`

Lists

There are many ways to make lists. A few of them are: enumerate, itemize, description, list

Example

```
\begin{itemize}
```

```
\item here
```

- here

```
\item is
```

- is

```
\item something
```

- something

```
\end{itemize}
```

Lists

There are many ways to make lists. A few of them are: enumerate, itemize, description, list

Example

```
\begin{enumerate}
```

```
\item here
```

① here

```
\item is
```

② is

```
\item something
```

③ something

```
\end{enumerate}
```

Mathematics

The beauty of it!

- in LaTeX there are two **modes**: **Text** Mode and **Math** Mode
- for **Math** Mode, we have **inline** and **display**
- in **inline** math, mathematical expression is within normal text.
- To do math on a line of text, put the mathematical expression between $\$$'s.

Example

```
 $\int_a^b \frac{k^2_m}{\beta f(x)} dx \in \mathcal{N}$ 
```

produces $\int_a^b \frac{k_m^2}{\beta f(x)} dx \in \mathcal{N}$

Mathematics

Math Display

- Many **environments** for this: `equation`, `align`, `\dots`

Example

```
\begin{equation}
  a_0 = \frac{1}{\pi} \int \limits_{-\pi}^{\pi} f(x)
x^2 \cos(nx) \, dx
\end{equation}
```

$$a_0 = \frac{1}{\pi} \int_{-\pi}^{\pi} f(x)x^2 \cos(nx) dx \quad (1)$$

Mathematics

Math Display

- Many **environments** for this: equation, align, ...

Example

```
\begin{align}
a_0 &= f(x) \quad \forall x \in X, \\
y &= \cos(nx) + \phi \quad \exists y \leq \epsilon
\end{align}
```

$$a_0 = f(x) \quad \forall x \in X, \quad (2)$$

$$y = \cos(nx) + \phi \quad \exists y \leq \epsilon \quad (3)$$

Mathematics

You can go as fancy as yo imagine

$$\lim_{x \rightarrow 0} \frac{e^x - 1}{2x} \stackrel{\left[\frac{a}{b} \right]}{\underset{H}{=}} \sum_{x \rightarrow 0}^m \frac{e^x}{2} = \underbrace{\underbrace{x}_{\text{real}} + i}_{\text{complex number}} \underbrace{y}_{\text{imaginary}}, \quad \forall x \in \mathbb{R}, \quad \exists y \leq \epsilon$$

$$\min_{\hat{\beta} \in \mathbb{R}} x = a_0 + \frac{1}{a_1 + \frac{1}{a_2 + \frac{1}{a_3 + \frac{1}{a_4}}}} + \begin{bmatrix} 1 & X_{12} & X_{13} \\ 1 & X_{22} & X_{23} \\ & \cdot & \\ & \cdot & \\ & \cdot & \\ 1 & X_{T_2} & X_{T_3} \end{bmatrix}$$

Tables

- to typeset tables with optional horizontal and vertical lines:

```
\begin{tabular}[pos]{column specs}
  element & element & ... \\ \hline
\end{tabular}
```

- column specs takes (any): l, c, r, p{ }, |
- pos : b, c, t
- cells are separated by &
- `\hline` is used to draw lines between rows.

Tables

Example

```
\begin{tabular}{ | l || c ||| r }  
  \hline  
  \textbf{a} & \textbf{b} & \textbf{c} \\ \hline  
  1 & 2 & 3 \\ \hline  
  4 & 5 & 6 \\ \hline  
  \hline  
  \hline  
  7 & 8 & 9 \\ \hline  
  \hline  
\end{tabular}
```

a	b	c
1	2	3
4	5	6
7	8	9

Graphics

- many different ways to include graphics in \LaTeX .
 - ▶ There is literally an entire manual of just graphics.
- the most common (and easiest) way to include graphics:

```
\includegraphics[options]{/path/to/image/picName}
```

- `\usepackage{graphicx}` must be loaded (in the preamble) for `\includegraphics` to work.
- supported image types: .pdf, .png, .jpg, (.eps)
- options: `width`, `height`, `scale`, `angle`, `page`, `resolution`, `trim`, `clip`, `keepaspectratio`

Graphics

Example

```
\includegraphics[width=0.8\linewidth]{figures/scExp182}
```



Graphics

Example

```
\includegraphics[angle=30,width=0.5\linewidth]  
  {figures/scExp182}
```



Floats

- Floats are **containers** for things in a document that cannot be broken over a page.
- separate entities (e.g. figures and tables), positioned in a part of page
- enable captions, and cross-reference

Floats

Figure

```
\begin{figure}[placementSpecifier]
  \includegraphics[...]{...}
  \caption{text}
  \label{key}
\end{figure}
```

- placementSpecifier is a combination of: h, t, b, p, !
 - label key is (unique) text used when referencing this figure.
- item;4-*j* The same can be applied for tables

Floats

Figure Example

```
\begin{figure}[placementSpecifier]
\includegraphics[width=0.2\linewidth]{figures/zuLogo}
\caption{This is our university logo.}
\label{fig:zuLogo}
\end{figure}
```



Figure: This is our university logo.

Now in text you can reference this figure using `\ref{fig:zuLogo}`, as shown in Fig.1

Floats

Table Example

```
\begin{table}
  \begin{tabular}{l|c||r}
    \hline
    1 & 2 & 3 \\ \hline
    4 & 5 & 6 \\ \hline
  \end{tabular}
  \caption{The same logic can be applied to tables.}
  \label{tbl:test}
\end{table}
```

1	2	3
4	5	6

Table: The same logic can be applied to tables.

Floats

Table Example

1	2	3
4	5	6

Table: The same logic can be applied to tables.

you can reference this table using `\ref{tbl:test}`,

As shown in Table.2 (note: I still remember Fig.1)

Additional Resources

- I highly recommend you to have the free Tobias Ötiker's, **Not So Short Introduction to LaTeX**. www.ctan.org/tex-archive/info/lshort/english/lshort.pdf.
- If you are going to use LaTeX seriously, you will want to get a book. The **LaTeX Companion** and the **Guide to LaTeX** are standards.
- Wikipedia has very useful guide (Wikibook) to LaTeX with very easy to follow instructions and many examples.
<https://en.wikibooks.org/wiki/LaTeX>
- And if you have any other questions, ask me:
mnahmed@zu.edu.eg

Thanks ...

Questions?

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