

Introduction to using L^AT_EX

Douglas Temple

duggles@netsoc.tcd.ie

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- What is \LaTeX ?
- The basics
- Getting it working (practical!)
- Styles and margins
- Formatting
- Lists, tables, pictures
- Maths mode
- Plethora of other bits and pieces

What is \LaTeX ?

- A document markup language (cf. XML, Markdown, etc.)
- \TeX first released by D. E. Knuth in 1978
- Leslie Lamport wrote some macros around \TeX
 - Released first version of \LaTeX (“Lamport \TeX ”) in 1984
- Widely used for professional/academic writing
 - Most academic journals accept manuscripts as $*\TeX$

Our first L^AT_EX document!

```
1 \documentclass{article}
2 % This comment is ignored
3 \begin{document}
4   Hello, world!
5 \end{document}
```

Your output:

Hello, world!

How to compile

- Save as `hello.tex`
- Run `pdflatex hello.tex` to get `hello.pdf`
- View in our favourite PDF viewer

But terminals scare me...

\LaTeX distributions

- \LaTeX is available in the MiK \TeX or pro \TeX t package for Windows
 - Full package manager and editor included in MiK \TeX
 - Never used pro \TeX t...
- Mac has Mac \TeX
- Linux has \TeX Live (usually available from repositories)

IDEs (not exhaustive)

- **Windows** MiK \TeX has \TeX works bundled. Also \TeX nicCenter
- **Linux** Kile, LyX, \TeX works, \TeX maker
- **OSX** \TeX works, \TeX studio
- Any text editor! (vim, emacs, sublime)

Some messy details

- Using `pdflatex` has some disadvantages (can't compile `.eps` files)
- Alternatively use `latex`, which gives a `.dvi`
- Then convert to `.ps` then `.pdf`
 - `dvips -Ppdf -o filename.ps filename.dvi`
 - `ps2pdf filename.ps`
- Many IDEs will give you the choice of using `pdflatex` or `latex => ps => pdf`
- **Alternatively** alternatively just use `xelatex` (what I use!)

Paragraphs and new lines

- Make a new paragraph with a line break
- Skip a line between paragraphs with two line breaks
- Force a new line with `\\`
- Whitespace is ignored by default (force a space with `"\ "`)

```
1 Some text
2 some      other text \\
3 More
4
5 New paragraph
```

Output:

```
Some text some other text
More
New paragraph
```

Font families

- Lots of variety. See www.tug.dk/FontCatalogue for a **large** list
- Default is Computer Modern though many alternatives exist
- Setting fonts is (unfortunately) slightly tricky
- Set for entire document by `\usepackage{times}`
 - or palatino, helvet, avant, newcent, bookman
- Document styles (like beamer or article) set their own default font
- Alternatively can use `fontspec` package and then `\setmainfont{Some Font Name}` (Works with Xe_LA_TE_X)

Font sizes

<code>\tiny{...}</code>	Deep Web
<code>\scriptsize{...}</code>	Gamification
<code>\footnotesize{...}</code>	Cloud
<code>\small{...}</code>	Wearable
<code>\normalsize{...}</code>	Apps
<code>\large{...}</code>	Big Data
<code>\Large{...}</code>	Internet of things
<code>\LARGE{...}</code>	Hyperconvergence
<code>\huge{...}</code>	Service-oriented Architecture
<code>\Huge{...}</code>	Data Privacy

Font effects

Two ways of specifying effects:

<code>\textnormal{...}</code>	<code>{\normalfont ...}</code>	Default font
<code>\textrm{...}</code>	<code>{\rmfamily ...}</code>	Roman (Serif) font
<code>\textsf{...}</code>	<code>{\sffamily ...}</code>	Sans-serif font
<code>\texttt{...}</code>	<code>{\ttfamily ...}</code>	Typewriter font
<code>\textmd{...}</code>	<code>{\mdseries ...}</code>	Medium Series
<code>\textbf{...}</code>	<code>{\bfseries ...}</code>	Bold Series
<code>\textup{...}</code>	<code>{\upshape ...}</code>	Upright (cancel italics)
<code>\textit{...}</code>	<code>{\itshape ...}</code>	<i>Italics</i>
<code>\textsl{...}</code>	<code>{\slshape ...}</code>	<i>Slanted</i>
<code>\textsc{...}</code>	<code>{\scshape ...}</code>	SMALL CAPS

Subtle difference is that the second column won't work with

`\verbatim{...}`

- Needs `color` or `xcolor` package
 - `\usepackage[usenames,dvipsnames,svgnames,table]{xcolor}`
- Have some predefined colours
- E.g. `\textcolor{red}{Some text}` or `{\color{red} Some text}`
- Can also define your own with `\definecolor{aName}{modelType}{spec}`
 - `\definecolor{myorange}{rgb}{1,0.5,0}`
 - `\definecolor{myorange}{RGB}{255,127,0}`
 - `\definecolor{myorange}{HTML}{FF7F00}`
 - `\definecolor{myorange}{cmyk}{0,0.5,1,0}`
- Can also use the colours to colour table elements, boxes, pages, etc.

Reserved characters

- L^AT_EX uses certain characters for control
- Thus need to escape them before writing
- These are: # \$ % & _ { }
- Type: \# \\$ \% \& _ \{ \}
- Three others are even messier
 - \ → `\textbackslash`
 - ^ → `\textasciicircum`
 - ~ → `\textasciitilde`
- In `verbatim` environments you don't need to escape
 - `\verb|^~%|` → `^~%`

Accents and special characters

<code>\' {a}</code>	á	<code>\ddag</code>	‡
<code>\` {e}</code>	è	<code>\textbar</code>	
<code>\^ {i}</code>	î	<code>\textgreater</code>	>
<code>\" {o}</code>	ö	<code>\textendash</code>	—
<code>\~ {u}</code>	ũ	<code>\texttrademark</code>	™
<code>\={a}</code>	ā	<code>\textexclamdown</code>	¡
<code>\. {e}</code>	è	<code>\textsuperscript {a}</code>	^a
<code>\u {i}</code>	ÿ	<code>\pounds</code>	£
<code>\v {o}</code>	ö	<code>\S</code>	§
<code>\H {u}</code>	ű	<code>\dag</code>	†
<code>\k {a}</code>	ą	<code>\textbackslash</code>	\
<code>\c {c}</code>	ç	<code>\textless</code>	<
<code>\r {e}</code>	ê	<code>\textemdash</code>	—
<code>\d {o}</code>	ø	<code>\textregistered</code>	®
<code>\b {u}</code>	u	<code>\textquestiondown</code>	¿
<code>\o</code>	ø	<code>\textcircled {a}</code>	Ⓐ
<code>\P</code>	¶	<code>\copyright</code>	©

- \LaTeX has different *styles* (sets of macros and default fonts, etc.) for different purposes
 - E.g. `book`, `article`, `report`, `slide`, `beamer`, `letter`, `memoir`, `proc` [proceedings]
 - Many more at <http://texcatalogue.ctan.org/bytopic.html#classes>
- Set with `\documentclass{article}` at the beginning

An article is a set of sections, each of which is divided into subsections:

- `\section{Section title}`
- `\subsection{Subsection title}`
- `\subsubsection{Subsubsection title}`

To have unnumbered sections, add a *:

- `\section*{Section title}`
- `\subsection*{Subsection title}`
- `\subsubsection*{Subsubsection title}`

Can also have `\paragraph{title}` and `\subparagraph{title}`

book and report structure

- Books and Reports have chapters on top of the sections
 - `\chapter{Chapter title}` or
 - `\chapter*{Chapter title}`
- There also exists an `\appendix` command. Each chapter after `\appendix` is treated as an appendix.
- Extra layer above `\chapter` called `\part`


```
1 \begin{document}
2 \tableofcontents
3 \chapter{Hello World!}
4 This is a chapter!
5 \section{And now}
6 For something completely different
7 \subsection{Why not}
8 Zoidberg?
9 \section{Oh}
10 Really?
11 \chapter{Yeah}
12 Rly
13 \end{document}
```

Contents

1	Hello World!	2
1.1	And now	3
1.1.1	Why not	3
1.2	Oh	3
2	Yeah	4

Chapter 1

Hello World!

This is a chapter!

1.1 And now

For something completely different

1.1.1 Why not

Zoidberg?

1.2 Oh

Really?

Chapter 2

Yeah

Rly

- Region of document subjected to additional formatting rules
- Syntax: `\begin{envname} ... \end{envname}`
- Example 1: Lists

```
1 begin{itemize}
2 \item This is a simple list
3 \item Each item has a bullet point
4 \item[Or] Optionally a label
5 \end{itemize}
```

- This is a simple list
 - Each item has a bullet point
- Or Optionally a label

More lists

We can number lists:

```
1 begin{enumerate}
2 \item This is a simple list
3 \item Each item is numbered
4 \item[Or] Optionally a label
5 \item Numbering is paused
6 \end{enumerate}
```

1. This is a simple list
2. Each item is numbered

Or Optionally a label

3. Numbering is paused

Or have a description:

```
1 \begin{description}
2 \item[Header 1] This is a simple list
3 \item Each item has a description
4 \item[A label] is expected
5 \end{description}
```

Header 1 This is a simple list

Each item has a description

A label is expected

Tables

```
1 \begin{tabular}{lcr}
2 entry 1 & second & final \\
3 new line & 1 & 3 \\
4 Final row & filler & text
5 \end{tabular}
```

entry 1	second	final
new line	1	3
Final row	filler	text

More Tables

```
1 \begin{tabular}{|c|p{0.3\textwidth}|c|@{same}}
2 \multicolumn{2}{|c}{apples} & test \\ \cline{1-2}
3 \multirow{2}{2cm}{Long entry} & another & yay \\
4 & Eat & Spinach \\
5 \end{tabular}
```

	apples	test	same
Long entry	another	yay	same
	Eat	Spinach	same

`\multirow` requires the `multirow` package

- Objects which must not be split across pages (figures, tables)
- Encapsulate a region within a special environment (`figure`, `table`)
- Black magic in \LaTeX determines where the environment is placed
- Can specify with *position specifiers*:
 - “Here” → `h`
 - “Top of page” → `t`
 - “Bottom of page” → `b`
 - “Put on page with other floats” → `p`
 - “Override \LaTeX and put here!” → `!`
 - “PUT IT *&%\$@)_ HERE!” → `H` (requires `float`, simil. to `h!`)
- `\begin{figure}[h]... \end{figure}`
- `\begin{table}[tp]... \end{table}`

More floats

```
1 \begin{table}[h]
2   \begin{tabular}{|c|c|}\hline
3     Apples & Bananas \\ \hline
4     Oranges & Pears \\ \hline
5   \end{tabular}
6   \caption{A table as a float}
7 \end{table}
```

Apples	Bananas
Oranges	Pears

Table 1: A table as a float

```
1 \begin{figure}[h]
2 \centering
3 \includegraphics[width=0.4\textwidth]{cat.jpeg}
4 \caption[CAT!]{A Pussy Cat!}
5 \end{figure}
```

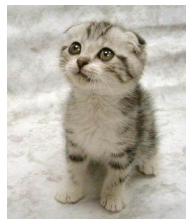


Figure 1: A Pussy Cat!

- `\listoffigures` and `\listoftables` will print a list of the floats
- The caption in the brackets is the “short caption”, sometime used in the `\listoffigures` (depends on style)

Maths mode

- \LaTeX is **very** popular for this reason
- Enter and escape inline maths mode with $\$ \dots \$$
- Accents work differently in maths mode (later)

```
1 \begin{equation}
2 ...
3 \end{equation}
```

(Or $\backslash equation*$ for unnumbered)

Example:

```
1 The solution to  $\sqrt{x} = 5$  is  $x=25$ .
```

The solution to $\sqrt{x} = 5$ is $x = 25$

Piecewise definitions

Use the `array` environment (like a maths-mode `tabular`)

```
1 \begin{equation}
2   \text{fac } x = \left\{
3     \begin{array}{ll}
4       1 & \text{if } x = 0 \\
5       x \cdot \text{fac } (x-1) & \text{if } x > 1
6     \end{array}
7   \right.
8 \end{equation}
```

$$\text{fac } x = \begin{cases} 1 & \text{if } x = 0 \\ x \cdot \text{fac } (x - 1) & \text{if } x > 1 \end{cases} \quad (1)$$

Can use `array`, or `matrix` (use `amsmath` package)

```
1  $\left[
2  \begin{matrix}
3  a & b & c \\
4  d & e & f \\
5  g & h & i
6  \end{matrix}
7  \right]$
```

Everything else

- Boxing around text with, e.g. `\fbox{...}`
- Bibliographies, citations (foot/endnotes), references (BibTeX)
- Changing page structures (e.g. headers, footers) with `geometry` and `fancyhdr`
- Indexes
- Including source code with `lstlistings`
- Making/redefining your own commands (`\newcommand`, `\renewcommand`)
- Making graphs with `dot2tex`, `pstricks`, `tikz`, etc.
- `\include{file}` to add pages in from other files
- `\input{file}` to “cat” the contents in
- Slideshows, transition effects, overlays, etc.
- Hyperlinks

Where to go for more information

- David Wilkins' "Getting Started with \LaTeX " - <http://www.maths.tcd.ie/~dwilkins/LaTeXPrimer/GSWLaTeX.pdf>
- Mittelbach and Goossens' "The \LaTeX Companion"
- Oitker *et al.*'s "The Not So Short Introduction to $\LaTeX 2_{\epsilon}$ " - <https://tobi.oetiker.ch/lshort/lshort.pdf>
- "TeX Exchange" - <http://tex.stackexchange.com/>