

\LaTeX : a powerful tool to master professional documents

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In a nutshell

\LaTeX is a powerful WYSIWYM tool



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- What You See Is What You Mean



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\LaTeX is a powerful WYSIWYM tool

- What You See Is What You Mean
- No What You See is What You Get (Word, etc.)



How can \LaTeX be used?

Offline installations

- Linux: Tex Live
- Mac OS: MacTeX
- Windows: MiKTeX, proTeXt or TeX Live

Online services

- Papeeria
- Overleaf
- Authorea
- ShareLaTeX
- Datazar
- LaTeX base



How can a \LaTeX document be edited?

Offline installations

- General purpose text editors
 - ▶ Some have \LaTeX plug-ins
- \LaTeX -oriented editors
 - ▶ TexMaker
 - ▶ TeXnicCenter
 - ▶ LyX
 - ▶ TeXstudio
 - ▶ TeXworks
 - ▶ Kile
 - ▶ gummi

Online services

- The service editor



What does a \LaTeX document look like?

\LaTeX is a **markup language**

- Thus, a document is a mixture of **content** and **commands**
- Mainly stored in **.tex** files (default file extension)

\LaTeX documents need to be **compiled**

- To produce a final, good-looking document
- Several output formats are possible:
 - ▶ DVI
 - ▶ PostScript
 - ▶ PDF
 - ▶ HTML



L^AT_EX markup: special characters

Characters that have a special meaning for markup

%	{ }	\$	~	#
\	[]	\$\$	^	_

For using them as normal characters there are escapes and alternatives

Examples

<code>\%</code>	%
<code>\textbackslash</code>	\
<code>\\$ \\$\\$</code>	\$ \$\$
<code>\{ \}</code>	{ }
<code>\#</code>	#
<code>_</code>	_

L^AT_EX markup: comments

From a % symbol until the end of the line

Example

```
This is text % and this is comment
```



L^AT_EX markup: commands

Start with a backslash (`\`), followed by the **command name**

- `\LaTeX` \rightarrow L^AT_EX
- `\documentclass`
- `\begin`, `\end`
- `\textbf`

Can have zero, one or more parameters

- `\documentclass{article}`
- `\begin{minipage}{\textwidth}`

Can have options

- `\documentclass[a4paper]{article}`



L^AT_EX markup: new commands

Are defined with `\newcommand`

Example

```
\newcommand\face{: -)}  
\face  
\face text  
{\face} text  
\face\ text
```

```
: -)  
:-)text  
:-) text  
:-) text
```



L^AT_EX markup: redefinition of commands

Are redefined with `\renewcommand`

Example

```
$\smile$  
\renewcommand\smile{: -)}  
\smile  
\smile text  
{\smile} text  
\smile\ text
```

```
␣  
:-)  
:-)text  
:-) text  
:-) text
```



L^AT_EX markup: separation between text paragraphs

They are defined by empty text lines

Line breaks can be forced with `\\`

The extra space between paragraphs is defined by `\parskip`

Example

```
This is a paragraph, that  
{\LaTeX} brakes into several  
consecutive text lines.  
Here\\ we will break it.
```

```
This is a new paragraph.
```

```
\setlength\parskip{1mm}  
Another one, 1mm away.
```

```
And another.
```

```
This is a paragraph, that LATEX  
brakes into several consecutive text  
lines. Here  
we will break it.  
This is a new paragraph.  
Another one, 1mm away.  
And another.
```

L^AT_EX markup: packages

Packages are add-ons

- To add new features and formats
- To define new commands

They are loaded with the `\usepackage` command

Examples

```
\usepackage[utf8]{inputenc} % Enables input files with UTF-8 chars
\usepackage[portuges,english]{babel} % To properly hyphenate words
\usepackage{hypertext} % To handle URLs and other hyper-references
\usepackage{color} % To handle colors
```



L^AT_EX markup: text and math modes

The default mode is text

Math mode is used to express mathematical expressions

There are many ways to enter and leave the math mode



L^AT_EX markup: math mode within paragraphs

Bounded by pairs of \$ or \$\$

Example

The value of the sine of 60° ($\pi/3$ Radians) is:
$$\sin\left(\frac{\pi}{3}\right) = \frac{\sqrt{3}}{2}$$

The value of the sine of 60° ($\pi/3$ Radians) is:

$$\sin\left(\frac{\pi}{3}\right) = \frac{\sqrt{3}}{2}$$



L^AT_EX markup: text size

Default sizes can be changed within context or environments

Example

```
\tiny tiny  
\scriptsize scriptsize  
\footnotesize footnotesize  
\small small  
\normalsize normal size  
\large large  
\Large larger  
\LARGE even larger  
\huge huge
```

tiny
scriptsize
footnotesize
small
normal size
large
larger
even larger
huge

L^AT_EX markup: text styles

Default style can be changed in specific locations

Example

```
\textbf{this is bold face}  
\textit{this is italic}  
\texttt{this is typed text}
```

this is bold face

this is italic

this is typed text



L^AT_EX markup: sectioning commands

Define the normal structural divisions of a document

`\part{part title}`: for large documents

`\chapter{...}`: for book/report chapter

`\section{...}`: for a chapter/article section

`\subsection{...}`

`\subsubsection{...}`

`\paragraph{...}`

`\subparagraph{...}`

`\appendix`: all chapter thereafter will be appendixes

By default are automatically numbered

- To avoid numbering, add an asterisk to the command name
- e.g. `\section*{...}`



Define the normal fields of a title and create it

`\title{title contents}`: defines the title

`\author{authors' names}`: defines the authors

`\date{a date}`: you can use `\today`

`\maketitle`: produces the title



L^AT_EX markup: fundamental document template

```
% Class of document and major structural attributes
\documentclass[options]{class}

% Import all required packages
\usepackage[...]{...}

% Begin the definition of the document's contents
\begin{document}

% define title
\title{A title}
\author{Mr.~X}
\date{\today} % To use the actual date
\maketitle

% rest of the contents go here

\end{document}
```



L^AT_EX markup: floats

Floats are objects that float around because they can be referred

- Figures: `\begin{figure} ... \end{figure}`
- Tables: `\begin{table} ... \end{table}`
- Other (require extra packages)

Floats can have a caption

- Defined with the `\caption` command
- The float type basically defines the initial text on the caption
- Each float can have many captions
- Captions can stand above or below the contents they describe

Float captions can have a label for cross-referencing

- Defined with the `\label` command



L^AT_EX markup: figure floats and their cross-referencing

This is how we reference
Figs.~\ref{f_one}
and~\ref{f_two},
packed in a single float.

```
\begin{figure}  
\center  
\fbox{something here}  
\caption{A caption, below}  
\label{f_one}  
\caption{Another caption, above}  
\label{f_two}  
\fbox{something else here}  
\end{figure}
```

This is how we reference Figs. 1
and 2, packed in a single float.

something here

Figure 1: A caption, below

Figure 2: Another caption, above

something else here



You can cross-reference any entity that has a number or a distinctive identifier

- Parts, chapters, sections, etc.
- Floats
- Equations

The basic technique is to use:

- `\label` for setting a label for the numbered entity (upon its definition)
- `\ref` for getting the number of a label defined anywhere



L^AT_EX markup: more cross-references

Pages

- Using `\pageref` instead of `\ref`

Bibliographic entries

- Using `\cite` instead of `\ref`



L^AT_EX markup: bibliography

BibTeX is very convenient

- Bibliographic entries defined with an attribute-value object
- Predefined number of entry types
- Each entry type has mandatory and optional attributes
- Each entry has a (unique) search key (used as label)

Entry types

- Book
- Article
- Inproceedings
- Incollection
- Booklet
- Techreport
- Masterthesis, Phdthesis
- Manual
- Misc, Unpublished

Typical entry attributes

- Author
- Title
- Booktitle, Journal, Howpublished
- Volume
- Number
- Address
- Month
- Year



L^AT_EX markup: importing bibliographic entries

First, we define entries in a BIB file

- A file with a `.bib` extension
- You can use more than one

Then, in the document main file, we use these commands:

- `\bibliographystyle{style name}`: defines the style of the bibliographic entries and their numbering
- `\bibliography{file_1, file_2, ...}`: defines the BIB files from which the entries are going to be fetched



L^AT_EX markup: importing contents

General contents

- With the command `\input{...}`
- Convenient to divide a large document into many small files

Images

- Must be used a package
- Usually, `graphicx`



Table of contents

- `\tableofcontents`

Other listings: figures and tables

- `\listoffigures`
- `\listoftables`



L^AT_EX markup: tabular environments

Useful to dispose contents within a tabulated structure

- For simply arranging contents
- For creating visible tables
- In text mode: `\begin{tabular} ... \end{tabular}`
- In math mode: `\begin{array} ... \end{array}`

Usually, the definition of tables with the `tabular` environment becomes very messy

- The environment is structured line by line
- But alignments are defined by columns
- Cell merges, realignments and decorations add confusion
- When colors are added, the final result is a complete mess



L^AT_EX markup: visible text table

```
\begin{tabular}{|c||r|r|}\hline
Algorithm & Block size (bits) & Key size (bits) \\ \hline
AES & 128 & 128, 192 or 256 \\
DES & 64 & 56 \\ \hline
\end{tabular}
```

Algorithm	Block size (bits)	Key size (bits)
AES	128	128, 192 or 256
DES	64	56



L^AT_EX markup: math tabulated contents

```
\begin{eqnarray} % 3 columns, right, center, left aligned
\cos^2\theta \; ; \; \tan^2\theta \; & = & \\
\cos^2\theta \; ; & \cdot & ; \; \frac{\sin^2\theta}{\cos^2\theta} \\
\nonumber & & % each line is numbered, unless stated otherwise
& = & \sin^2\theta % this line will be numbered
\end{eqnarray}
\[ % Non-numbered math expression
\left| x \right| = \left\{ \begin{array}{ll} % columns aligned left, left
x & \quad \mbox{if } x \geq 0; \\ % \mbox{ is a text box
-x & \quad \mbox{if } x < 0. \\
\end{array} \right. \right. % \left brackets must always be closed...
\]
```

$$\begin{aligned} \cos^2 \theta \tan^2 \theta &= \cos^2 \theta \cdot \frac{\sin^2 \theta}{\cos^2 \theta} \\ &= \sin^2 \theta \end{aligned} \tag{1}$$

$$|x| = \begin{cases} x & \text{if } x \geq 0; \\ -x & \text{if } x < 0. \end{cases}$$





L^AT_EX markup: image manipulation

Images are a sort of “characters”

- An, as such, can be placed anywhere
- By default, images are aligned as characters: along a bottom line

```
This logo \includegraphics[height=2em]{ua} can be placed anywhere  
\includegraphics[height=\baselineskip,angle=90]{ua} but the result  
be strange{\ldots}  
\includegraphics[height=3em,width=.5\textwidth]{ua} See?
```

This logo  can be placed anywhere  but the result can be strange...



Metric and other “systems”

- pt : point
- pc : pica (12 pt)
- in : inch (72.27 pt)
- bp : big point (72 bp = 1 in)
- cm : centimeter
- mm : millimeter
- dd : Didot point (1157 dd = 1238 pt)
- cc : cicero (12 dd)



L^AT_EX markup: lengths and spacing

There are commands that give a length and introduce space

- `\textwidth`: width of the current text environment
- `\textheight`: height of the current text environment
- `\hfill`: horizontal fill space
- `\vfill`: vertical fill space
- `\hspace{...}`: horizontal space with a given width
- `\vspace{...}`: vertical space with a given height



L^AT_EX markup: spacing in math mode

There are several spacing commands

- Specified in terms of the unit `mu`
- This is a math unit equal to `1/18 em`
- The size of `em` is taken from the math symbols family

<code>\,</code>	<code>3/18</code> of <code>\quad</code> (<code>3 mu</code>), same as <code>\thinmuskip</code>
<code>\:</code>	<code>4/18</code> of <code>\quad</code> (<code>4 mu</code>), same as <code>\medmuskip</code>
<code>\;</code>	<code>5/18</code> of <code>\quad</code> (<code>5 mu</code>), same as <code>\thickmuskip</code>
<code>\!</code>	<code>-3/18</code> of <code>\quad</code> (<code>-3 mu</code>)
<code>\</code>	(space after backslash) same as space in normal text
<code>\quad</code>	space equal to <code>em</code> of the current font size (<code>= 18 mu</code>)
<code>\qquad</code>	twice <code>\quad</code> (<code>= 36 mu</code>)



L^AT_EX markup: hyphenation hints

Sometimes L^AT_EX does wrong hyphenation

- But we can provide the correct method with `\-`

Examples

```
When Babel does not know how to make the correct
word hy\ -phe\ -na\ -ti\ -on % for this occurrence

% for all occurrences of the word hyphenation
\hyphenation{hy\ -phe\ -na\ -ti\ -on}
```



L^AT_EX markup: Easter egg

How do we produce “elegant” quotation marks?

- instead of these ”basic” ones...

With a pair of grave accents (`) on the left and a pair of acute accents (´), or commas, on the right!

Examples

```
‘ ‘ beautiful ’ ’  
" ugly "
```

```
“beautiful”  
”ugly”
```

