Introduction to LaTeX

First part

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What is LaTeX?

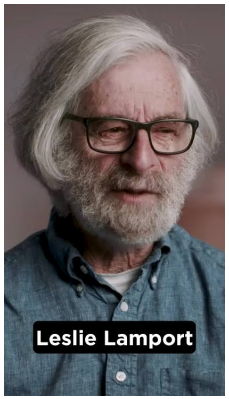
Introduction – What is LaTeX?

- TeX (a Greek word meaning "art") invented by Donald Knuth (American mathematician and computer scientist) in 1979.
- It is a language or document composition system giving the author the means to obtain documents in a professional way without having to worry about their formatting.
- Priority is given to the essential: the content.



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- LaTeX is pronounced "LateK" (Originally Latekh).

What is LaTeX used for?

Introduction – What is LaTeX used for?

- To write reports, dissertations and theses,
- To write books, course notes,
- To write articles,
- To write administrative documents: requests, reports, CVs, ...
- To produce presentations (slides or transparencies),
- And to provide them in format: PS, PDF, HTML, ...
- of very good quality.

Advantages of LaTeX?

Introduction – Advantages of LaTeX?

- Makes document creation easy,
- Produces readable and clear documents,
- Automatic generation of tables of contents, lists of figures and tables, numbering of chapters, sections, subsections, theorems, equations, bibliography, ...
- Possibility to easily describe complex mathematical equations,
- LaTeX implementation exists for all platforms (DOS, Windows, Unix, ...)
- LaTeX is free (gratis!!!),
- Applies modifications to all pages at once,
- Suitable for large documents like books of more than 700 pages.

Disadvantages of TEX?

Introduction – Disadvantages of TEX?

- Difficulty of learning,
- LATEX is not WYSIWYG (What You See Is What You Get), unlike Word,
- One does not see the document as it will be printed; to visualize the document, one must compile it.

Installation of MiKTeX

MiKTeX (Others: TEXLive) is the tool that allows you to transform your future lines of LATEX code into a clean PDF readable by all. To install MiKTeX, proceed as follows:

1. go to: `http://miktex.org/download` and download the executable;
2. run the executable and follow the installation instructions (Lab).

Scientific WorkPlace: Paid



Installation of Texmaker

Texmaker (Others: TEXnicCenter, TEXstudio, WinEdt). These text editors (or graphical interfaces) are where one types their file. To install Texmaker, proceed as follows:

1. Go to the Texmaker website: `http://www.xm1math.net/texmaker/download.html` and download the executable;
2. run the executable and follow the installation instructions (Lab);

Remark: Right-click on "Workstation", "Properties", "General": note whether your processor is 32 or 64 bits.

Software used

Texmaker: Linux, Windows, Mac

Final verification

Final verification

If you want to make sure everything works, you can proceed to a final verification as described below:

1. Open Texmaker;
2. Top left: File then New;
3. Copy the code "First text in LaTeX", provided below, and save it in a folder.

First text in LaTeX

```
\documentclass{article}
\begin{document}
\textbf{First} text in \LaTeX
\end{document}
```

First text in LaTeX
Everything therefore works perfectly!

Structure of a file

```
\documentclass[11pt]{article}
...
...
...
\begin{document}
....
....
\end{document}
```

2*Preamble:

receives instructions that will be valid throughout the document

2*Body of the document:

contains the text of the document

- The preamble begins at the first line of the file and ends at the `\begin{document}` tag (excluded).
- Everything written between `\begin{document}` and `\end{document}` constitutes the body of the document.
- Nothing that is marked afterwards is taken into account.

Let us detail an example

```
\documentclass[11pt,twocolumn]{article}
\usepackage{graphicx}
\usepackage[utf8]{inputenc}
\usepackage[francais]{babel}
\usepackage{amsfonts,amsmath,amssymb}
\begin{document}

.............

\end{document}
```

Document classes

There exist different document classes:

1. `report`: small documents.
2. `article`: short reports, journal articles, ...
3. `book`: very long documents (books, theses, ...)
4. `letter`: writing letters
5. `beamer`: for making presentations with slides.

Structure of a file – Options

- **11pt** defines a character body whose standard character size is 11 pt. LaTeX offers two other font sizes, 10 pt and 12 pt.
- **a4paper** defines the paper size used (21×29.7). The document dimensions are adopted accordingly. Same for `a5paper`.
- **landscape** indicates that the document is oriented in landscape format.
- **twocolumn** indicates that the compiled text is written globally on two columns. By default, the document is written on one column (`onecolumn`).
- **oneside** indicates that the document must be processed for single-sided printing. The option `twoside` indicates that the document must be processed for double-sided printing. In particular, this affects the alternation of margins.

Structure of a file – Extensions (Packages)

The translation of *package* is *extension*. An extension allows extending LaTeX's possibilities and is dedicated to a precise task.

- `\usepackage[utf8]{inputenc}` allows typing directly on the screen, in the `*.tex` file, accented characters.
- `\usepackage{graphicx}` This package allows using the `\includegraphics` command which offers more possibilities for adjusting the insertion of images.
- `\usepackage[francais]{babel}` allows specifying to the compiler that one wishes to type their document in French, which gives in particular correct hyphenations.
- `\usepackage{amsfonts,amsmath,amssymb}` allows obtaining mathematical characters (of great beauty!).

Structure of a file – Decomposing the tex file

- Write the document in several files
- One file per chapter, section or other,
- Use the `\include{file}` command to gather them in the main file.

```
\documentclass{report}
\begin{document}
\include{Introduction}
\include{Chapter1}
\include{Chapter2}
\include{Conclusion}
\end{document}
```

Generating the lists

Table of contents, list of figures, title page ....

`\maketitle`: creates the cover page

`\tableofcontents`: inserts the table of contents

`\listoftables`: inserts the list of tables

`\listoffigures`: inserts the list of figures

`\begin{name} ... \end {name}`: Environment for many things

Body of the text – Bold, italic, . . .

- `\textbf{}` : **Text**
- `\textit{}` : *Text*
- `\underline{}` : Text
- `\large, \Large, \LARGE` : Text, Text, Text

Paragraphs: New line, New page, Alignment

1. `\\` : Return to the line
2. `\newpage` : New page
3. By default paragraphs are justified
4. `\begin{center} paragraph \end{center}` : Center
5. `\begin{flushright} paragraph \end{flushright}` : Right
6. `\begin{flushleft} paragraph \end{flushleft}` : Left

Lists

Example with enumerate

```
\begin{enumerate}
\item Element 1
\item Element 2
\item Element 3
\end{enumerate}
```

Result:

1. Element 1
2. Element 2
3. Element 3

Example with description

```
\begin{description}
\item[case1] Element 1
\item[case2] Element 2
\item[case3] Element 3
\end{description}
```

Result:

case1 Element 1

case2 Element 2

case3 Element 3

Writing mathematics – Inline expressions

The extensions `amsfonts`, `amsmath` and `amssymb` are necessary. The first presentation is called "inline". Formulas are enclosed between:

- `\(` and `\)`
- `$` and `$`
- `\begin{math}` and `\end{math}`

The three writings give the same results. In practice, it is the second (between `$` and `$`) that is most often used.

Example

`soit $ \alpha, \gamma, \xi $` : soit α, γ, ξ

`$ \sqrt{\frac{x^2}{y-z}} $` : $\sqrt{\frac{x^2}{y-z}}$

Writing mathematics – The equation environment

But it is better to compose the most important formulas outside the text on separate lines; for this one uses the delimiters:

- `\[` and `\]`
- `$$` and `$$`
- `\begin{equation*}` and `\end{equation*}`

Example

Soit l'équation :

```
\begin{equation*}
ax+b=0
\end{equation*}
```

which gives: $ax + b = 0$

Numbered display formulas

They can be obtained by using the `equation` environment if the formula contains a single equation, and the `eqnarray` environment if the formula contains several equations, each on one line:

```
Soit l'équation (\ref{myeq}) suivante :
\begin{equation} \label{myeq}
ax+b=0
\end{equation}
```

which gives: Soit l'équation (1) suivante :

$$ax + b = 0 \tag{1}$$

Mathematical formulas

Tables

\tabular : create a table

```
\begin{tabular}{l|l|l|l}
\hline \hline
Nom & Prénom & Age & Code & Note \\
\hline
Salim & Kamel & 21 & $\Omega$ & 12.5 \\
Yacine & Farid & 20 & $\sigma$ & 14 \\
Ali & Wahid & 22 & $\delta$ & 10 \\
\hline \hline
\end{tabular}
```

Tables

- Use `l` for a left-aligned column, `r` for a right-aligned column and `c` for a centered column. `|` allows obtaining a vertical line.
- Inside the `tabular` environment, the character `&` is the column separator,

```
| is a new line and
| inserts a horizontal line.
```

Tables – Indicating a table

`\begin{table} ... \end{table}` : Indicate to LaTeX table to add it to the list of tables and to add a caption and a label.

```
\begin{table}
\begin{tabular}{l}
\hline \hline
Nom & Prénom & Age & Code & Note \\
\hline
Salim & Kamel & 21 & & \\
\hline
Yacine & & & & \\
\hline
Ali & & & & \\
\hline \hline
\end{tabular}
\end{table}
```

Tables

Name	First name	Age	Code	Note
Salim	Kamel	21	Ω	12.5
Yacine	Farid	20	σ	14
Ali	Wahid	22	δ	10

Table: Age, Code and Note

To refer to the table of the previous example one uses the function ??| .