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L^AT_EX

Lecture 2 – Common elements

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Preliminary notions

A LaTeX source file is a code written in some kind of programming language; it contains both the corpus of the document and the commands (marking instructions) that explain to pdfLaTeX (one of the most common LaTeX compilers) how to treat the text to generate the final PDF document.

If the compiler succeeds, the folder in which we are working will get other files, like:

- .toc: it contains the index (Table Of Contents);
- .bbl: it contains the bibliography;
- .log: log file;
- .aux: auxiliary file, containing other informations.

These files are not to be touched: LaTeX creates them during the first compiling and it uses them.

| Prodotti da | Estensione | Descrizione |
|---------------------------|------------------|--|
| Utente | .bib | Database bibliografico |
| | .jpg, .pdf, .png | Formati grafici per L ^A T _E X |
| | .tex | File sorgente |
| Classi, pacchetti e stili | .bst | Stile bibliografico per Biber |
| | .cls | Classe di documento |
| | .sty | Pacchetto |
| Composizione | .aux | Trasporta informazioni generiche |
| | .lof | Indice delle figure |
| | .log | Rendiconta l'ultima composizione |
| | .lot | Indice delle tabelle |
| | .toc | Indice generale |
| Pacchetti e programmi | .bbl | Bibliografia creata con Biber |
| | .blg | Rendiconto di Biber |
| | .idx | Voci dell'indice analitico |
| | .ind | Prodotto di MakeIndex |
| | .ilg | Rendiconto di MakeIndex |
| | .out | Segnalibri ipertestuali |
| Output | .pdf | Prodotto di PDF ^L A _T E _X |

The .tex file

We'll always work on the .tex file, which has the following structure.

Header:

- Class declaration & package loading (look at <https://www.ctan.org/pkg/>)
- Custom commands
- General options
- Everything is contained in the red square.

Text:

- Everything is contained in the blue square.

```
\documentclass[opzioni]{classe}  
\usepackage[opzioni]{pacchetto}
```

```
\begin{document}  
...  
...  
...  
\end{document}
```


The .tex file

First of all, we must declare the kind of document, and its class, using the command:

- «opzioni» are the general document settings, and they are global;
- «classe» is the chosen document class, which defines the kind of document we are writing.

```
\documentclass[opzioni]{classe}
```

Most commons classes

| | |
|---------|----------------------------------|
| article | Scientific papers, articles, ... |
| report | Relations |
| book | Books and thesis |
| letter | Letters |
| beamer | Presentations |

The .tex file

Between the square brackets in the documentclass command you can declare:

- 10pt, 11pt, 12pt – They set the font size – Default is 10pt;
- a4paper, a5paper, ... – They set the page corners – Default is letterpaper, the USA standard;
- oneside, twoside – They specify if the text will be codified into one or two faces – Default is one for article and report, two for book;
- opneright, openany – The first, default for book, makes a new chapter start on the right, the second on any. Not available for article.
- twocolumn – Splits the text on two columns per page.

Americans when they see someone using km/h instead of glazed donuts per bald eagle



Some typography

- The cage is the area of the sheet in which the body of the text is composed;
- A page is formed by the headboard, the cage and the footer;
- ISO A4 format is 21cm x 29.7cm (width by paper height);
- American "letter" format is 8.5 in x 11.5 in, or 21.6 cm x 29.2 cm;
- The body is the measure of the size of the characters.



Document structure

Top matter – At the beginning of most documents there will be information about the document itself, such as the title and date, and also information about the authors, such as name, address, email etc.

```
\documentclass{article}

\begin{document}

\begin{abstract}
Your abstract goes here...
...
\end{abstract}
...
\end{document}
```

By default, LaTeX will use the word "Abstract" as a title for your abstract. If you want to change it into anything else, e.g. "Executive Summary", add the following line before you begin the abstract environment:

```
\renewcommand{\abstractname}{Executive Summary}
```

```
\documentclass[11pt,a4paper]{report}

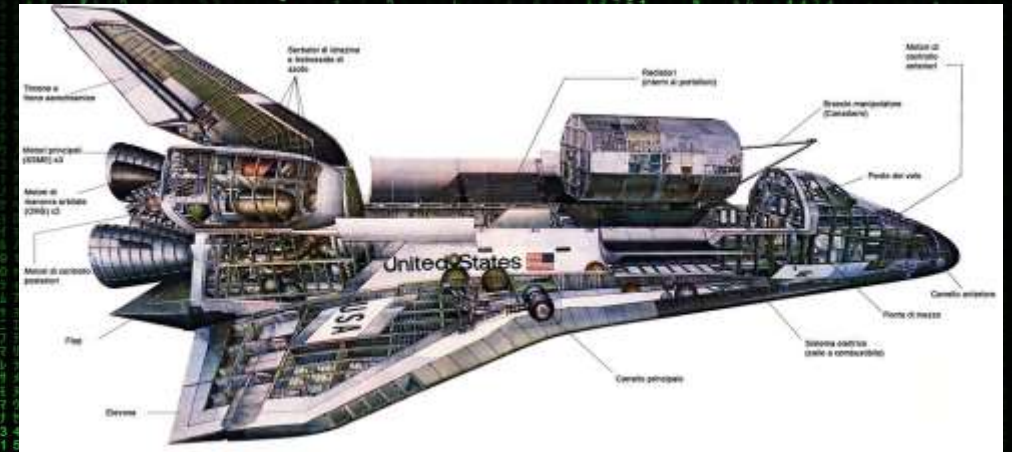
\begin{document}
\title{How to Structure a LaTeX Document}
\author{Andrew Roberts}
\date{December 2004}
\maketitle
\end{document}
```

Abstract – Most research papers have an abstract. This should appear in its logical order, therefore, after the top matter, but before the main sections of the body. This command is available for the document classes article and report, but not book.

Sections and chapters

Features:

- You don't need to specify section numbers;
- You don't need to use `\begin` and `\end` command;
- You don't need to add each section to the index;
- You can customize your section titles.



| Command | Level | Comment |
|--|-------|------------------------|
| <code>\part{"part"}</code> | -1 | not in letters |
| <code>\chapter{"chapter"}</code> | 0 | only books and reports |
| <code>\section{"section"}</code> | 1 | not in letters |
| <code>\subsection{"subsection"}</code> | 2 | not in letters |
| <code>\subsubsection{"subsubsection"}</code> | 3 | not in letters |
| <code>\paragraph{"paragraph"}</code> | 4 | not in letters |
| <code>\subparagraph{"subparagraph"}</code> | 5 | not in letters |

Special paragraphs

```
\usepackage{verbatim}
```

```
This is another  
\begin{comment}  
rather stupid,  
but helpful  
\end{comment}  
example for embedding  
comments in your document.
```

This is another example for embedding comments in your document.

```
\begin{alltt}  
Verbatim extended with the ability  
to use normal commands. Therefore, it  
is possible to \emph{emphasize} words in  
this environment, for example.  
\end{alltt}
```

Verbatim extended with the ability
to use normal commands. Therefore, it
is possible to *emphasize* words in
this environment, for example.

```
\begin{verbatim}  
The verbatim environment  
  simply reproduces every  
character you input,  
including all s p a c e s!  
\end{verbatim}
```

The verbatim environment
 simply reproduces every
character you input,
including all s p a c e s!

Book structure

Features:

- The standard LaTeX book class almost follows the same layout;
- If you do not make use of chapters, it is barely useful to use it;
- The class provides macros to change the formatting of some parts.

Traditional book format:

- Frontmatter: Half-title, Empty, Title page, Information (copyright, ISBN, ...), Dedication, Table of contents, List of figures, Preface.
- Mainmatter: Main topic, Appendix.
- Backmatter: Bibliography, Glossary / Index

The `\appendix` macro can be used to indicate that following sections or chapters are to be numbered as appendices.

Example of book [here](#). You can compare it with an article, like [this](#).

```
\begin{document}
\frontmatter

\maketitle

% Introductory chapters
\chapter{Preface}
% ...

\mainmatter
\chapter{First chapter}
% ...

\appendix
\chapter{First Appendix}

\backmatter
\chapter{Last note}
```

```
\appendix
\section{First Appendix}
```


Bibliography

At the ending of any good research paper there will be a complete list of references. LaTeX has two ways of inserting your references into a document:

- you can embed them within the document itself. It's simpler, but it can be time-consuming if you are writing several papers about similar subjects so that you often have to cite the same books;
- you can store them in an external BibTeX file and then link them via a command to your current document and use a BibTeX style to define how they appear. This way you can create a small database of the references you might use and simply link them, letting LaTeX work for you.

You just discovered why LaTeX creates one of its auxiliary files! What could it be?

A screenshot of a text editor window titled "BibTeX" showing a BibTeX file. The file contains several entries, including articles, books, and a book review. The entries are formatted with LaTeX commands like \article, \book, and \bookreview. The editor has a standard toolbar with icons for file operations and editing. The status bar at the bottom indicates "This is a .bib file open in TeXworks 0.6.6 (MikTeX 21.3)".

```
File: info.com Example.bib
BibTeX

\article{smit54,
  author = {J. G. Smith and H. K. Weston},
  title = {Nothing Particular in this Year's History},
  year = {1954},
  journal = {J. Geophys. Res.},
  volume = {2},
  pages = {14-15}
}

\book{colu92,
  author = {Christopher Columbus},
  title = {{How I} Discovered {America}},
  year = {1492},
  publisher = {Hispanic Press},
  address = {Barcelona}
}

\article{gree00,
  author = {R. J. Green and U. P. Fred and W. P. Norbert},
  title = {Things that Go Bump in the Night},
  year = {1900},
  journal = {Psych. Today},
  volume = {46},
  pages = {345-678}
}

\article{phil99,
  author = {T. P. Phillips},
  title = {Possible Influence of the Magnetosphere on {American} History},
  year = {1999},
  journal = {J. Oddball Res.},
  volume = {98},
  pages = {1000-1003}
}

\article{jame76,
  author = {Kelly James and Harris, Jr., George and Wilby Wollops},
  title = {{American} Independence and Magnetism},
  year = {1776},
  journal = {Revol. Tracts},
  volume = {32},
  pages = {34-55}
}

\book{colu92,
  author = {Roslanowski, Andrzej and Shae, Saharon},
  title = {Exponentiation in power series fields},
  year = {1997},
  publisher = {Hispanic Press},
  address = {Dartel}
}
```


An example on Overleaf

The screenshot displays the Overleaf web editor interface. The top navigation bar includes a 'Menu' button, an 'Upgrade' button, the document title 'Pericolosità sismica probabilistica di un sito italiano per la costruzione di un ospedale militare', and several utility icons: 'Review', 'Condividi', 'Submit', 'History', 'Layout', and 'Chat'. Below the navigation bar, the editor is divided into three main sections. On the left is a file explorer showing a list of files: 'fase5b.png', 'Relazione.lof', 'Relazione.lot', 'Relazione.pdf', 'Relazione.tex' (highlighted), 'seismogram.png', 'strikeslip.png', and 'taipei.png'. Below the file explorer is a 'File outline' section listing the document's structure: 'Introduzione', 'Identificazione delle sorg...', 'Distribuzione delle magn...', 'Distribuzione delle dista...', 'Intensità dell'onda sis...', 'Calcolo della curva di pe...', and 'Analisi dei risultati otten...'. The central pane shows the LaTeX source code for 'Relazione.tex'. The code includes package declarations for 'babel', 'fontenc', 'inputenc', 'amsmath', 'amssymb', 'graphicx', 'caption', 'booktabs', 'verbatim', 'geometry', and 'captionsetup'. It also contains the document title, author information (Giovanni N. D'Aloisio, Elisabetta M. Bilotto, Antonio Di Sandro), the date (4 novembre 2022), and the beginning of the document body. The right pane shows the compiled PDF output. The title page of the PDF matches the LaTeX source, displaying the title, authors, and date. Below the title page is a 'Sommarario' (Summary) section, followed by an 'Indice' (Table of Contents) listing the document's sections and their page numbers. The 'Indice' section includes: '1 Introduzione' (1), '2 Identificazione delle sorgenti sismiche' (2), '3 Distribuzione delle magnitudo' (2), '4 Distribuzione delle distanze sorgente sito' (2), '5 Intensità dell'onda sismica' (3), '6 Calcolo della curva di pericolosità sismica' (5), and '7 Analisi dei risultati ottenuti' (6). Below the 'Indice' is an 'Elenco delle figure' (List of Figures) section, which includes: '1 Illustrazione di una faglia strike slip' (2), '2 Distribuzione di probabilità della magnitudo' (3), '3 Un tipico sismogramma. Il punto di massimo è la PGA' (3), '4 Posizionamento di uno smorzatore a massa risonante sul Taipei 101' (4), '5 Distribuzione della PGA (Akkar-Bommer, 2010)' (5), '6 Distribuzione della PGA (Akkar-Bommer, 2010)' (5), '7 Curva di pericolosità sismica del sito in termini di PSA' (6), and '8 Curva di pericolosità sismica del sito in termini di PGA' (7).

Text formatting

Writers use formatting techniques to differentiate textual elements from the rest of the text. Italicization is often used to add emphasis to key words or phrases. Footnotes are useful for providing extra information or clarification without interrupting the main flow of the text. However, it is also very easy to abuse, and a document that has been overdone can look and read worse.

1 Unformatted Solution

(1)

$$E_{h,betr} = \begin{cases} [(Q_{h,li0} + Q_{h,li} \times GHZ) + f_{h,rech} + E_{e,hilf,spez} \times f_{e,prim}] \times A_{ebf} \times f_{h,red}, \\ [(Q_{h,li0} + Q_{h,li} \times GHZ) + f_{h,rech} + E_{e,hilf,spez} \times f_{e,prim}] \times A_{ebf} \times f_{h,red} + E_{h,erst} + E_{h,ent}, w \end{cases}$$

2 Formated Solution

(2)

$$E_{h,betr} = \begin{cases} [(Q_{h,li0} + Q_{h,li} \times GHZ) + f_{h,rech} + E_{e,hilf,spez} \times f_{e,prim}] \times A_{ebf} \times f_{h,red}, & \text{wenn Lebenszyklus des Gebäudes kein Vielfaches des Lebenszyklus der Heizung ist} \\ [(Q_{h,li0} + Q_{h,li} \times GHZ) + f_{h,rech} + E_{e,hilf,spez} \times f_{e,prim}] \times A_{ebf} \times f_{h,red} + E_{h,erst} + E_{h,ent}, & \text{wenn Lebenszyklus des Gebäudes ein Vielfaches des Lebenszyklus der Heizung ist} \end{cases}$$

Text formatting


Some of the greatest `\emph{discoveries}`
in science
were made by accident.

`\textit{Some of the greatest \emph{discoveries}}`
in science
were made by accident.}

`\textbf{Some of the greatest \emph{discoveries}}`
in science
were made by accident.}

The `\emph` command does different things depending on the context. Try it by yourself [here](#).

For getting bold, italic or underlined text, just use the `\textbf`, `\textit` or `\underline` commands.



Some of the greatest *discoveries* in science were made by accident.
Some of the greatest discoveries in science were made by accident.
Some of the greatest *discoveries* in science were made by accident.

Spacing & hyphenation

- If you want to use larger inter-line spacing:
- The command `\-` inserts a discretionary hyphen into a word, in order to make it the only point where hyphenation is allowed, and it can be used when LaTeX isn't capable to hyphenate it automatically:

```
\linespread{factor}
```

```
\begin{minipage}{2in}  
I think this is: su-per-cal-%  
i-frag-i-lis-tic-ex-pi-%  
al-i-do-cious  
\end{minipage}
```

I think this is: supercalifragi-
listicexpialidocious

Quote-marks and superscript and subscript

LaTeX treats left and right quotes as different entities. For single quotes, a grave accent gives a left quote mark, and an apostrophe gives a right. For double quotes, simply double the symbols, and LaTeX will interpret them accordingly. The right quote is also used for apostrophe in LaTeX.

```
\documentclass{article}
\begin{document}
Wombat\textsubscript{walzing}
```

```
Michelangelo was born on March 6\textsuperscript{th}, 1475.
\end{document}
```

To ``quote'` in LaTeX

To ```quote''` in LaTeX

To ```quote"` in LaTeX

To `„quote''` in LaTeX

`„German quotation marks```

`<<French quotation marks>>`

```Please press the `x' key.```

`„Proszę, naciśnij klawisz <x>''.`



```
\usepackage[T1]{fontenc}
```

To “quote” in LaTeX.

To “quote” in LaTeX.

To „quote” in LaTeX.

„German quotation marks“

«French quotation marks»

“Please press the ‘x’ key.”

„Proszę, naciśnij klawisz «x»”.

Wombat<sub>walzing</sub>

Michelangelo was born on March 6<sup>th</sup>, 1475.



# Special characters

| LaTeX command       | Sample | Description                                                                      |
|---------------------|--------|----------------------------------------------------------------------------------|
| <code>\{o}</code>   | ò      | grave accent                                                                     |
| <code>\'o</code>    | ó      | acute accent                                                                     |
| <code>\^o</code>    | ô      | circumflex                                                                       |
| <code>\"o</code>    | ö      | umlaut, trema or dieresis                                                        |
| <code>\H{o}</code>  | ő      | long Hungarian umlaut (double acute)                                             |
| <code>\~{o}</code>  | õ      | tilde                                                                            |
| <code>\c{c}</code>  | ç      | cedilla                                                                          |
| <code>\k{a}</code>  | ą      | ogonek                                                                           |
| <code>\l{}l</code>  | ł      | barred l (l with stroke)                                                         |
| <code>\={o}</code>  | ō      | macron accent (a bar over the letter)                                            |
| <code>\b{o}</code>  | ɒ      | bar under the letter                                                             |
| <code>\.o</code>    | ó      | dot over the letter                                                              |
| <code>\d{u}</code>  | ų      | dot under the letter                                                             |
| <code>\r{a}</code>  | å      | ring over the letter (for å there is also the special command <code>\aa</code> ) |
| <code>\u{o}</code>  | ö      | breve over the letter                                                            |
| <code>\v{s}</code>  | š      | caron/háček ("v") over the letter                                                |
| <code>\t{oo}</code> | oô     | "tie" (inverted u) over the two letters                                          |
| <code>\o{}o</code>  | ø      | slashed o (o with stroke)                                                        |
| <code>\i{}i</code>  | ı      | dotless i (i without tittle)                                                     |

- Less than and greater than:

```
\textless
\textgreater
```

- Use UTF-8:

```
\usepackage[utf8]{inputenc}
```

- Euro:

```
\usepackage[official]{eurosym} + \euro{}
```

- Degree symbol:

```
\usepackage{amsmath}
\usepackage{siunitx}
%...

A $\SI{45}{\degree}$ angle.

It is \SI{17}{\degreeCelsius} outside.
```

- Other symbols: add `\` before the symbol, for example `\$` for \$.



# Special characters

Not like this ... but like this:\\  
New York, Tokyo, Budapest, \ldots

Not like this ... but like this:  
New York, Tokyo, Budapest, ...

| Command | Example                           | Description              |
|---------|-----------------------------------|--------------------------|
| \today  | May 31, 2006                      | Current date             |
| \TeX    | TeX                               | Your favorite typesetter |
| \LaTeX  | LAT <sub>E</sub> X                | The Name of the Game     |
| \LaTeXe | LAT <sub>E</sub> X 2 <sub>ε</sub> | The current incarnation  |

Hyphen: daughter-in-law, X-rated\\  
En dash: pages 13--67\\  
Em dash: yes---or no? \\  
Minus sign: \$0\$, \$1\$ and \$-1\$

daughter-in-law, X-rated  
pages 13–67  
yes—or no?  
0, 1 and –1

| Input | Output | Purpose                    |
|-------|--------|----------------------------|
| -     | -      | inter-word                 |
| --    | -      | page range, 1–10           |
| ---   | —      | punctuation dash—like this |
| \$-\$ | –      | minus sign                 |