

LaTeX workshop

From novice to expert, to appreciator.

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KU Leuven Ghent – Dramco

<https://github.com/GillesC/LaTeX-Workshop>

1. Why L^AT_EX?

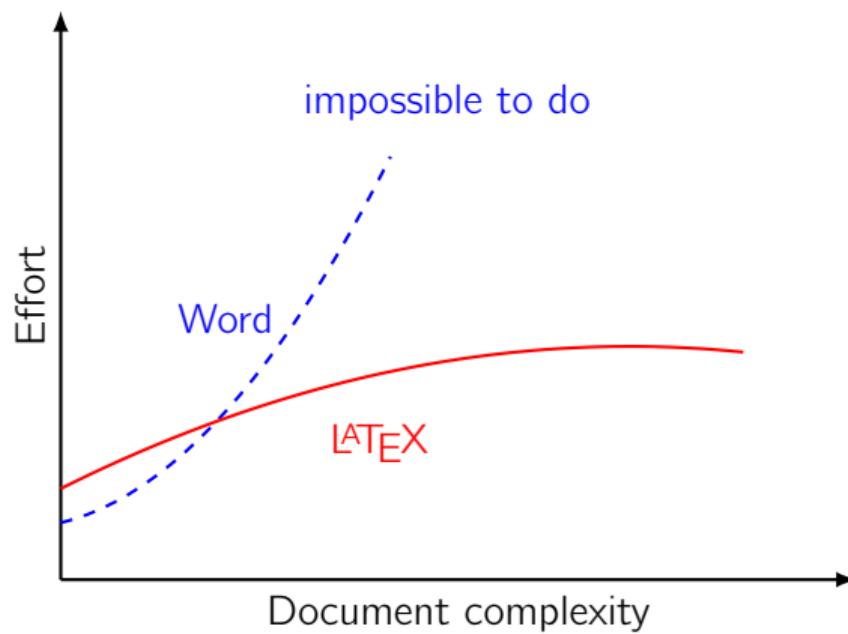
2. Getting up and running

3. The basics

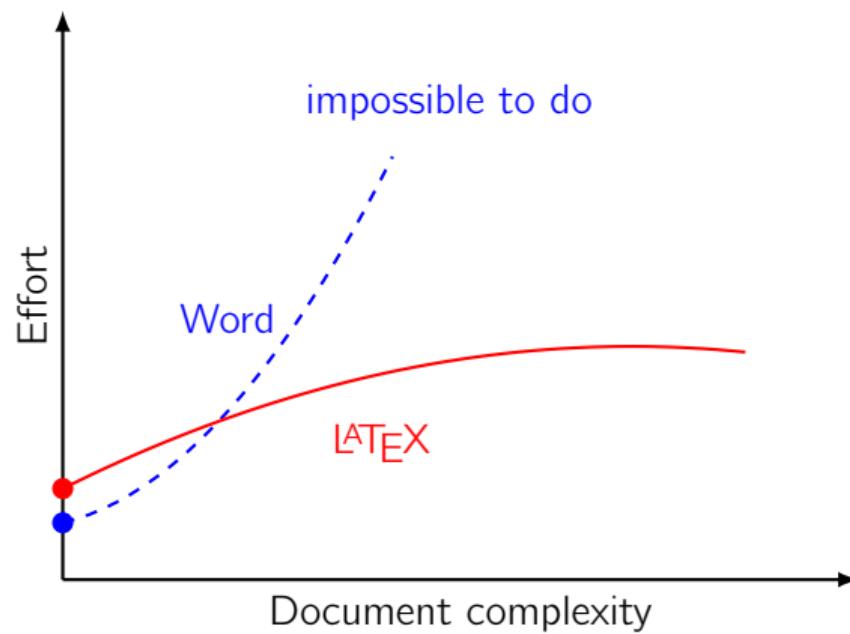
4. Up your L^AT_EX game with TikZ

5. Master Thesis Template

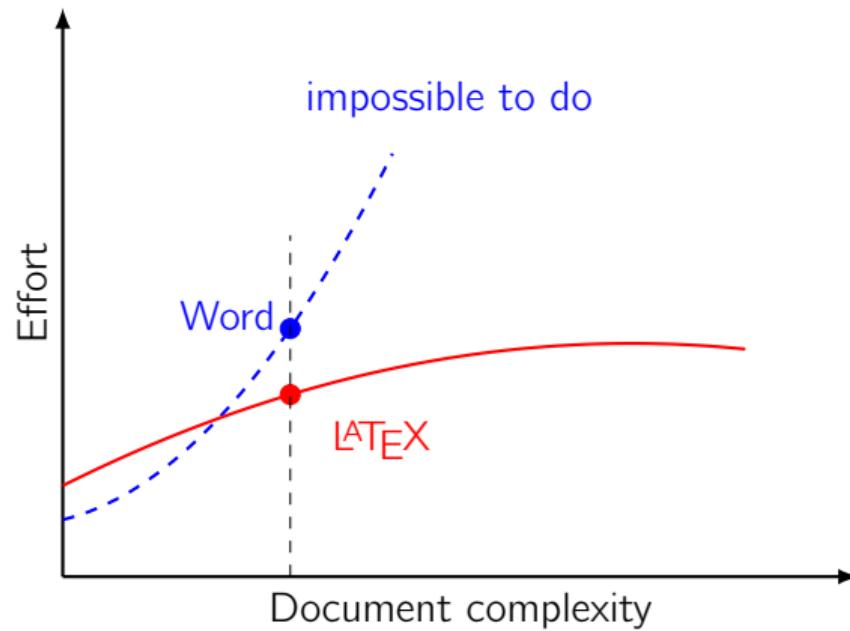
1.0 Why LaTeX?



1.0 Why LaTeX?



1.0 Why LaTeX?



1.0 My goals for this workshop

- ▶ See the beauty and possibilities of L^AT_EX
- ▶ Give an overview of the basics and elaborate on common pitfalls and must-have knowledge
- ▶ Provide a basis to fall back on (not everything will be covered in detail)

1.0 Things on how I am going to convince you to try L^AT_EX

- ▶ You can put text in comments and later retrieve old parts
- ▶ You can rearrange text easily by just switching some lines
- ▶ You can make unbelievably nice looking professional figures
- ▶ Using commands to replace words *reusable*
- ▶ Abbreviations (and re-using them) *Students*
- ▶ Reusing the same colors in text, graphs to depict the same things *reusable*
- ▶ Math in MS Word is awful.
- ▶ Referencing/citing becomes a worry of the past.

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1.0 Interesting Sources

- ▶ Thesis specific: <https://dramco-edu.github.io/ThesisTips-and-Tricks>
- ▶ Writing documents in \LaTeX :
<https://github.com/DRAMCO/writing-scientific-papers-in-latex-tips-and-tricks>
- ▶ \LaTeX specific : <https://github.com/dramco-edu/LaTex>
- ▶ \LaTeX Workshop: <https://github.com/GillesC/LaTeX-Workshop>
- ▶ Overleaf Documentation: <https://www.overleaf.com/learn>

1. Why L^AT_EX?
2. Getting up and running
3. The basics
4. Up your L^AT_EX game with TikZ
5. Master Thesis Template

2.0 Install LaTeX

Distribution:

- ▶ Tex Live for Windows (or MikTeX)
- ▶ TeX Live for Linux
- ▶ MacTeX for macOS

Editors:

[VS Code](#), [overleaf.com](#), TeXworks, TeXstudio, Texmaker, etc.

2.0 Using Overleaf

Key features:

- ▶ Setup-free L^AT_EX
- ▶ Visual Editor and Code Editor
- ▶ Project sharing
- ▶ ...

Offline editors when:

- ▶ Project is large (long compile time)
- ▶ More extensive features (e.g., with VS Code)
- ▶ Working offline

1. Why L^AT_EX?
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3.1 Starting a document

Document class

```
\documentclass{article}  
\begin{document}  
    Hello world!  
\end{document}
```

`\documentclass` tells \LaTeX how to lay out your document

Standard classes are `article`, `report`, `book`, `letter`, `beamer` for presentations

Each major publisher typically has its own class (e.g., `IEEEtran`)

3.1 Starting a document

Preamble

```
\documentclass{article}
```

```
\begin{document}  
    Hello world!  
\end{document}
```

In the **preamble**, you define which packages to use

- ▶ `\usepackage[english]{babel}`
- ▶ `\usepackage{graphicx}`

```
\usepackage[option1,  
option2]{graphicx}
```

3.1 Starting a document

Document itself

```
\documentclass{article}
```

`\begin{...}` and `\end{...}` define
the beginning and the ending
of an *environment*

```
\begin{document}  
Hello world!  
\end{document}
```

`\begin{document}` and `\end{document}`
identify where your document
starts and stops

3.1 Including a Title and an Author

```
\documentclass{article}
\title{My First Document}
\author{E. Peschiera}
\date{}
\begin{document}
\maketitle
Hello world!
\end{document}
```

`\title{...}` and `\author{...}`
are self-explanatory

`\date{}` is useful to suppress the
showing of the current date

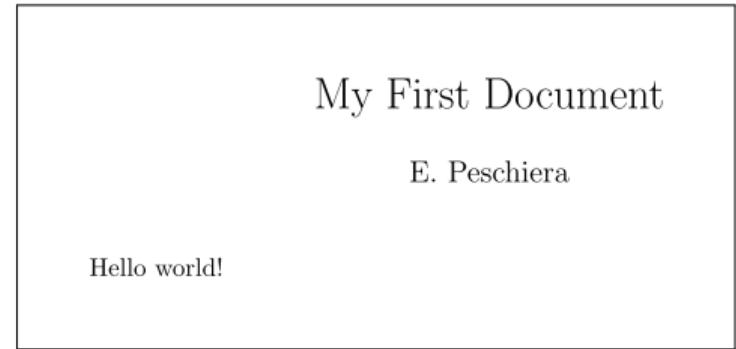
`\maketitle` is fundamental! Without it,
title and author are excluded

Note: templates can define their own title/author commands.

3.1 Including a Title and an Author

Result

```
\documentclass{article}
\title{My First Document}
\author{G. Callebaut}
\date{}
\begin{document}
\maketitle
Hello world!
\end{document}
```



3.1 Including Structuring Elements

Numbered elements

- ▶ `\chapter{...}`
- ▶ `\section{...}`
- ▶ `\subsection{...}`
- ▶ `\subsubsection{...}`

Unnumbered elements, same commands
but with *

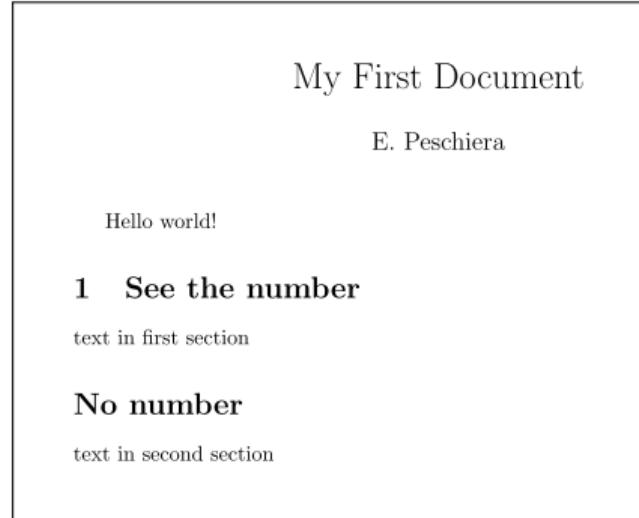
- ▶ `\chapter*{...}`

Depending on the template, certain elements
might not be present

- ▶ `\chapter{}` only in books and reports
- ▶ No structuring elements
supported in letters

3.1 Including Structuring Elements

```
1 \documentclass{article}
2
3 \title{My First Document}
4 \author{E. Peschiera}
5 \date{}
6
7 \begin{document}
8
9 \maketitle
10
11 Hello world!
12
13 \section{See the number}
14 text in first section
15
16 \section*[No number]
17 text in second section
18
19 \end{document}
```



3.2 Including a Figure

Need graphicx package

```
\usepackage{graphicx}
```

Define a figure environment

```
\begin{figure}[placing  
specifier]  
    \centering  
    \includegraphics[options]{  
        pathToFigure}  
    \caption{text explaining  
        the figure}  
\end{figure}
```

[placing specifier]

- ▶ h = here
- ▶ t = top of the page
- ▶ b = bottom of the page
- ▶ p = on a special page for *figures, tables, etc.*
- ▶ ! = override LaTeX parameters that normally decide good positioning

3.2 Including a Figure

Need graphicx package

```
\usepackage{graphicx}
```

Define a figure environment

```
\begin{figure}[placing  
specifier]  
    \centering  
    \includegraphics[options]{  
pathToFigure}  
    \caption{text explaining  
the figure}  
\end{figure}
```

`\centering` makes sure the included figure
is centered in the environment

similar placing as in figures, but now with
respect to the other subfigures.

3.2 Using Subfigures

Needs

```
\usepackage{caption}  
\usepackage{subcaption}
```

Define a figure environment

```
\begin{figure}[placing  
specifier]  
  \begin{subfigure}[placing  
specifier]  
    \includegraphics  
  \end{subfigure}  
  \hfill  
  \begin{subfigure}[placing  
specifier]
```

`\subfigure` allows to place different subfigures in one figure environment.

`\includegraphics` finds and inserts the actual figure file

- ▶ optional typically refers to the width or height of the figure
- ▶ most often related to `\textwidth`, e.g. `[width=0.5\textwidth]`

3.2 Inserting a Table

```
\begin{table}[placing options]
  \caption{text explaining the
    Table}
  \centering
  \begin{tabular}{columnFormat}
    colTitle & <repeat for all
    columns> \\
    \hline
    data & data & <repeat> \\
    \hline
  \end{tabular}
\end{table}
```

table environment makes sure that
the table can be correctly placed

tabular environment
= actual table

3.2 Inserting a Table

```
\begin{table}[placing options]
  \caption{text explaining the
    Table}
  \centering
  \begin{tabular}{columnFormat}
    colTitle & <repeat for all
    columns> \\
    \hline
    data & data & <repeat> \\
    \hline
  \end{tabular}
\end{table}
```

{columnFormat} defines

- ▶ How many columns in the table
- ▶ The layout of the columns
 - c: centered text
 - l: left-aligned text
 - r: right-aligned text
 - fixed-width columns p{2cm}
 - m: middle
 - p: top
 - b: bottom

3.2 Inserting a Table

```
\begin{table}[placing options]
  \caption{text explaining the
    Table}
  \centering
  \begin{tabular}{columnFormat}
    colTitle & <repeat for all
    columns> \\
    \hline
    data & data & <repeat> \\
    \hline
  \end{tabular}
\end{table}
```

& is a column separator. Used to show in which column the next *item* goes

\hline inserts a horizontal line

\\\ is the standard LaTeX command for a line break

In a table: next row

3.2 Inserting a Table

```
1 \documentclass{article}
2
3 \usepackage{graphicx}
4
5 \title{My First Document}
6 \author{E. Peschiera}
7 \date{}
8
9 \begin{document}
10
11 \maketitle
12
13 \section{Included Table}
14 This is a short Table
15
16 \begin{table}[h]
17   \caption{Look at my awesome result numbers.}
18   \centering
19   \begin{tabular}{|l|c|r}
20     \hline
21     Exp. name & time [s] & Comment \\ \hline
22     walking & 180.15 & really fun \\ \hline
23     running & 59.23 & difficult \\ \hline
24     swimming & 00.0 & impossible on land \\ \hline
25     \hline
26   \end{tabular}
27 \end{table}
28
29 some other text here
30
31 \end{document}
```

My First Document
E. Peschiera

1 Included Table

This is a short Table

Table 1: Look at my awesome result numbers.

Exp. name	time [s]	Comment
walking	180.15	really fun
running	59.23	difficult
swimming	00.0	impossible on land

some other text here

3.2 Note on Figures and Tables

In case your document is multicolumn, e.g., IEEE paper, but your figure needs to span more than 1 column: use * when defining the environment

```
\begin{figure*} ... \end{figure*}  
\begin{table*} ... \end{table*}
```

3.2 Making beautiful tables

Highly recommended document:

<https://people.inf.ethz.ch/markusp/teaching/guides/guide-tables.pdf>.

Guidelines

- ▶ avoid vertical lines
- ▶ Avoid “boxing up” cells, usually 3 horizontal lines are enough: above, below, and after heading (see examples in this guide)
- ▶ avoid double horizontal lines
- ▶ enough space between rows
- ▶ if in doubt, align left
- ▶ right-align numbers (using same notation/unit)
- ▶ use `\usepackage{booktabs}`

3.2 Making beautiful tables

Rank	Lead Arranger	Number of Deals	Dollar Amount	Market Share	Equator Principles Adoption
1	State Bank of India	52	\$21,631.6	10.1%	NA
2	Mitsubishi UFJ Financial	88	9,486.1	4.4	Dec 2005
3	Sumitomo Mitsui	71	8,188.1	3.8	Jan 2006
4	Credit Agrocole	60	6,506.4	3.1	Jun 2005
5	Mizuho Financial	55	5,797.5	2.7	Oct 2003
6	Société Generale	55	5,760.5	2.7	Sep 2007
7	BNP Paribas	55	5,390.8	2.5	Oct 2008
8	Axis Bank	18	5,216.9	2.4	NA
9	IDBI Bank	10	5,162.3	2.4	NA
10	ING	49	4,916.1	2.3	Jun 2003
Others		102	135,430.4	63.6	
Total Market		615	\$213,486.7	100%	

3.3 Inserting an Equation

Free-standing equation

Need *amsmath* package

```
\usepackage{amsmath}
```

Use equation environment

```
\begin{equation}
<type equation here>
\end{equation}
```

To type your equation, you need to know the correct commands

A nice overview:

[https://en.wikibooks.org/wiki/
TeX/Mathematics](https://en.wikibooks.org/wiki/TeX/Mathematics)

3.3 Inserting an Equation

```
1 \documentclass{article}
2
3 \usepackage{graphicx}
4
5 \title{My First Document}
6 \author{E. Peschiera}
7 \date{}
8
9 \begin{document}
10
11 \maketitle
12
13 \section{Included Equation}
14 This is a very difficult and rarely seen equation
15
16 \begin{equation}
17   x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}
18 \end{equation}
19
20 some other text here
21
22 \end{document}
```

My First Document

E. Peschiera

1 Included Equation

This is a very difficult and rarely seen equation

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \quad (1)$$

some other text here

3.3 Inserting an Equation

In-line equation

An equation can also be in-line = inside the text

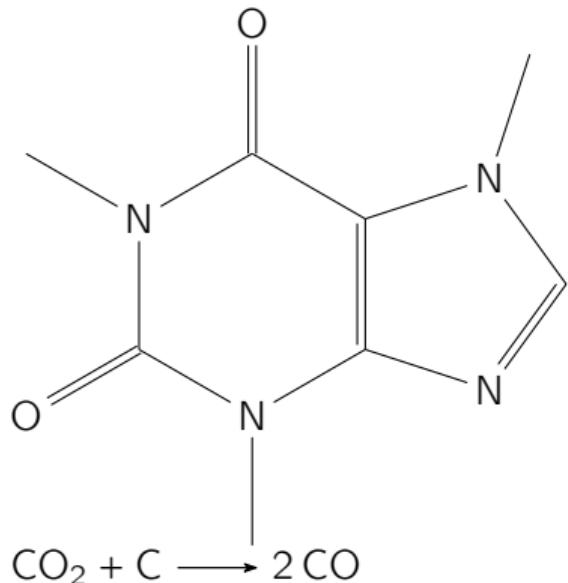
This is enabled by using the math environment $\$...$$

e.g., Variable $\$D\$$ is calculated as $\$D = S \oplus d_i\$$ using the XOR operation.

Variable D is calculated as $D = S \oplus d_i$ using the XOR operation.

Of course, not possible to refer to these equations as they do not have a number

3.4 Inserting Chemistry formulae



```
\usepackage{chemfig}  
\usepackage{mhchem}  
\ce{CO2 + C -> 2 CO}
```

https://www.overleaf.com/learn/latex/Chemistry_formulae

3.5 Inserting an Algorithm

Many packages exist to typeset an algorithm

```
\usepackage{algorithmic}  
\usepackage{algorithm2e}  
\usepackage{algpseudocode}
```

Suggested: algpseudocode

Algorithm typically embedded in an algorithm environment

```
\usepackage{algorithm}  
\begin{algorithm}  
...  
\end{algorithm}
```

3.5 Inserting an Algorithm

```
1 \documentclass{article}
2
3 \usepackage{graphicx}
4 \usepackage{algorithm}
5 \usepackage{algpseudocode}
6
7 \begin{document}
8
9 \section{Included Algorithm}
10
11 This is a very simple algorithm in pseudocode.
12
13 \begin{algorithm}[h]
14 \caption{Example algorithm.}
15 \begin{algorithmic}[1]
16 \If {$i \geq \text{maxval}$}
17   \State $i \gets 0$ 
18 \Else
19   \If {$i+k \leq \text{maxval}$}
20     \State $i \gets i+k$ 
21   \EndIf
22 \EndIf
23 \end{algorithmic}
24 \end{algorithm}
25
26
27 \end{document}
```

1 Included Algorithm

This is a very simple algorithm in pseudocode.

Algorithm 1 Example algorithm.

```
1: if  $i \geq \text{maxval}$  then
2:    $i \leftarrow 0$ 
3: else
4:   if  $i + k \leq \text{maxval}$  then
5:      $i \leftarrow i + k$ 
6:   end if
7: end if
```

3.6 Inserting a Listing

Instead of pseudocode, you can also typeset actual code. This is called a *listing*

```
\usepackage{listings}
\begin{lstlisting}
<code here>
\end{lstlisting}
```

Or input code file directly, using

```
\lstinputlisting[language=
programmingLanguage]{PathToSourcefile}
```

The listings package supports many programming languages, but still enables you to customize everything you want

Full explanation:

https://en.wikibooks.org/wiki/LaTeX/Source_Code_Listings

3.6 Inserting a Listing

Actual listing and result

```
35 \begin{document}
36
37 \section{Included Listing}
38
39 This is actual code.
40
41 \begin{lstlisting}[language=Python, caption=Function to compute the Discrete Fourier Transform of a signal.]
42 import numpy as np
43
44 def DFT(x):
45     n = np.arange(x.shape[-1]) # time indexes
46     N = x.shape[-1] # signal length
47     X = np.zeros(N, dtype=complex)
48     for k in range(N):
49         X[k] = np.sum(x*np.exp(-1j*2*np.pi*k*n/N))
50     return X
51 \end{lstlisting}
52
53
54 \end{document}
```

1 Included Listing

This is actual code.

```
1 import numpy as np
2
3 def DFT(x):
4     n = np.arange(x.shape[-1]) # time indexes
5     N = x.shape[-1] # signal length
6     X = np.zeros(N, dtype=complex)
7     for k in range(N):
8         X[k] = np.sum(x*np.exp(-1j*2*np.pi*k*n/N))
9     return X
```

Listing 1: Function to compute the Discrete Fourier Transform of a signal.

Better package for Python: minted, <https://ctan.org/pkg/minted>

3.6 Code highlighting with minted

manni	<pre>import numpy as np def incmatrix(genl1,genl2): m = len(genl1) n = len(genl2) M = None #to become the incidence matrix VT = np.zeros((n*m,1), int) #dummy variable #compute the bitwise xor matrix M1 = bitxormatrix(genl1) M2 = np.triu(bitxormatrix(genl2),1)</pre>	<pre>import numpy as np def incmatrix(genl1,genl2): m = len(genl1) n = len(genl2) M = None #to become the incidence matrix VT = np.zeros((n*m,1), int) #dummy variable #compute the bitwise xor matrix M1 = bitxormatrix(genl1) M2 = np.triu(bitxormatrix(genl2),1)</pre>
rrt	<pre>import numpy as np def incmatrix(genl1,genl2): m = len(genl1) n = len(genl2) M = None #to become the incidence matrix VT = np.zeros((n*m,1), int) #dummy variable #compute the bitwise xor matrix M1 = bitxormatrix(genl1) M2 = np.triu(bitxormatrix(genl2),1)</pre>	<pre>import numpy as np def incmatrix(genl1,genl2): m = len(genl1) n = len(genl2) M = None #to become the incidence matrix VT = np.zeros((n*m,1), int) #dummy variable #compute the bitwise xor matrix M1 = bitxormatrix(genl1) M2 = np.triu(bitxormatrix(genl2),1)</pre>
perldoc	<pre>import numpy as np def incmatrix(genl1,genl2): m = len(genl1) n = len(genl2) M = None #to become the incidence matrix VT = np.zeros((n*m,1), int) #dummy variable #compute the bitwise xor matrix M1 = bitxormatrix(genl1) M2 = np.triu(bitxormatrix(genl2),1)</pre>	<pre>import numpy as np def incmatrix(genl1,genl2): m = len(genl1) n = len(genl2) M = None #to become the incidence matrix VT = np.zeros((n*m,1), int) #dummy variable #compute the bitwise xor matrix M1 = bitxormatrix(genl1) M2 = np.triu(bitxormatrix(genl2),1)</pre>

The minted package supports many programming languages, but requires installing Pygments. (supported out-of-the-box in Overleaf)

More information: https://www.overleaf.com/learn/latex/Code_Highlighting_with_minted

3.7 Labels and Referencing

A figure, table, equation, algorithm, listing has no place in a document, unless it is referenced!

`\label{<label>}` inside the environment to be referenced, and
`\ref{<label>}` in the text.

e.g.,

```
\caption{Some fig.  
caption}\label{fig:cool-fig}.  
Fig.~\ref{fig:cool-fig} becomes  
Fig. 1.
```

Use `\usepackage{cleveref}` and use correct naming conventions:

`ch`: chapter

`sec`: (sub)section

`fig`: figure

`tab`: table

`lst`: code listing

`alg`: algorithm

`app`: appendix (sub)section

`\cref{fig:cool-fig}` becomes
Fig. 1.

3.7 Labels and Referencing

```
1 \documentclass{article}
2
3 \usepackage{graphicx}
4
5 \begin{document}
6
7 \section{Included labeled Figure}
8
9 Fig.\ref{fig:a_fig} shows bla bla bla
10
11 \begin{figure}[h]
12   \centering
13   \includegraphics[width=0.3\textwidth]{fig.png}
14   \caption{A fig in a figure.}
15   \label{fig:a_fig}
16 \end{figure}
17
18 \end{document}
```

1 Included labeled Figure

Fig. 1 shows bla bla bla



Figure 1: A fig in a figure.

3.8 Bibliography

Best practice

Resource you want to cite, must be provided to LaTeX in BibTeX format

Although you could store your BibTeX directly in your .tex document, much better to store it in a separate .bib file, and point LaTeX to this file.

3.8 Bibliography

In the preamble:

```
\usepackage[style=ieee]{biblatex}  
\addbibresource{bib.bib}  
\AtBeginBibliography{\footnotesize}
```

The last command is optional.

Just before the end of the document:

```
\printbibliography
```

3.8 BibTeX

```
@ARTICLE{10460235,  
    author={Callebaut, Gilles and Liu, Liang and  
Eriksson, Thomas and Van der Perre, Liesbet and  
Edfors, Ove and Fager, Christian},  
journal={IEEE Microwave Magazine},  
title={6G Radio Testbeds: Requirements, Trends, and Approaches},  
year={2024},  
volume={25},  
number={4},  
pages={14-31},  
doi={10.1109/MMM.2024.3351970}  
}
```

3.8 Bibliography

On IEEEExplore

The screenshot shows a detailed view of a paper record from IEEEExplore. At the top left, the title "An overview of MIMO" is displayed, along with the publisher "IEEE". Below the title, the authors listed are A.J. PAULRAJ, D.A. GORE, R.U. NABAR, and H. BOLCSKEI. To the right of the authors is a yellow "Cite This" button, which is highlighted with a yellow box. Below the authors, there are three metrics: 1417 Cites in Papers, 92 Cites in Patents, and 14246 Full Text Views. On the right side of the page, a "Cite This" dialog box is open, showing options for Plain Text, BibTeX (which is selected and highlighted with a yellow box), RIS, and Refworks. The BibTeX section contains the following code:

```
@ARTICLE{1266912,  
author={PAULRAJ, A.J. and GORE, D.A. and NABAR, R.U. and BOLCSKEI, H.},  
journal={Proceedings of the IEEE},  
title={An overview of MIMO communications - a key to gigabit wireless},  
year={2004},  
volume={92},  
number={2},  
pages={198-218},  
doi={10.1109/JPROC.2003.821915}}
```

Below the dialog box, the abstract section is visible, stating: "High data rate wireless communications, nearing 1 Gb/s transmission rates, is of interest in emerging wireless local area networks and home audio/visual networks. Designing very high speed wireless links that offer good quality-of-service and range capability in non-line-of-sight (NLOS) environments."

3.8 Bibliography

Citing a reference

Optional, but to prettify citations

`\usepackage{cite}` (\leftarrow only if you are not using biblatex)

In text:

“...using a
reference \sim \cite{citekey}”

\sim is a fixed space. This prevents a line-break
on this space.

Always insert \sim before `\cite{}`.

1 Included Reference

A famous paper from the early 2000s pointed out how the use of multiple antennas at the transmitter and at the receiver was the key to achieving data rates in the order of 1 Gb/s [1].

References

- [1] A. Paulraj, D. A. Gore, R. U. Nabar, and H. Bolcskei, “An overview of MIMO communications - A key to gigabit wireless,” *Proceedings of the IEEE*, vol. 92, no. 2, pp. 198–218, 2004.

3.8 Bibliography

The screenshot shows a bibliographic entry for a paper titled "An overview of MIMO communications - a key to gigabit wireless". The entry is displayed in BibTeX format within a modal window titled "Cite This". The BibTeX code is:

```
@ARTICLE{1206012,  
author={PAULRAJ, A.J. and GORE, D.A. and NABAR, R.U. and BOLCSKEI, H.},  
journal={Proceedings of the IEEE},  
title={An overview of MIMO communications - a key to gigabit wireless},  
year={2004},  
volume={92},  
number={2},  
pages={198-218},  
doi={10.1109/JPROC.2003.821915}}
```

The main page of the document includes the following information:

- Journals & Magazines > Proceedings of the IEEE
- Publisher: IEEE
- Cite This button
- Author: A.J. PAULRAJ ; D.A. GORE ; R.U. NABAR
- Metrics:
 - 1417 Cites in Papers
 - 92 Cites in Patents
 - 14246 Full Text View
- Abstract section with the following text:

High data rate wireless communications, nearing 1 Gb/s transmission rates, is of interest in emerging wireless local area networks and home audio/visual networks. Designing very high speed wireless links that offer good quality-of-service and range capability in non-line-of-sight (NLOS) environments.

3.8 Cleaning BibTeX file

The screenshot shows a comparison between a raw BibTeX file on the left and its cleaned version on the right, along with the configuration settings for the cleaning process.

Raw BibTeX File (Left):

```
001   @inproceedings{...,
002     author = {...},
003     pages = {...},
004     organization = {...}
005   }
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007   @article{...@new,
008     title = {...},
009     author = {...},
010     year = ...,
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BibTeX Tidy Configuration (Right):

- Indent:**
 - Indent with tabs
 - Indent with spaces
- Whitespace:**
 - Align values
 - Wrap values
 - Insert blank lines
- Values:**
 - Enclose values in braces
 - Enclose values in double braces
 - Remove braces
 - Strip double-braced values
 - Use numeric values where possible

Status: Successful! Tidied 65 entries.

Tidy

3.8 Want to know more about Ref. Managers and BibTeX?

Or more general information about information retrieval?

Contact colleague Eef Soete (eef.soete@kuleuven.be)



Eef Soete · 2nd

Liaison librarian at KU Leuven libraries 2Bergen - campus Rabot Ghent
& campus Bruges



KU Leuven - Brugge

1. Why L^AT_EX?
2. Getting up and running
3. The basics
4. Up your L^AT_EX game with TikZ
5. Master Thesis Template

4.0 Why creating figures in L^AT_EX?

- + Adjustability/Flexibility

Rebuilding your document automatically updates the figure: making changes is as easy as modifying L^AT_EX code

- + Consistency:

Fonts, colors, text sizes, etc., are consistent.

- + Vector graphics

- + Easy to port your text to a slide deck

- The learning curve...

- Compiling can become slow

Inspired by the Tikz workshop by Pieter Belmans (<https://github.com/pbelmans/tikz-workshop>).

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Inspired by the Tikz workshop by Pieter Belmans (<https://github.com/pbelmans/tikz-workshop>).

4.0 Why creating figures in L^AT_EX?

- + Adjustability/Flexibility

Rebuilding your document automatically updates the figure: making changes is as easy as modifying L^AT_EX code

- + Consistency:

Fonts, colors, text sizes, etc., are consistent.

- + Vector graphics

- + Easy to port your text to a slide deck

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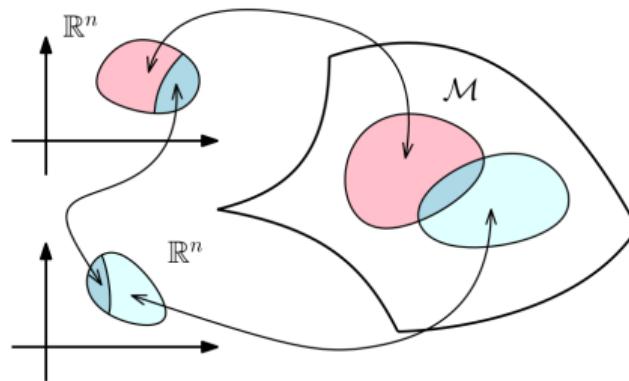
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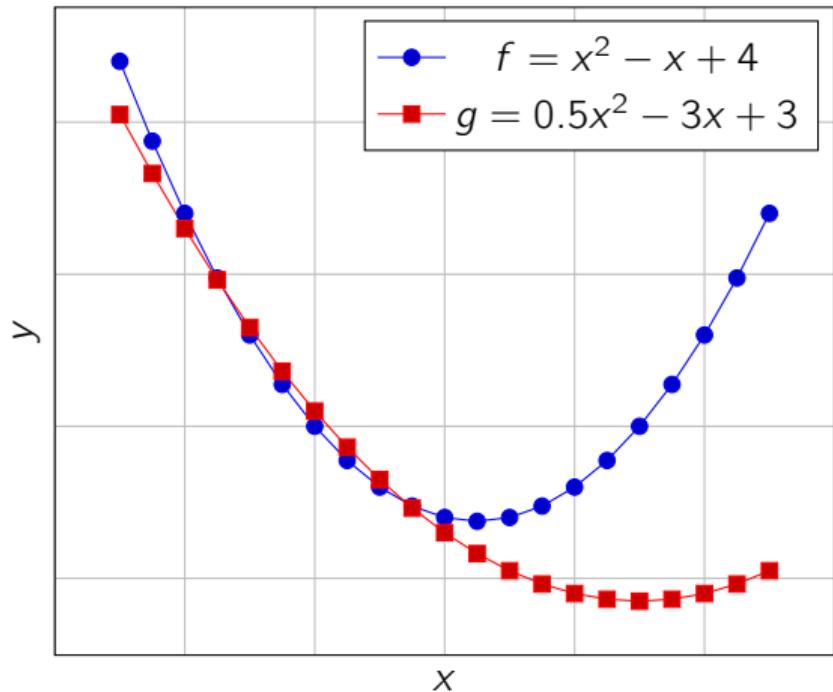
4.0 Resources

- ▶ TeXample.net
- ▶ PGFPlots.net
- ▶ PGFPlots Gallery
- ▶ Pretty figures (Tool from ETH Zurich)



4.0 Plotting CSV files

x	f	g
-5.0	34.0	30.5
-4.5	28.75	26.625
-4.0	24.0	23.0
-3.5	19.75	19.625
-3.0	16.0	16.5
-2.5	12.75	13.625
-2.0	10.0	11.0
-1.5	7.75	8.625
-1.0	6.0	6.5



4.0 Integration with External Tools

I would not recommend the following anymore:*

`matlab2tikz` <https://github.com/nschloe/matlab2tikz> Export Matlab figures directly to TikZ.

`matplotlib2tikz` <https://github.com/nschloe/matplotlib2tikz> Export Matplotlib figures directly to TikZ.

*use CSV to plot, making it easier to update later.

4.0 Tikz Externalize (in Overleaf)

- ▶ TikZ is recompiled every run
- ▶ externalize to save as PDF
- ▶ `\tikzexternalize{prefix=tikz/}` command must be given in the project's main .tex file
- ▶ Ensure in Overleaf that `tikz/` is created and contains a dummy file
- ▶ Set a filename for each TikZ picture
`\tikzsetnextfilename{file name}`
- ▶ More information on the Overleaf Documentation.

1. Why L^AT_EX?
2. Getting up and running
3. The basics
4. Up your L^AT_EX game with TikZ
5. Master Thesis Template

5.0 Now it's your turn

- ▶ Download and compile the master's thesis template at
 - KU Leuven: <https://iiw.kuleuven.be/english/students/master-thesis/templates>
 - UGent: <https://latex.ugent.be/>
- ▶ Clean-up the .bib file
- ▶ Plot a graph using Tikz with your own generated data
- ▶ Include two pictures and place them side-by-side
- ▶ Add another reference and cite it in the document.
- ▶ Add another abbreviation to the abbreviations.tex document and use it in your text (in plural).

5.1 Best Practices

- ▶ use `\usepackage{subcaption}`, not subfigure package
- ▶ use `\usepackage{biblatex}`, not package cite and natbib
- ▶ use `\usepackage{cleveref}`, not built-in ref
- ▶ use `\usepackage{siunitx}`
- ▶ use `\usepackage{booktabs}` and `\usepackage{tabularx}` if required
- ▶ name your Tikz figures
- ▶ Open issues in the GitHub repo for feature requests or errors. (KU Leuven template and <https://github.com/DRAMCO/writing-scientific-papers-in-latex-tips-and-tricks>)
- ▶ structure your text using `\input{}` commands.
- ▶ Comment out parts of the thesis to compile quicker (chapter per chapter), also handy when debugging

5.1 Common issues

- ▶ Copying and pasting resulted in an error. Often Unicode problem.
- ▶ Read the log outputs, i.e., errors, when compiling failed.
- ▶ Use of reserved characters: \ { } \$ & # ^ _ % ~ (in .bib or in text). You need to escape them using \ or other means.



5.1 Acknowledgments & References

- ▶ This slide deck started from previous work from Dr. Ing. Jens Vankeirsbilck and Ing. Emanuele Peschiera.
- ▶ Thanks to Benjamin J. B. Deutschmann and Thomas Wilding for the beautiful Tikz examples.

- ▶ Thesis specific: <https://dramco-edu.github.io/ThesisTips-and-Tricks>
- ▶ Writing documents in \LaTeX :
<https://github.com/DRAMCO/writing-scientific-papers-in-latex-tips-and-tricks>
- ▶ \LaTeX specific : <https://github.com/dramco-edu/LaTex>
- ▶ \LaTeX Workshop: <https://github.com/GillesC/LaTeX-Workshop>

LaTeX workshop

From novice to expert, to appreciator.

Prof. Dr. Gilles Callebaut
KU Leuven Ghent – Dramco

<https://github.com/GillesC/LaTeX-Workshop>