

**Introduction**

Introduction

**L<sup>A</sup>T<sub>E</sub>X**

Introduction

Why L<sup>A</sup>T<sub>E</sub>X?

Technicalities

Folder structure  
and file names

**TeXstudio**

How to work with  
TeXstudio

**Exercises**

Baby-steps

Paper structure

Formula's

Figures

Tables

Referencing

**Conclusion**

Next time

# **L<sup>A</sup>T<sub>E</sub>X for Economics and Business Administration**

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# Why this workshop?

- In the *social sciences* few attention to what tools to use (and why)
- L<sup>A</sup>T<sub>E</sub>X is very much used in the scientific world and *works* brilliantly together with
  - statistical packages, such as `Stata` and `R`,
  - markdown/HTML,
  - reference managers.
- Why I want to give this workshop
  - intrinsic interest
  - my goal: pre-conferences workshops / courses

# What I want (and don't want) with this workshop

- Give a general introduction of why some tools work together
  - L<sup>A</sup>T<sub>E</sub>X
  - reference managers
  - (statistical) output
- Give an introduction to L<sup>A</sup>T<sub>E</sub>X
  - First the basics + using references
  - Next workshop: some advanced stuff
- What I do not want
  - Tell you what applications to use (**you** need to decide and make a **well-informed** decision)

# Background

- T<sub>E</sub>X has been devised by Donald E. Knuth in the late 70's
- L<sup>A</sup>T<sub>E</sub>X is a set of macro's around TeX and devised in the 80's
- L<sup>A</sup>T<sub>E</sub>X is a *typesetting program*, not a *Word processor*
  - It is actually some code that needs to be compiled
  - Code is typed in by an editor
- So,
  - Huge differences between Word and L<sup>A</sup>T<sub>E</sub>X
  - for L<sup>A</sup>T<sub>E</sub>X you need an editor:
    - Specific editors: TexStudio, TexShop, RStudio
    - General editors: Sublime, TextMate, Atom, Vim, Emacs

# Disadvantages

- Not WYSIWYG
- You need to learn (quite) some commands
  - Learning curve, but
  - hurray for [cheat sheets](#) and Google
- Difficult to cooperate with people from the *dark side*
- *Basic* L<sup>A</sup>T<sub>E</sub>X has *difficulties* with incorporating new fonts (Hoefler, minion pro)
  - XeTeX
  - For the purists: L<sup>A</sup>T<sub>E</sub>X does it right ([L<sup>A</sup>T<sub>E</sub>X vs Word](#))
- Difficult to create unstructured and ugly documents

# Advantages

- Free (as in beer) and ubiquitous
- WYSIWYM
- Consistent lay-out throughout the whole document (including tables, appendices, formulas, source code, etc)
- Internal references are a breeze (references, ToC, ToT ...)
- Forced to structure documents
- Macros, thus scriptable
- Large community, thus a package for almost everything (books, articles, presentation, posters, exams, musicscores)
- Superior typography & output
- Many free **L<sup>A</sup>T<sub>E</sub>X** templates

## Introduction

Introduction

## L<sup>A</sup>T<sub>E</sub>X

Introduction

Why L<sup>A</sup>T<sub>E</sub>X?

Technicalities

Folder structure  
and file names

## TeXstudio

How to work with  
TeXstudio

## Exercises

Baby-steps

Paper structure

Formula's

Figures

Tables

Referencing

## Conclusion

Next time

# L<sup>A</sup>T<sub>E</sub>X versus Markdown

- Markdown (all variants): lightweight markup language that can export to .doc, .html, and .pdf.
- Much easier than L<sup>A</sup>T<sub>E</sub>X but less flexible
- Used by writers/blogs even for complete websites
- But good interaction with L<sup>A</sup>T<sub>E</sub>X; if not only for formula's

## Introduction

Introduction

## L<sup>A</sup>T<sub>E</sub>X

Introduction

Why L<sup>A</sup>T<sub>E</sub>X?

### Technicalities

Folder structure  
and file names

## TeXstudio

How to work with  
TeXstudio

## Exercises

Baby-steps

Paper structure

Formula's

Figures

Tables

Referencing

## Conclusion

Next time

# How does L<sup>A</sup>T<sub>E</sub>X work in practice?

- You edit a `.tex` file without thinking about how it looks
  - distraction free writing (yeah right)
- You then compile it
  - L<sup>A</sup>T<sub>E</sub>X is unforgiving: if there is an error, usually it does not compile
  - Typically, errors are missing brackets or parentheses.
- Typically, source `.tex` file is compiled into `.pdf`



# A process diagram

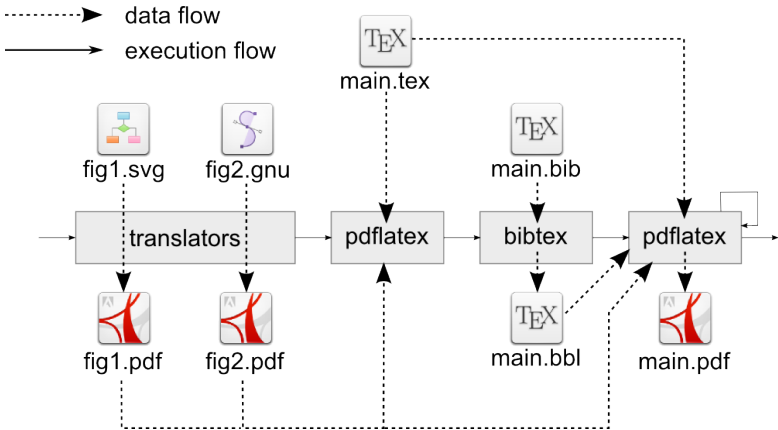


Figure: Process diagram

# Code, documentation and output

## Introduction

Introduction

## L<sup>A</sup>T<sub>E</sub>X

Introduction

Why L<sup>A</sup>T<sub>E</sub>X?

## Technicalities

Folder structure  
and file names

## TeXstudio

How to work with  
TeXstudio

## Exercises

Baby-steps

Paper structure

Formula's

Figures

Tables

Referencing

## Conclusion

Next time

- 1 Synonyms
- 2 All based on `.txt` files
- 3 Encompasses almost anything
  - data itself (`.csv`, `.txt`)
  - set of commands for data cleaning and statistical analysis (`.do`, `.R`)
  - database with references (`.bib`)
  - text for articles, presentations or websites (`.tex`, `.html`)
- 4 Only output is displayed/interpreted differently (e.g., in a browser or pdf viewer)

# Folder structure of your new project (theses, paper, assignment & research)

- Think *a priori* about project set-up
  - Seperate analysis, data and output files
- Be careful with source data!
  - Seperate source and derived data files
  - Typically
    - you get/collect data
    - transform data
    - analyse data
- Keep track of all these stages!

## Introduction

Introduction

## L<sup>A</sup>T<sub>E</sub>X

Introduction

Why L<sup>A</sup>T<sub>E</sub>X?

Technicalities

Folder structure  
and file names

## TeXstudio

How to work with  
TeXstudio

## Exercises

Baby-steps

Paper structure

Formula's

Figures

Tables

Referencing

## Conclusion

Next time

# TeXstudio: A quick tour

- Preferences
- Keyboard shortcuts
- LaTeX dropdown menu

## Introduction

Introduction

## L<sup>A</sup>T<sub>E</sub>X

Introduction

Why L<sup>A</sup>T<sub>E</sub>X?

Technicalities

Folder structure  
and file names

## TeXstudio

How to work with  
TeXstudio

## Exercises

### Baby-steps

Paper structure

Formula's

Figures

Tables

Referencing

## Conclusion

Next time

# First: organize!

- 1 Create a specific workshop folder somewhere where you can find it.
- 2 Think about versioning system and a back-up system
- 3 E.g.: use dropbox and/or Time Machine

# Exercise 1: Open from template and fill in!

```
1 \documentclass[] {article}
2 %opening
3 \title{}
4 \author{}
5
6 \begin{document}
7
8 \maketitle
9
10 \begin{abstract}
11
12 \end{abstract}
13
14 \section{}
15
16 \end{document}
```

## Introduction

Introduction

## L<sup>A</sup>T<sub>E</sub>X

Introduction

Why L<sup>A</sup>T<sub>E</sub>X?

Technicalities

Folder structure  
and file names

## TeXstudio

How to work with  
TeXstudio

## Exercises

### Baby-steps

Paper structure

Formula's

Figures

Tables

Referencing

## Conclusion

Next time

# OK; and now what?

- 1 Save your file in your folder (give is an appropriate name)
- 2 Press F1 (or F5)
- 3 The editor now sends L<sup>A</sup>T<sub>E</sub>X the message that it should *compile* your file
- 4 L<sup>A</sup>T<sub>E</sub>X creates many new files

# Exercise 2: Create a paper structure

```
1 \section{ }  
2 \subsection{ }  
3 \subsubsection{ }  
4
```

Note that the following are used for books

```
1 \part{ }  
2 \chapter{ }
```

And for bigger projects:

```
1 \include{ }  
2 \input{ }
```



# Intermezzo: preamble

Part before `\begin document` is called preamble

```
1 \documentclass[] {article}
2
3 % This is where packages are loaded
4 % and specific commands are given that
5 % determine how the lay-out and desing
6 % of your document will look like
7 % including: references, tables,
8 % paragraphs, headers, etc.
9
10 \begin{document}
```

# Intermezzo: white spaces and special characters

An empty line starts a new paragraph and consecutive white spaces are treated as one

```
1 One paragraph
2
3 Second      paragraph (just one white space)
```

The following characters are reserved # \$ % & \_ { } ~ \ and should be used as follows

```
1 \# \$ \% \^ \& \_ \{ \} \~{}
2 \textbackslash{}
```

So, with a backslash before except for the backslash (does this make sense?)

# Exercise 3: Create a table of contents

More complex text structures are relatively easy, just insert  
(after `\begin document`)

```
1 \tableofcontents
2 \listoffigures
3 \listoftables
```

## Introduction

Introduction

## L<sup>A</sup>T<sub>E</sub>X

Introduction

Why L<sup>A</sup>T<sub>E</sub>X?

Technicalities

Folder structure  
and file names

## TeXstudio

How to work with  
TeXstudio

## Exercises

Baby-steps

**Paper structure**

Formula's

Figures

Tables

Referencing

## Conclusion

Next time

- Itemization

```
1 \begin{itemize}
2     \item blue
3     \item red
4 \end{itemize}
```

- Enumeration

```
1 \begin{enumerate}
2     \item first item
3     \item second item
4 \end{enumerate}
```

# Exercise 4: Lists

Create the following mode choice list in your `.tex` document

- 1 Cycling
- 2 Walking
- 3 Driving
- 4 Public transport
  - Bus
  - Tram
  - Metro
  - Train

# Further text control

- Bold

1 `\textbf{bold}`

- Emphasize

1 `\textit{italics}` or `\emph{emphasized}`

# Formula's

Inline math  $\$ \$$ ; displayed math  $\$ \$ \$ \$$ ; for example:

```
1  $x^2$
2  $x_2$
3  $\sqrt{x}$
4  $$Y = K^\alpha L^{1-\alpha}$$
5  $$\sum_{i=1}^I$$
6  $$\frac{\partial x}{\partial y}$$
7  \begin{equation}
8      E = mc^2
9  \end{equation}
```

## Introduction

Introduction

## L<sup>A</sup>T<sub>E</sub>X

Introduction

Why L<sup>A</sup>T<sub>E</sub>X?

Technicalities

Folder structure  
and file names

## TeXstudio

How to work with  
TeXstudio

## Exercises

Baby-steps

Paper structure

Formula's

Figures

Tables

Referencing

## Conclusion

Next time

# Exercise 5: Create these formula's

- 1 Regression formula:

$$y_i = \alpha + \beta x_i + \epsilon_i$$

- 2 The mean

$$\bar{x} = \frac{1}{N} \sum_{i=1}^N x_i$$

- 3 Optimal economic order quantity:

$$Q^* = \sqrt{\frac{2DK}{h}}$$



# Figures

## Figures/graphs and tables in a floating environment

```
1 \begin{figure}[h!]{  
2 \center  
3 \includegraphics{ligatures_latex}  
4 \caption{A figures about ligatures}  
5 \label{fig:ligatures}  
6 \end{figure}
```

Figures can be .pdf, .jpg, .png and a whole lot of other types (but not bitmaps!)

# Tables

## Introduction

Introduction

## L<sup>A</sup>T<sub>E</sub>X

Introduction

Why L<sup>A</sup>T<sub>E</sub>X?

Technicalities

Folder structure  
and file names

## TeXstudio

How to work with  
TeXstudio

## Exercises

Baby-steps

Paper structure

Formula's

Figures

**Tables**

Referencing

## Conclusion

Next time

```
1 \begin{table}[t!]  
2     \caption{This is the caption}  
3     \begin{tabular}{|l|c|r|}  
4         \hline  
5         first & row & data \\  
6         second & row & data \\  
7         \hline  
8     \end{tabular}  
9     \label{tab:example}  
10 \end{table}
```

# Referencing

## Internal references are a breeze

```
1 \label{} % Label something
2 \ref{} % Refer to that
3 \footnote{} % Add footnote
4 \thanks{} % For in title
```

# Exercise 6: Create a table

Create the following table

## Introduction

Introduction

## L<sup>A</sup>T<sub>E</sub>X

Introduction

Why L<sup>A</sup>T<sub>E</sub>X?

Technicalities

Folder structure  
and file names

## TeXstudio

How to work with  
TeXstudio

## Exercises

Baby-steps

Paper structure

Formula's

Figures

Tables

Referencing

## Conclusion

Next time

**Table:** Average grades

First name	Surname	Grade
Sherlock	Holmes	7.9
John H.	Watson	8.1

And refer to it in text as such:

*Table 1 gives the average grades for course solving crimes.*

## Introduction

Introduction

## L<sup>A</sup>T<sub>E</sub>X

Introduction

Why L<sup>A</sup>T<sub>E</sub>X?

Technicalities

Folder structure  
and file names

## TeXstudio

How to work with  
TeXstudio

## Exercises

Baby-steps

Paper structure

Formula's

Figures

Tables

Referencing

## Conclusion

Next time

## Literature references (at the end)

```
1 \cite{} % cite something
2 % Now tell LaTeX where to find references
3 \bibliography{references.bib}
4 % and which citation style to use
5 \bibliographystyle{apalike}
```

Later, we dive into how to make this look good

## Introduction

Introduction

## L<sup>A</sup>T<sub>E</sub>X

Introduction

Why L<sup>A</sup>T<sub>E</sub>X?

Technicalities

Folder structure  
and file names

## TeXstudio

How to work with  
TeXstudio

## Exercises

Baby-steps

Paper structure

Formula's

Figures

Tables

Referencing

## Conclusion

Next time

# Exercise 7: References

- 1 Search on Google Scholar for three references from Erik Verhoef and/or Wout Dullaert
- 2 Put those in a `.bib` file in the **same** directory as your `.tex` file
- 3 Refer to those in your `.tex` file
- 4 Create the reference list

## Introduction

Introduction

## L<sup>A</sup>T<sub>E</sub>X

Introduction

Why L<sup>A</sup>T<sub>E</sub>X?

Technicalities

Folder structure  
and file names

## TeXstudio

How to work with  
TeXstudio

## Exercises

Baby-steps

Paper structure

Formula's

Figures

Tables

Referencing

## Conclusion

Next time

# Next workshop

- Use of packages
- Making things look better!
- Graphs
- Better tables with `Stata` and `R` output
- Slides