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LaTeX for Economics and Business Administration

Thomas de Graaff

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Why this workshop?

- In the *social sciences* few attention to what tools to use (and why)

- LaTeX 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
  - LaTeX
  - reference managers
  - (statistical) output
- Give an introduction to LaTeX
  - 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

- TeX has been devised by Donald E. Knuth in the late 70's
- LaTeX is a set of macro's around TeX and devised in the 80's
- LaTeX 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 LaTeX
  - for LaTeX you need an editor:
    - Specific editors: TexStudio, TexShop, RStudio
    - General editors: Sublime, TextMate, Atom, Vim, Emacs

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Disadvantages

- Not WYSIWYG
- You nead to learn (quite) some commands
  - Learning curve, but
  - hurray for cheat sheets and Google
- Difficult to cooperate with people from the *dark side*
- *Basic* LaTeX has *difficulties* with incorporating new fonts (Hoefler, minion pro)
  - XeTeX
  - For the purists: LaTeX does it right (LaTeX 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 LaTeX templates

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LaTeX versus Markdown

- Markdown (all variants): lightweight markup language that can export to `.doc`, `.html`, and `.pdf`.
- Much easier then LaTeX but less flexible
- Used by writers/blogs even for complete websites
- But good interaction with LaTeX; if not only for formula's

How does LaTeX work in practice?

- You edit a `.tex` file without thinking about how it looks
  - distraction free writing (yeah right)
- You then compile it
  - LaTeX 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`

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A process diagram

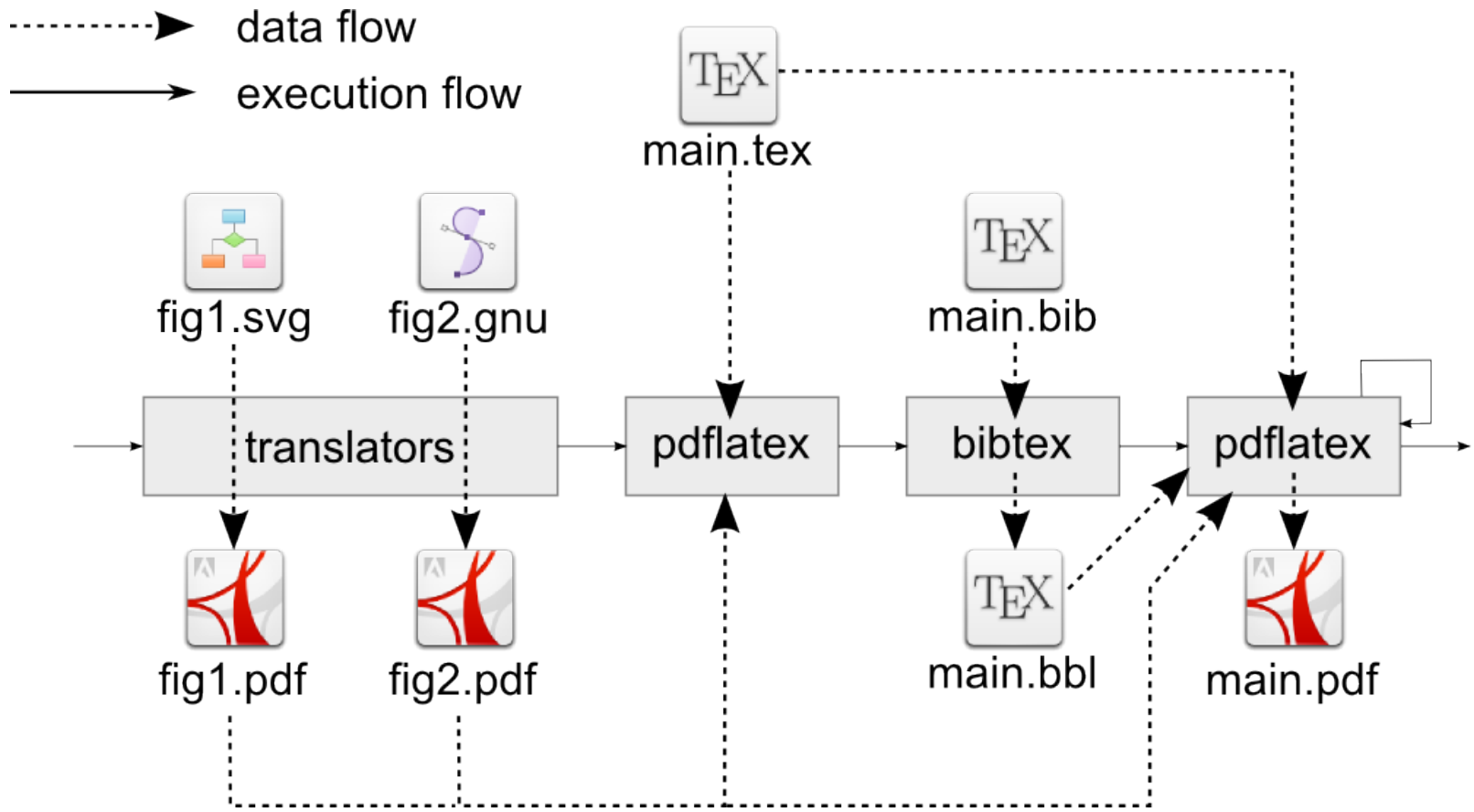

Figure: Process diagram

Code, documentation and output

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!

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TeXstudio: A quick tour

- Preferences
- Keyboard shortcuts
- LaTeX dropdown menu

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

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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}
```

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 LaTeX the message that it should *compile* your file
4. LaTeX creates many new files

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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}
```

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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
```

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Lists

- 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

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Further text control

- Bold

```
1 \textbf{bold}
```

- Emphasize

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

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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}
```

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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

```
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}
```

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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

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.*

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BibTeX

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

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

Next workshop

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