LaTeX for Methodologists

Lecture 1: Introducton

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Contact Details

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Introduction

- LaTeX is a completely different way of writing assignments, papers, articles and even presentation slides and books
- This course is a brief introduction to using LaTeX for creating scientific documents
- It is specifically aimed at psychological researchers and methodologists
  - Relatively little focus on mathematical formulae
  - APA style documents
  - Incorperating statistical anayses with `R` and `Sweave/knitr`

Course Outline

April 2:	Introduction
April 10:	Basics of writing in $\LaTeX$
April 16:	Writing APA style articles
April 23:	Advanced topics

Course Outline

April 2:	Introduction
	▶ What is LaTeX?
	▶ Why use LaTeX?
	▶ How to obtain a LaTeX distribution?
	▶ How to obtain a LaTeX editor?
	▶ General outline of a LaTeX document
April 10:	Basics of writing in LaTeX
April 16:	Writing APA style articles
April 23:	Advanced topics

Course Outline

April 2:	Introduction
April 10:	Basics of writing in LaTeX
	▸ Document Structure
	▸ Sectioning
	▸ Writing text
	▸ Environments
	▸ Special text
	▸ Mathematical formulae
April 16:	Writing APA style articles
April 23:	Advanced topics

Course Outline

April 2:	Introduction
April 10:	Basics of writing in LaTeX
April 16:	Writing APA style articles ► The apa document class ► Header information ► Writing the body ► Citations using BibTeX and apacite
April 23:	Advanced topics

Course Outline

April 2:	Introduction
April 10:	Basics of writing in LaTeX
April 16:	Writing APA style articles
April 23:	Advanced topics

- Incorperating statistics using `R` and `Sweave/knitr`
- Making presentation slides with `beamer`

Today's lecture

Introduction

What is LaTeX?
- History of LaTeX

Why use LaTeX?
- LaTeX vs WYSIWYG

Obtaining LaTeX

Making a first LaTeX document

Hello world example

What is LaTeX?

LaTeX is…

- A program that takes a plain text file with codes as input and produces a output document
  - This process is usually called *compiling*
  - The input is a plain text file with `.tex` extension
  - The output is a multipage vector based image file. In the past this was `.DVI` but nowadays mostly `pdf` and `postscript` are used
  - We will use `.pdf`, which can be created with the pdfLaTeX program
- The programming language in which the input file is written

What is LaTeX?

LaTeX refers to the *programming language* used to write the input file and the *program* used to interpret this file and compile the output file. It does **not** refer to an editor in which you write the input file.

What is LaTeX?

Simple representation:

$$\begin{tikzcd}
\boxed{\text{.tex}} \arrow[r] & \text{pdf}\LaTeX \arrow[r] \arrow[d] & \boxed{\text{.pdf}} \\
& \boxed{\text{other files}} &
\end{tikzcd}$$

What is LaTeX?

More advanced representation including Sweave and citations.

$$\begin{tikzcd}
\boxed{\text{.Rnw}} \arrow[r] & \text{Sweave} \arrow[r] \arrow[d] & \boxed{\text{.tex}} \arrow[r] & \text{pdf}\LaTeX \arrow[r] \arrow[d, bend left] & \boxed{\text{.pdf}} \\
\boxed{\text{data}} \arrow[ur] & \boxed{\text{figures}} \arrow[urr] & & \boxed{\text{other files}} \arrow[u, bend left] \arrow[d, bend left] & \\
& & \boxed{\text{.bib}} \arrow[r] & \text{BibTeX} \arrow[u, bend left] &
\end{tikzcd}$$

What is LaTeX?

For now, only consider:

$$\begin{tikzcd}
\boxed{\text{.tex}} \arrow[r] & \text{pdf\LaTeX} \arrow[r] \arrow[d] & \boxed{\text{.pdf}} \\
& \boxed{\text{other files}} &
\end{tikzcd}$$

History of TEX

- In 1969, computer scientist Donald Knuth published the book “The Art of Computer Programming”. It was typeset using 19th century techniques.
- 8 years later, in 1977, Knuth received proofs of the second edition. By this time the typesetting technology were largely replaced photography and he found the proofs awful
- With computers on the rise, Knuth saw a future in digital typesetting and decided that a long term stable system for digital typesetting was needed.
- This lead Knuth to devellop TEX

TEX

- TEX is a low-level markup and programming language (because it has if-else statements)
- Its name comes from the greek word $\tau\epsilon\chi\nu o\lambda o\gamma\iota\alpha$ (technologìa), which translates to “technology”.
- TEX is meant to be very stable, so that it is a platform that produces the same documents for many years.
- Its current version is 3.1415926. Future version numbering will asymptotically approach π

TEX

Donald Knuth on the future of TEX:

> *absolutely final change (to be made after my death), will be to change the version number to π, at which point all remaining bugs will become features.*

History of LaTeX

- TeX is a very low-level language, meaning you have to specify many settings to control the way your document looks
- In the early 1980s, Leslie Lamport wrote a system of macros to automate most things of TeX, this resulted in LaTeX
- LaTeX is based on the idea that authors should be able to focus on the content of what they are writing without being distracted by its visual presentation
- The current version of LaTeX is LaTeX 2$_\varepsilon$, a new version is being developed for over 20 years now

LaTeX now

- Almost all use of TeX is through LaTeX.
- LaTeX is free as in “free speech“ an free beer
- LaTeX is used especially by many researchers as main method of producing documents
- There is a large active and supportive community behind LaTeX that produce many packages for extending LaTeX
- There is an abundance of good software for editing LaTeX files

WYSIWYG programs

- LaTeX is completely different from What You See Is What You Get programs (WYSIWYG) you are used to
- For example:
  - Microsoft Word
  - Openoffice.org
  - LibreOffice
- The main difference between the the two is that in WYSIWYG programs you directly edit the output file while with LaTeX you edit the input file

Disadvantages of LaTeX vs. WYSIWYG

- LaTeX comes with a different learning curve. Anyone can write something in WYSIWYG programs, while it takes some time to even produce basic documents in LaTeX
- It can be hard to see what the document will look like
- You need to know a lot of commands to use LaTeX (but, as we will see later, LaTeX editors greatly reduce this)
- It can be harder to make very specific changes in LaTeX
- LaTeX can be very frustrating when it is not clear why your document does not look the way you want it to look
- Collaboration on LaTeX documents is harder, but Google comes to the rescue

Advantages of LaTeX vs. WYSIWYG

- In LaTeX your documents will look very professional with minimal effort
- Produce your documents in PDF
  - Your audience reads your document in a lightweight reader instead of an editor
  - Your documents do not require special software to view
  - Your documents will always look the same
- Your files are all in plain text. No binary documents that can break causing you to lose what you have written
- You do not have to spend time on specifying the layout, placing the figures, writing the reference list and making sure the fonts are all correct
- Mathematical formulae can easily be included.
- Your document is very flexible. Need to add a figure? All references to later figures are automatically corrected!

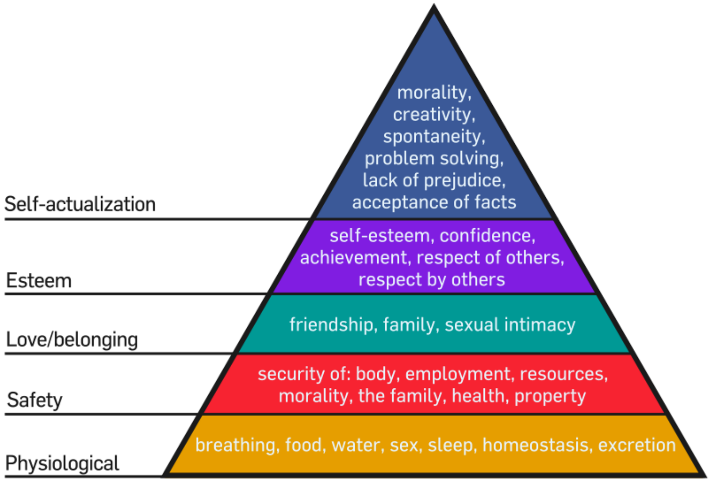
Ambiguities in LaTeX vs. WYSIWYG

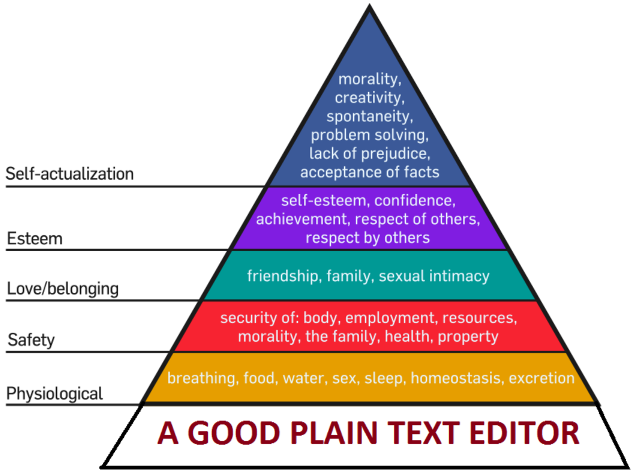
- LaTeX forces you to properly section your article
- Some journals require LaTeX format, and others do not accept LaTeX format
- LaTeX takes a long time to learn
- While you can do marvelous things with WYSIWYG editors, this takes even longer to learn and is usually not wanted in scientific reports

Obtaining LaTeX

To use LaTeX you need three things:

- A *plain text editor*
- A *LaTeX distribution*
- A program to view PDF files
    - Adobe Reader


morality, creativity, spontaneity, problem solving, lack of prejudice, acceptance of facts
Self-actualization
self-esteem, confidence, achievement, respect of others, respect by others
Esteem
friendship, family, sexual intimacy
Love/belonging
security of: body, employment, resources, morality, the family, health, property
Safety
breathing, food, water, sex, sleep, homeostasis, excretion
Physiological


morality, creativity, spontaneity, problem solving, lack of prejudice, acceptance of facts
self-esteem, confidence, achievement, respect of others, respect by others
friendship, family, sexual intimacy
security of: body, employment, resources, morality, the family, health, property
breathing, food, water, sex, sleep, homeostasis, excretion
A GOOD PLAIN TEXT EDITOR
Self-actualization
Esteem
Love/belonging
Safety
Physiological

LaTeX editors

- A LaTeX distribution supplies you with the programs needed to compile LaTeX documents
- But you also need an editor to write these documents
- As is the same with all programming languages, LaTeX documents are written in *plain text*
- Because of this, any plain text editor can be used
- Editors come in all sorts of sizes with highly different levels of complexity. In general the complexer an editor the more you can do with it
- Which editor is the best is a highly debated subject!

A good editor for LaTeX has syntax highlighting, bracket matching, included log output and shortcuts for compiling and viewing your document

plain text editors

Typically a programmer wants to use a single editor for all languages. These so called plain text editors can differ strongly. Some examples of such editors that can be used for LaTeX

Notepad++	A very nice and clean editor for Windows. Very lightweight, not much functionality besides writing code
Gedit	The default text editor for Linux. Very lightweight and can be extended with many plugins
Emacs	The editor of choice for many programmers. Very hard to learn but very useful in the end. Is an IDE for many programming languages. Some consider it to be an operating system
Vim	Another editor of choice of many programmers

Even if you don't use it for LaTeX, you want a good plain text editor!

LaTeX editors

Other editors are specialized for LaTeX:

Rstudio	If you did not use this IDE yet for R then do so. Has especially good support for `Sweave` and `knitr`
TeXniccenter	Has a menu very similar to WYSIWYG editors with shortcuts for common pieces of codes
TeXmaker	Similar to TeXniccenter with less functionality but cross platform
TeXworks	A very basic LaTeX editor which does what you want it to do and not much else. Comes default with most distributions

Which editor to use?

Depends on your needs, writing style and preferences

Need to write?	Use:
Short note, abstract, outline, any text that does not need formatting	Don't use LaTeX, use a good lightweight plain text editor (notepad++, Gedit, etcetera.)
A lot of text while New to LaTeX and used to WYSIWYG editors	Use TeXnicCenter or TeXmaker
Text in which `R` code is included or run in the background	Use RStudio or Emacs (with `knitr`) package)
LaTeX texts often and programming in multiple languages	Learn a powerfull editor such as Emacs

TeXworks

In this course we will be using TeXworks because it is very basic and comes default with MiKTeX and MacTeX and is available for Linux as well.
Important to note is that TeXworks is *not* the only choice.
Indeed it isn't even metioned on the previous slide.

LaTeX distributions

- LaTeX is distributed through distributions
- A good distribution has a package manager that allows you go install and update packages with relative ease
- In this course we will be using:

Windows:	MikTeX
Mac:	MacTeX
Linux:	TeXlive

Detailed instructions to install these distributions can be found on the course website.

PATH variable

- The instruction guide will ask you to set something called a PATH variable
- This is a small list of paths to directories that tells your computer where it can find programs
- This enables you to run pdfLaTeX from commandline
- In some editors, this is the only way to make a shortcut to LaTeX
- Might not be needed now but useful to have set right lateron

A first LaTeX document

Open TeXworks, make a file with the following code:

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

Save this file in an empty folder. Then select “pdfLaTeX” from the drop down menu and press the play button.

Templates

- Often it can be hard to start from scratch
- Many templates exist to help you get started, find them on Google!
- Often in these comments are used to say what you need to do
    - A comment is preceded by a % sign

Tips

Learning LaTeX can take a while, and even after that you often encounter problems with compiling. Here are some tips to help when you get stuck:

- Compile your document often!
- Comments are a very useful debugging tool
- Use line numbering in your editor. the output of pdfLaTeX will mention the line number where things went wrong
- Use templates
- Really stuck? Try to identify the problem look online:
  - `http://google.com/`
  - `http://tex.stackexchange.com/`

For next week, try the following:

- Install a LaTeX distribution for your operating system using the instructions in the instructions on my website
- Install TeXworks
- Try to compile the hello world template aboce
- Try some templates. What works? What errors do you get if it doesn’t?