

# Introduction to (L)T<sub>E</sub>X

## Workshop

Dr Dainius Masiliūnas

Laboratory of Geo-Information Science and Remote Sensing  
Wageningen University & Research

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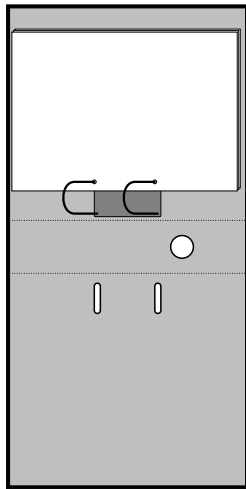
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B<sub>I</sub>T<sub>E</sub>X

CTAN

# Background

- Writing reports, papers, theses, articles, ...
- Office text processors: Microsoft Office Word, LibreOffice Writer, WPS Office Words, Calligra Words etc.
- Seemingly good software?
- But has irritations...
- Professionals use  $\text{\TeX}$ , a markup language for making documents
- Why?



## Issues with Office

- Images: they never stay in place, go above text, outside of caption boxes, etc.
- Copy-pasting text (or worse, tables) leads to formatting problems
- Different office programs render the same files differently
- Bibliography management is a hassle, citation styles are too rigid
- Math formulas handled by another program altogether
- Reformatting (for publishing etc.) is tricky
- Large documents/images become very slow
- $\text{\TeX}$  solves that, and more: it's fun!



# $\text{T}_{\text{E}}\text{X}$

- A typesetting system by Donald Knuth in 1978 (MS Word: 1990)
  - $\text{\LaTeX}$  (Leslie Lamport 1984): additions to base  $\text{T}_{\text{E}}\text{X}$  for ease of use
  - $\text{ConT}_{\text{E}}\text{Xt}$  (1996, Dutch): additions to  $\text{T}_{\text{E}}\text{X}$  for more control
- Document files are plain text (`.tex`, source code, markup)
- An engine (compiler) is used to turn it into a standard read-only document (PDF, PS)
  - $\text{pdf}\text{\LaTeX}$
  - $\text{X}_{\text{E}}\text{T}_{\text{E}}\text{X}$
- Highly extensible, heavily package-oriented: “there’s a package for that”
- Available as a distribution: engines + packages
- Free and open-source software, cross-platform





# Example

```
\documentclass[12pt]{article}
\usepackage{amsmath}
\title{\LaTeX}
\date{}
\begin{document}
\maketitle
\LaTeX{} is a document preparation system for
the \TeX{} typesetting program. It offers
programmable desktop publishing features and
extensive facilities for automating most
aspects of typesetting and desktop publishing,
including numbering and
cross-referencing,
tables and figures, page layout,
bibliographies, and much more.

\LaTeX{} was
originally written in 1984 by Leslie Lamport
and has become the
dominant method for using
\TeX; few people write in plain \TeX{} anymore.
The current version is \LaTeXe.

% This is a comment, not shown in final output.
% The following shows typesetting
power of LaTeX:
\begin{align}
E_0 &= mc^2
\\
E &= \frac{mc^2}{\sqrt{1-\frac{v^2}{c^2}}}
\end{align}

% Same in built-in LaTeX math:
$$ E_0 = mc^2 $$
$$ E = \frac{mc^2}{\sqrt{1-\frac{v^2}{c^2}}} $$
\end{document}
```

ℒℒℒℒ

ℒℒℒℒ is a document preparation system for the ℒℒℒℒ typesetting program. It offers programmable desktop publishing features and extensive facilities for automating most aspects of typesetting and desktop publishing, including numbering and cross-referencing, tables and figures, page layout, bibliographies, and much more.

ℒℒℒℒ was originally written in 1984 by Leslie Lamport and has become the dominant method for using ℒℒℒℒ; few people write in plain ℒℒℒℒ anymore. The current version is ℒℒℒℒℒℒ.

$$E_0 = mc^2 \quad (1)$$

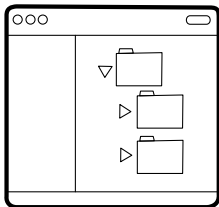
$$E = \frac{mc^2}{\sqrt{1-\frac{v^2}{c^2}}} \quad (2)$$

$$E_0 = mc^2$$

$$E = \frac{mc^2}{\sqrt{1-\frac{v^2}{c^2}}}$$

# Graphical user interfaces

- Quick access to formatting, math, table creation macros, spell checking, word wrap, search, compiling, viewing the result
- Cross-platform GUIs, such as:
  - [Texmaker](#) and [TeXstudio](#)
  - [Kile](#)
  - [LyX](#)
- All depend on an already installed  $\text{T}_{\text{E}}\text{X}$  distribution (i.e.  $\text{T}_{\text{E}}\text{X}$  Live) to work!
  - Linux distributions provide  $\text{T}_{\text{E}}\text{X}$  Live (and GUIs) out of the box via package managers
  - $\text{T}_{\text{E}}\text{X}$  Live installer for Windows [available](#)
  - macOS can use Mac $\text{T}_{\text{E}}\text{X}$



# Collaborative editing

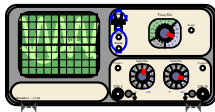
- Web-based editors (a la Google Docs)
  - Overleaf Pro:
    - Free for everyone with a WUR email! And all collaborators per-project
    - Track changes, double-click to find etc.
  - Others: Papeeria, Authorea, etc. but much more limited than Overleaf right now
- Git (thanks to plain text)
  - GitHub, GitLab, own server, ...
  - Beware of merge conflicts: split chapters into separate files, one line per sentence
  - Useful even when writing alone: no more problems with backups and multiple versions
- Both combined! Natively on Overleaf!





## Drawbacks

- Learning curve: pays off in the long run
- Confusing errors (if any!)
  - Auxiliary files in working directory may help: .log for engines, .blg for BibTEX
  - Overfull \hboxes: text interpreted as a character/box; if it cannot be broken up nicely, warns you
  - File '<package>.sty' not found. means you don't have the package installed
- Quirkiness:
  - pdfL<sup>A</sup>T<sub>E</sub>X doesn't support UTF-8 symbols
  - Need packages for handling image formats etc.
- People who are unwilling to learn to use collaborative L<sup>A</sup>T<sub>E</sub>X editors or PDF editors



## Want to learn more?

- WikiBooks:  
<https://en.wikibooks.org/wiki/LaTeX>
- CTAN: <http://ctan.org>
- Stack Exchange: <http://tex.stackexchange.com/>
- This presentation and examples:  
<https://github.com/GreatEmerald/tex-workshop>
- Paper for Advanced Earth Observation course
- Master thesis and first PhD paper
- PhD thesis template:  
[https://github.com/bbrede/Wageningen\\_PhD\\_thesis\\_template](https://github.com/bbrede/Wageningen_PhD_thesis_template)



# Questions?

## Theory

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# Practical

You can look at, compile and edit the examples given in the following slides on Overleaf.

1. Register and log into Overleaf:  
<https://www.overleaf.com/edu/wur>
2. Follow the invitation link:  
<https://www.overleaf.com/read/czfbwrhcjnz#e5bd1d>
3. Read-only; to make your own copy, click **“Menu”** at the top left, then **“Copy project”** (you must be **logged in!**)



# Text and math

(example.tex, utf8.tex)

- $\text{T}_{\text{E}}\text{X}$  is plain text: no formatting is preserved when pasting
- Whitespace is ignored, unless two new lines
- Inline maths capability with math-specific styles, syntax is fairly intuitive
- UTF-8 support is better in  $\text{X}_{\text{E}}\text{L}_{\text{A}}\text{T}_{\text{E}}\text{X}$ , e.g. text in Chinese

# Formatting

## (ISPRSGuidelines\_authors.tex)

- Formatting can be global or local
  - Global formatting is done in the file header: page margins, line spacing, font size, etc.; geometry package
  - Local formatting is done inline with special commands like `\texttt`, `\textbf`, `\textit`
  - Experts enjoy semantic styles by defining new commands:  
`\newcommand{\code}[1]{\texttt{#1}}`
- Journals often provide .cls style templates or template .tex files
  - `<filename>.cls`: use `\documenttype{<filename>}`
  - `<filename>.tex`: possibly use `\input{<filename>}`, edit or use as a reference
  - Example: ISPRS provides .cls files and an example .tex

# Figures

## (figures.tex)

- $\text{\LaTeX}$  has a figure environment that makes it easy to include figures and refer to them
- The position of figures is determined automatically – no problem to add more text
- $\text{\TeX}$  is optimised for vector graphics (PDF, EPS, SVG), avoid rasters
- `hyperref` package allows following references within the PDF

# BibTeX

## (bibliography.tex)

- A system that handles all things bibliography
- Database of bibliography is stored in plain text, .bib files, one may copy-paste entries from Google Scholar
- Reference managers (Zotero, Mendeley, EndNote etc.) can export to BibTeX format
- Cite entries by referring to their aliases
- The default citing package is rigid, use `natbib` or `biblatex` for customisability
- Integrates with `hyperref`
- Two-step process; might need two compilation rounds



## More packages!

(`acronyms.tex`, `changes.tex`, `gantt.tex`)

- CTAN: Comprehensive T<sub>E</sub>X Archive Network (<http://ctan.org>)
- 6609 packages at the moment of writing! (was 5199 in 2017)
  - `changes`: adding edit suggestions and comments!
  - `glossaries`: Acronym management!
  - `pgfgantt`: Gantt charts! Useful for writing proposals.
  - `tikz`: flowcharts and other vector graphics!
  - `textcomp`: symbols °, ©, ... for pdfL<sup>A</sup>T<sub>E</sub>X
  - `qrcode`: QR code generation!
  - `knitr`: embed R code into T<sub>E</sub>X!
    - Allows putting the output of *R* commands into plain text, no more copy-pasting results
    - Exact same tool as for `.Rmd`, handles `.Rtex` too
    - Actually an *R* package implementing a T<sub>E</sub>X engine
  - `beamer`: Presentations! Like this one!