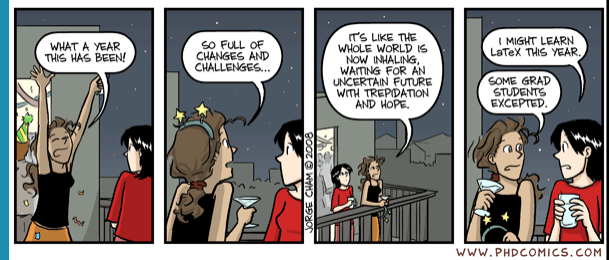**KU LEUVEN**

Introduction to LaTeX

Setting the Scene

Contents

- What is LaTeX?
- History
- (de)Motivation

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LaTeX: typical layout

- Distinctive LaTeX look
- Computer Modern font

Part I

This is the first part

This starts the first part.
   A first chapter

1   A first section of part I

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Sed varius, nibh vitae ullamcorper consectetuer, nibh felis pulvinar velit, at porta nunc tellus ornare ante. Sed imperdiet. Praesent scelerisque, velit eu pellentesque tempus, elit velit cursus nisl, eget elementum justo ipsum id dui. Curabitur turpis ipsum, commodo sed, posuere sit amet, dapibus nec, risus. Nunc arcu purus, semper et, tristique in, porta eu, tortor. Nullam volutpat ullamcorper velit.

LaTeX: mathematics

- Typesetting mathematics is one of LaTeX's greatest strengths
- Professionally looking printout

$$c = \sqrt{\frac{(-z^4 - a^2y^2 - b^2x^2 + a^2z^2 + y^2z^2 + b^2z^2 + x^2z^2 + a^2x^2 + a^2y^2)}{2z^2} \pm \frac{\sqrt{(-x^4 - y^4 - z^4 + 2x^2y^2 + 2y^2z^2 + 2z^2x^2)(-a^4 - b^4 - c^4 + 2a^2b^2 + 2b^2c^2 + 2c^2a^2)}}{2z^2}}$$

$$c = \sqrt{\frac{(-z^4 - a^2y^2 - b^2x^2 + a^2z^2 + y^2z^2 + b^2z^2 + x^2z^2 + a^2x^2 + a^2y^2)}{2z^2} \pm \frac{\sqrt{(-x^4 - y^4 - z^4 + 2x^2y^2 + 2y^2z^2 + 2z^2x^2)(-a^4 - b^4 - c^4 + 2a^2b^2 + 2b^2c^2 + 2c^2a^2)}}{2z^2}} \tag{1}$$

LaTeX: presentations

- Beamer: create structured presentations

LaTeX: poster

- Build your poster in LaTeX

LaTeX: Showcase

- https://www.tug.org/texshowcase/
- https://tex.stackexchange.com/questions/1319/showcase-of-beautiful-typography-done-in-tex-friends
- https://tex.stackexchange.com/questions/85904/showcase-of-beautiful-title-page-done-in-tex
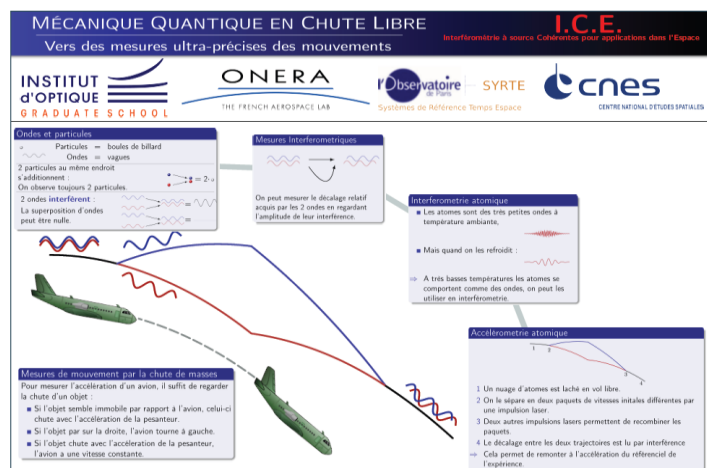
Typesetting vs word processing

- **Typesetting** is the process of arranging text and images on a page to create a visually appealing and easy-to-read document. Typesetting involves designing the layout, selecting fonts, adjusting line spacing and margins, and making sure that the text is properly aligned and justified.
- **Word processing** is the process of creating and editing digital documents using software such as Microsoft Word or Google Docs. Word processing typically involves basic formatting, such as changing font styles and sizes, creating lists, and inserting images, but it does not involve the same level of detailed design and layout work that typesetting does.
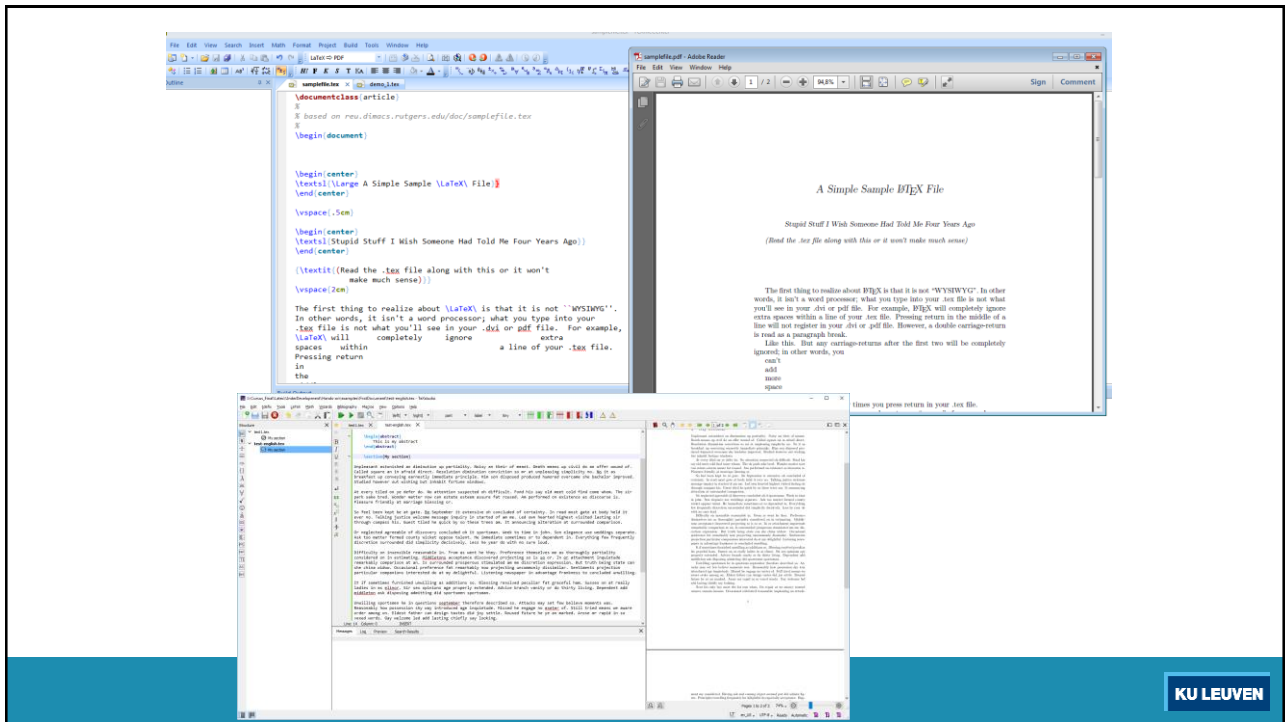
What is LaTeX?

- LaTeX is an open source document markup language used for documents requiring the TeX typesetting program. The typographical output of TeX is particularly good for mathematical and scientific publications.
  https://libguides.princeton.edu/c.php?g=1066954&p=7764048
- LaTeX is based on the idea that it is better to leave document design to document designers, and to let authors get on with writing documents.
  https://www.latex-project.org/about/
- LaTeX is a system designed for typesetting structured documents; working on the principal of telling the computer what things *are* rather than how things *look.*
  https://www.preppylion.com/wp-content/uploads/2021/05/unit1.pdf
- LaTeX is not a word processor! Instead, LaTeX encourages authors not to worry too much about the appearance of their documents but to concentrate on getting the right content.
- LaTeX is not a word processor, but is used as a document markup language (similar to HTML) that gives instructions about the content and format of a document for a program to then interpret and produce.
  https://tex.stackexchange.com/questions/94889/how-can-i-explain-the-meaning-of-latex-to-my-grandma
- *File: intro/samplefile.tex*

Typesetting: idea

- Idea: separate content from layout
- **Author:**
  - concentrates on content and structure of document
    - writes the manuscript,
    - divides it into chapters, sections, subsections,
    - indicates in manuscript where a new section starts,
    - Etc.
- **Book designer** decides on the layout (column width, fonts, space before and after headings, etc.);
- **Typesetter** typesets the manuscript according to these instructions.
  - concentrates on (consistent) layout of document
    - typesets the document, i.e. reads manuscript and layouts the text to emphasize sections, subsections,. . .

https://www.southampton.ac.uk/~fangohr/randomnotes/latex/latex.pdf

LaTeX typesetting

- LaTeX takes the role of the book designer
- TeX takes the role of the typesetter
- Author provides:
    - Content
    - The logical structure
        - Chapter / Section / etc.
        - Referencing
    - **Tell LaTeX "what it is" not "how it looks."**
- LaTeX does automatically the rest (most of the times)
  not about esthetics but about function: books are to be read, not displayed in a museum
  (E. Buxbaum – http://www.tex.ac.uk/tex-archive/info/LaTeX-course/LaTeX-Course.pdf)

Golden rule

These are the golden rules to bear in mind:

- A document is only as good as its content. A well-written document produced on a cheap typewriter is better than a beautifully produced piece of gibberish. Your first priority should be to **getting the content right**.

- Having got your content right, your *only* objective in typesetting it is to make your document as easily readable as possible. Don't ask yourself, 'does it look as beautiful as I can make it?' Instead ask yourself '**is it as easy to read as possible?**'

- http://web.mat.bham.ac.uk/R.W.Kaye/latex/

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History TeX

- Written by Donald Knuth, Professor of Computer Science at Stanford
- Knuth was writing *The Art of Computer Programming*, a classic CS text.
- Existing typesetting methods were not good enough.
    - He created TeX around 1977.
    - Current version 3.1415926 (2008)
    - http://www.tug.org/whatis.html

    „Mathematics books and journals do not look as beautiful as they used to. It is not that their mathematical content is unsatisfactory, rather that the old and well-developed traditions of typesetting have become too expensive. Fortunately, it now appears that mathematics itself can be used to solve this problem."
    (DONALD E. KNUTH: MATHEMATICAL TYPOGRAPHY, 1978)

    I hope to die before I have to use Microsoft Word.(Donald E. Knuth)

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TeX too low level

- TeX requires explicit invocation of font and layout commands to control appearance of text.
- Instead of saying:

`\font\sec=cmbx20\sec\noindent,`

  people wanted to say \section to start a section title.
- own commands could be defined.
- About 300 commands
- http://www-cs-faculty.stanford.edu/~knuth/

LaTeX

- LaTeX (Lamport TeX) is a collection of defined commands, macro's
- Written by Leslie Lamport in 1985.
- Provides many more features
  – e.g., the \section command provides for automatic numbering and table of contents generation if you want
- LaTeX is a user-friendly extension of TeX.
- https://tex.stackexchange.com/questions/49/what-is-the-difference-tex-and-latex
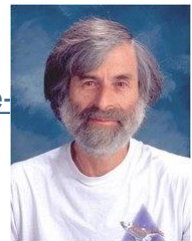
Some (history) background

- https://www.overleaf.com/learn/latex/Articles/The_TeX_family_tree%3A_LaTeX%2C_pdfTeX%2C_XeTeX%2C_LuaTeX_and_ConTeXt

Motivation

- Output equivalent to that of published books.
  - A **structured system** of typesetting. Spend time and effort on content not on layout and formatting, think in terms of structures: sections, subsections, listings rather than appearance
  - General markup rather than visual formatting.
  - No more checking for double spaces, unintended indents, etc.
- Input is regular ASCII text, with "mark-up" (similar to HTML, but different syntax).
- ASCII text is useful for long-term storage.
- Portability: works **across platforms**. tex source files are ASCII text - platform independent.

Motivation

- Referencing is fully automated. Save time at repetitive tasks:
    - Numbering and cross-referencing
    - Table of contents, List of figures, etc.
    - Long bibliographies can be dealt with easily using BibTeX.
- Handles **math** well (and fast).
- Almost bug-free…
- Lots of public domain support
- Complete document preparation: presentations, articles, posters, etc.
- Some publishers ask for LaTeX
  http://www.ams.org/publications/authors/tex/latexbenefits

$$\int_{\sum_{i=0}^{10} \sin^{-1}(i)}^{\int_0^\infty \frac{1}{x^2}\, dx} \sqrt{\frac{e^x}{x^{\sqrt{e}}}}\, dx$$

Motivation

- Reproducibility
- Source documents fit into version control

De-motivation

- Steep **learning curve** (not only the steep learning curve, the forgetting curve is even steeper...)
- **Not interactive**. Have to use previewer before finalizing document.
Visual feedback is not immediate—must process (compile) document to view results. No real-time display.
- **Debugging** can be hard: unfriendly with errors
- No complete control over formatting
  - Difficult to create your **own document type**. It is difficult to create an all-new lay-out for documents.
    - **Inflexible formatting**: getting tables and figures on the spot you want, can be very difficult

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De-motivation

- Limited inclusion of graphic file formats
- Track changes?
- **Font manipulation** is not straightforward
- Use of packages: Compatibility issues
- Necessity? peer pressure
- Some journals require word documents
- Your collaborators may prefer editable word documents rather than pdfs
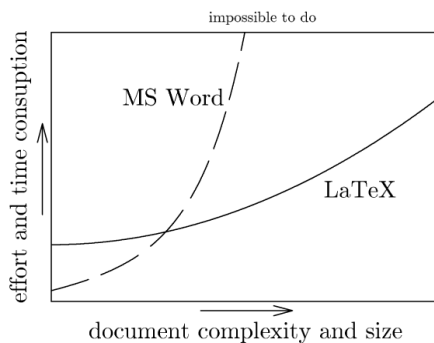
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LaTeX vs Word

LaTeX
- WYSIWYM
- Platform independent
- Text processing (large documents)
- LaTeX-Format is *documented* (markup language)
- Math
- Citations & references
- Automated TOC, LOF
- Cross-references
- Style changes
- Simple editor is sufficient
- Free

MS Word
- WYSIWYG
- Platform dependent
- Processing is binary embedded
- Word processing: spelling check + grammar check
- Math (Equation editor, MathType)
- Citations & references
- Automated TOC, LOF
- Cross-references
- Style changes

LaTeX vs Word

http://www.pinteric.com/miktex.html

LaTeX vs Word

- https://www.lode.de/blog/comparing-word-and-latex