Outline: LaTeX

Seminar on Selected Tools Week 0 — Python, LaTeX and Git

ppppass

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Section 1

Introduction

What is TEX and LATEX?

1. TEX is a typesetting system originally designed by Donald Knuth.
2. LATEX is a typesetting system based on TEX designed originally designed by Lesile Lamport.
3. Basic idea of TEX and LATEX: "What you think is what you get", distinguished from "What you see is what you get"
4. Programming mechanism of TEX and LATEX is based on macros.

Why to use LATEX?

1. Beautiful and elegant layout and fonts
2. Full and explicit control of details
3. Very easy to handle structured materials
   e.g. papers, books, notes
4. De facto standard for mathematics, physics and computer science
5. Widely used math modes for mathematical formulas
   e.g. Markdown, websites and even daily communication
6. A great number of packages, and an activate community

When not to use LATEX: the material is highly unstructured

Basic concepts

1. TEX engines and TEX formats
2. Commands (control sequences) and arguments
3. Whitespaces
4. Envorinments and groups
5. Math modes: inline and displayed
6. Packages and document classes
7. Floats: figures and tables
8. Bibliography tools

Basic structure of a document

1. Command `\documentclass{...}`: `article`, `ctexart` and `beamer`
2. Preamble: definitions and `\usepackage{...}`s
3. Begin a document environment: `\begin{document}`
4. Top matters: `\title{...}`, `\author{...}` and `\date{...}`
5. Section: `\section{...}` and so on
6. Paragraphs separated by a single blank line
7. End a document environment: `\end{document}`

Section 2

Basic typesetting

Text formatting

1. Special characters: `\&`, `\_`, `\S`
2. Whitespace: `\ `, `\!`, `\phantom{...}` and `\hspace{...}` Use two blank lines to initiate a new paragraph
3. Paragraphs: `\\`, `\par` and two blank lines
4. Orthogonal coordinates of fonts:
   English: `\ttfamily`, `\bfseries`, `\textrm{...}`, `\textit{...}`
   Chinese: `\kaishu`, `\heiti`
5. Emphasize: `\emph{...}`
6. Font size: `\tiny`, `\small`, `\large`, `\Large`, `\LARGE`
7. Align: `\centering`, `\raggedright`

Basic environments

1. Quotes: `quote`
2. Lists: `enumerate`, `itemize` and package `enumitem`
3. Theorems: `\newtheorem` and package `ntheorem`
4. Verbatim: `\verb'...'`
5. Program lists: `lstlisting` and package `listings`

Formula formatting

1. Use $ for inline formulas
   and envorinment `equation` for displayed ones
2. Symbols
3. Formula structures
4. Environments
5. Package `amsmath`

Mathematical symbols

1. Types: normal texts, operators, binary operators, relations accents
2. Fonts: `\mathrm{...}`, `\mathbf{...}`
3. Normal symbols: `\exists`, `\forall`
4. Operators: `\log`, `\sin`
5. Binary operators: `+`, `\setminus`, `\otimes`
6. Relations: `\le`, `\equiv`, `\approx`
7. Whitespace: `\,`, `\!`
   frequently used: `\mathop{\mathrm{d}\!} x`

Formula structures

1. Subscript and superscript: `_` and `^`
2. Fraction and binominals: `\frac{...}{...}`, `\binom{...}{...}`
3. Roots and radicals: `\sqrt{...}`
4. Huge operators: `\sum`, `\product`, `\bigoplus`
5. Delimiters: `\left`, `\right`, and brakets like `\lfloor`
6. Matrices: environment `matrix`, `bmatrix` and package `amsmath`

Mathematical environments

1. Basic equations: enviromnet `equation`
2. Matrices: environment `matrix`, `bmatrix`
3. If-cases: environment `cases`
4. Gathered equations: environment `gather`
5. Aligned equations: environment `align`
6. Formulas in formulas: environment `split`, `gathered` and `aligned`

Section 3

Further topics

Bibliography

1. BibTeX
2. Footnote: `\footnote{...}`
3. Cite: `\cite{...}`
4. Display: `\printbibliography`
5. BibLaTeX is also available

Floats

1. Environment `figure`
2. Environment `table`
3. Package `graphicx`

Tables

1. Environment `tabular` and `array`
2. Column formats: e.g. `|c|rrrlr|`
3. Align: `&` and `\\`
4. Row lines: `\hline`

Other useful packages

1. Layout: `geometry`
2. Longer table: `longtable`
3. Multiple integrals: `esint`
4. Calligraphy: `mathrsfs`
5. Algorithms: `algorithm2e` or `algorithm`
6. Hyper-links: `hyperref`
7. Include .pdf files: `pdfpages`
8. Thesis: `pkuthss`, `thuthesis`