

# Short introduction to L<sup>A</sup>T<sub>E</sub>X

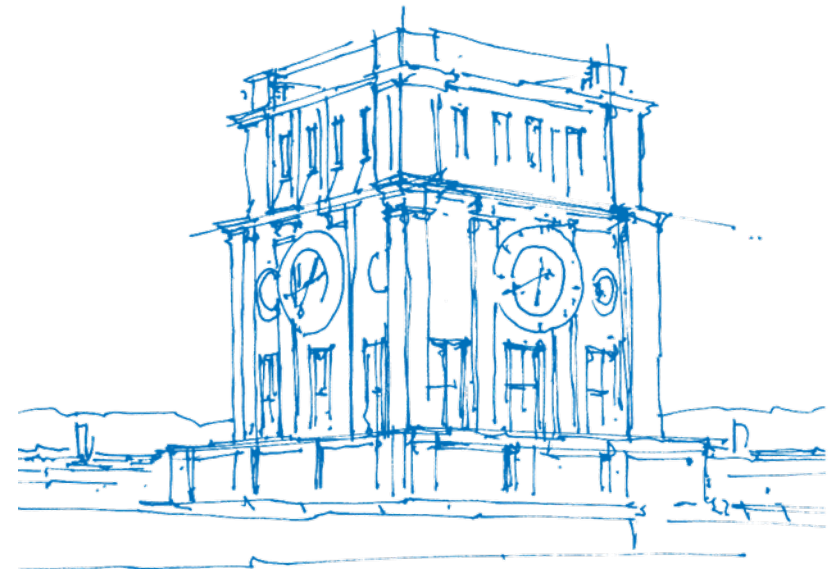
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München, November 15, 2016



*TUM Uhrenturm*

# Overview

In this presentation, I would like to

- Present the  $\text{\LaTeX}$  typesetting system to newbies
  - What  $\text{\LaTeX}$  is (not)
  - Advantages and disadvantages
  - Basic  $\text{\LaTeX}$  elements
  - How to get started
- Give advice to the experienced users among you
  - Build automation and tools
  - Version control with git
  - TUM templates and style



Figure:  $\text{\LaTeX}$  – A document preparation system. Source:  
<https://www.latex-project.org>

# What $\text{\LaTeX}$ is (not)

- It is a typesetting system for various document types
  - Journal articles
  - Books
  - Theses (Master's, Bachelor's, PhD, ...)
  - Presentation slides
- It is an open-source and platform independent software package
- It is a generator for PDF files
- It is **not** a word processor
- It is **not** a WYSIWYG editor (although there are certain  $\text{\LaTeX}$  editors with such a feature)

# Advantages and disadvantages

## Advantages:

- Produces nice looking documents, the user can focus on the content
- Takes care of automatic generation of
  - Cross-references (tables, figures, ...) and citations
  - Table of contents, list of figures, ...
  - Glossaries and bibliography
- Excellent typesetting of mathematical formulas
- Automatic placement of tables, figures, ... with captions
- Provides a multitude of extension packages

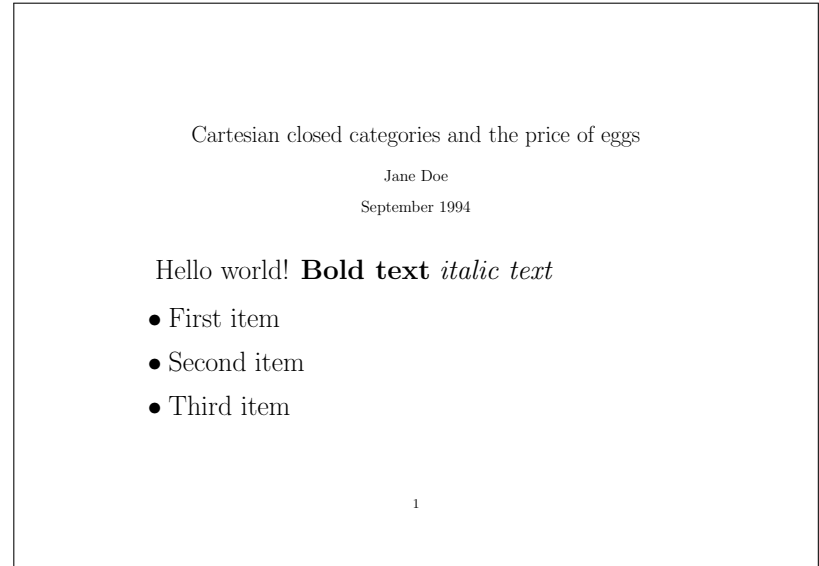
## Disadvantages:

- The user has to learn  $\LaTeX$  commands (similar to learning a programming language)
- Adapting the design is difficult (but there are many existing templates you can use)

# Basic L<sup>A</sup>T<sub>E</sub>X elements – Text formatting

```
\documentclass{article}
\usepackage[a5paper,landscape]{geometry}
\title{Cartesian closed categories
and the price of eggs}
\author{Jane Doe}
\date{September 1994}
\begin{document}
\maketitle
\huge
Hello world!
\textbf{Bold text}
\textit{italic text}

\begin{itemize}
\item First item
\item Second item
\item Third item
\end{itemize}
\end{document}
```



# Basic L<sup>A</sup>T<sub>E</sub>X elements – Document structure

```
\documentclass{article}
\usepackage[a5paper, landscape, top=1cm,
  bottom=1cm]{geometry}
\title{Cartesian closed categories
  and the price of eggs}
\author{Jane Doe}
\date{September 1994}
\begin{document}

\tableofcontents

\section{Introduction}

\section{Mathematical Model}
\subsection{Resonator cavity}
\subsubsection{Fabry–Perot cavity}
\subsubsection{Ring cavity}
\subsection{Carrier transport}

\section{Conclusion}

\end{document}
```

## Contents

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1	Introduction	
2	Mathematical Model	
2.1	Resonator cavity	
2.1.1	Fabry-Perot cavity	
2.1.2	Ring cavity	
2.2	Carrier transport	
3	Conclusion	

# Basic L<sup>A</sup>T<sub>E</sub>X elements – Figures and tables

```
\documentclass{article}
\usepackage[a5paper, landscape, top=1cm,
  bottom=1cm]{geometry}
\usepackage{graphicx}
\title{Cartesian closed categories
  and the price of eggs}
\author{Jane Doe}
\date{September 1994}
\begin{document}
\huge
This is my large text. As shown in Fig.
\ref{fig:geometry}, the metal–metal waveguide
quantum cascade laser ...
```

```
\begin{figure}
  \centering
  \includegraphics[width=10cm]{../svg/geometry}
  \caption{Typical geometry of a QCL.}
  \label{fig:geometry}
\end{figure}

\end{document}
```

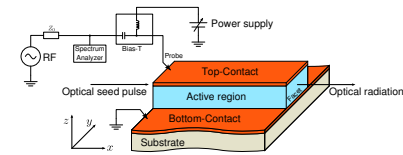


Figure 1: Typical geometry of a QCL.

This is my large text. As shown in Fig. 1, the metal-metal waveguide quantum cascade laser ...

# Basic L<sup>A</sup>T<sub>E</sub>X elements – Mathematical equations

```
\documentclass{article}
\usepackage[a5paper, landscape, top=1cm,
  bottom=1cm]{geometry}
\title{Cartesian closed categories
  and the price of eggs}
\author{Jane Doe}
\date{September 1994}
\begin{document}
\huge
Equations in text are marked with dollar
signs around the expression, for example
 $a^2 + b^2 = c^2$ .
```

However, von Neumann's equation

```
\begin{equation}
  \label{eq:neumann}
  \partial_t \hat{\rho} = -\frac{i}{\hbar} [\hat{H}, \hat{\rho}]
\end{equation}
can be referenced to (see Eq. \ref{eq:neumann}).

\end{document}
```

Equations in text are marked with dollar signs around the expression, for example  $a^2 + b^2 = c^2$ .

However, von Neumann's equation

$$\partial_t \hat{\rho} = -\frac{i}{\hbar} [\hat{H}, \hat{\rho}] \quad (1)$$

can be referenced to (see Eq. 1).



# How to get started

## Installation

- Windows
  - MikTeX is a  $\text{\TeX}$  distribution, TeXnicCenter and Texmaker are editors
  - <http://www.howtotex.com/howto/installing-latex-on-windows/>
- Mac OS X
  - For example, there is MacTeX and Texmaker
  - <http://www.howtotex.com/howto/installing-latex-on-mac-os-x/>
- Linux
  - Multitude of distributions and flavors
  - For Debian one can install `texlive` and `texmaker` via the packet manager
  - Sometimes it makes sense to download and install TeXLive directly

## Tutorials

- Enter “latex tutorial” into the search engine of your choice
- Search for issues and error messages (the links to <http://stackoverflow.com> are generally a good choice)

# Build automation and tools

## Build automation

- For  $\text{\LaTeX}$ : Does your editor provide it? `latexmk` command available?
- For  $\text{\LaTeX}$  or complete project with extra tools: `make`

## Tools

- Create plots of data
  - gnuplot (open-source)
  - MATLAB (proprietary)
- Vector graphics
  - inkscape (open-source)
  - tikz/pgf ( $\text{\LaTeX}$  package)

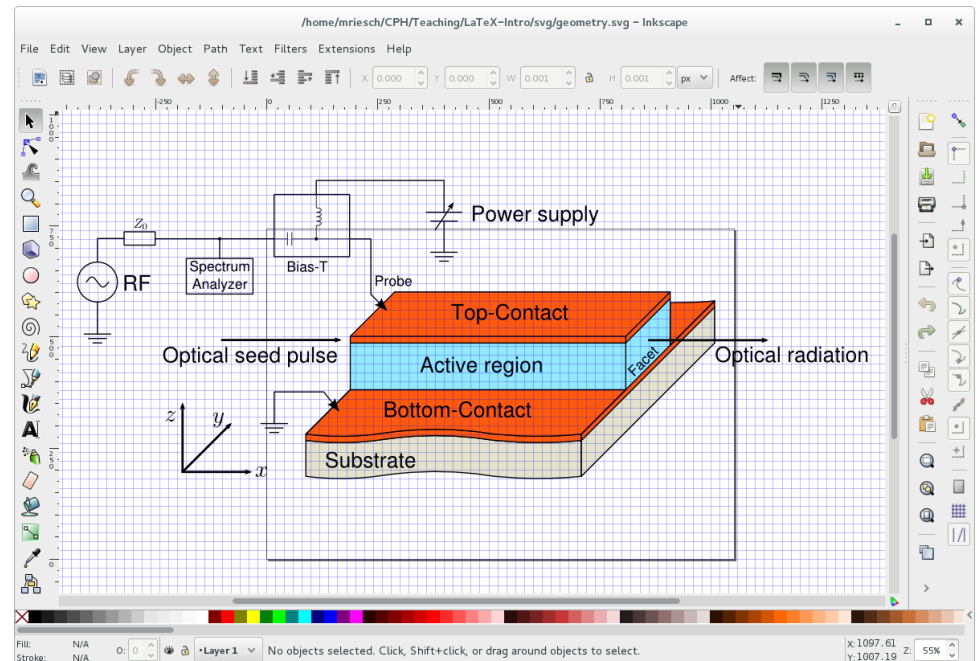


Figure: The inkscape vector graphics editor.

# Version control with git

Is version control really necessary?

- Do you want to make backups?
- Are you working in a group?
- Do you want to keep track of the changes you and your co-workers made?

The git version control system

- open-source, distributed, scales from small projects to e.g. the Linux Kernel
- Private repositories available [bitbucket.com](https://bitbucket.com), public repositories [github.com](https://github.com)
- Steep learning curve, but mostly a small subset of commands will do for you

# TUM templates and style

TUM Corporate Design ([tum.de/cd](http://tum.de/cd)) provides  $\text{\LaTeX}$  templates for

- Presentation slides (based on `beamer`)
- Theses (based on `scrbook`)
- Letters and office papers

Additionally, there is a design guide (see TUM CD homepage).

There is work in progress. We will keep you posted and provide you with templates for your theses and presentation slides.

# Thank you for your attention!

Contact me ([michael.riesch@tum.de](mailto:michael.riesch@tum.de)) if you have questions about the templates.

