A \LaTeX \ Tutorial

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What is \LaTeX

- \LaTeX{} is a typesetter. It is not WYSIWYG. It is not a word processor.

- Author specifies the structure of the document symbolically (in a mark-up language), without worrying about the formatting (like XML)

- \LaTeX{} takes care of the formatting of the document according to the specified document style

- \LaTeX{} files are text files, with mark-up for sectioning, equations, tables and figures.
Why is \textit{LaTeX} better than Microsoft Word for theses and papers?

- Professional quality typesetting of documents, and, in particular, equations
- Automatic numbering and \textit{crossreferencing} of
  - references
  - figures and tables
  - equations
  - sections and pages
• **Document style change** from thesis to conference or journal paper is more or less trivial.

• Baseline font size change is trivial, and scales headings and equations, too.

• **Automatic placement of floating objects** (figures and tables)

• **Equations are not graphics.** They are an integral part of the text.
• Automatic generation of
  – table of contents
  – list of figures
  – list of tables
  – index

• Archival: \LaTeX{} files can be processed and printed \textit{decades} later. \LaTeX{} files cannot be corrupted!

• \textit{De facto} standard for publishing scientific documents, especially medium-to-large ones.

• WYSIWYG products running on top of \LaTeX{} exist, but they are expensive (US$450/single user). See: \url{http://www.mackichan.com/products\rightarrow products\rightarrow Scientific Word}.\end{quote}
The \LaTeX{} process

• Option 1 (open source):
  
  – The \LaTeX{} file is processed with \texttt{latex} to generate a DVI file
  
  – The DVI file is processed with \texttt{dvips} to generate a Postscript file
  
  – The Postscript file can be:
    
    * previewed using Ghostview
    
    * printed
    
    * converted to pdf format using command \texttt{ps2pdf} or \texttt{Acrobat Distiller}.

• Option 2: The \LaTeX{} file is processed with \texttt{pdflatex} to produce a pdf file directly.
The \LaTeX\ process

- User provides: File.tex, Refs.bib

- Files using \texttt{latex}: File.dvi, File.bbl, File.aux, File.ps
  Printable file: File.ps or convert to \texttt{pdf} via \texttt{ps2pdf}(UNIX) or Acrobat Distiller (Win))

- Files using \texttt{pdflatex}: File.bbl, File.aux, File.pdf
How to get started with \LaTeX

• Get hold of a thesis or paper in \LaTeX

• Use it as a template

• Use

  – \texttt{MikTeX} for Windows

  – \texttt{gnuemacs} \LaTeX\ editing mode on Unix, and the \texttt{latex}, \texttt{bibtex}, \texttt{dvips}, \texttt{ps2pdf} or \texttt{pdflatex}, \texttt{bibtex} commands
A very simple \LaTeX\ file

From “Getting Started with \LaTeX\”, by David R. Wilkins
http://www.maths.tcd.ie/~dwilkins/LaTeXPrimer/Index.html

\documentclass[12pt]{article}
\begin{document}

The foundations of the rigorous study of \emph{analysis} were laid in the nineteenth century, notably by the mathematicians Cauchy and Weierstrass. Central to the study of this subject are the formal definitions of \emph{limits} and \emph{continuity}.

Let $D$ be a subset of $\mathbf{R}$ and let $f : D \to \mathbf{R}$ be a real-valued function on $D$. The function $f$ is said to be \emph{continuous} on $D$ if, for all $\epsilon > 0$ and for all $x \in D$, there exists some $\delta > 0$ (which may depend on $x$) such that if $y \in D$ satisfies
\[ |y - x| < \delta \]
then
\[ |f(y) - f(x)| < \epsilon. \]

One may readily verify that if $f$ and $g$ are continuous functions on $D$ then the functions $f+g$, $f-g$ and $f \cdot g$ are continuous. If in addition $g$ is everywhere non-zero then $f/g$ is continuous.

\end{document}
And the file after typesetting

The foundations of the rigorous study of analysis were laid in the nineteenth century, notably by the mathematicians Cauchy and Weierstrass. Central to the study of this subject are the formal definitions of limits and continuity.

Let \( D \) be a subset of \( \mathbb{R} \) and let \( f: D \to \mathbb{R} \) be a real-valued function on \( D \). The function \( f \) is said to be continuous on \( D \) if, for all \( \epsilon > 0 \) and for all \( x \in D \), there exists some \( \delta > 0 \) (which may depend on \( x \)) such that if \( y \in D \) satisfies

\[
|y - x| < \delta
\]

then

\[
|f(y) - f(x)| < \epsilon.
\]

One may readily verify that if \( f \) and \( g \) are continuous functions on \( D \) then the functions \( f + g \), \( f - g \) and \( f.g \) are continuous. If in addition \( g \) is everywhere non-zero then \( f/g \) is continuous.
Figures (photographs or diagrams) in \LaTeX

- Must be in \textit{encapsulated postscript} (eps) (for \LaTeX) or pdf or jpeg format (for pdflatex)

- Diagrams can be generated with a drawing program that can export into encapsulated postscript, e.g. CorelDraw, Dia, PowerPoint (Windows), Xfig (Unix), or print into pdf format.

- Eps file is “included” into a \LaTeX\ file using \texttt{includegraphics}

- Size and orientation can be adjusted with \texttt{includegraphics}

\textbf{Example}: Previous Figure made in CorelDraw, exported into eps/pdf, included in \LaTeX\ file as: \texttt{\includegraphics[scale=0.7]{./LatexProcessing}} \texttt{ } \texttt{latex will use the eps version, pdflatex will use the pdf version.}
Structure of a \LaTeX\ file: preamble

\documentclass[12pt]{article}
\pagestyle{plain}
\usepackage{graphicx} % include macros for including eps or pdf figure files
\usepackage{setspace}
\onehalfspacing
%\newcommand{\comment}[1]{ {\tiny {#1} } } % show comments, for editing
\newcommand{\comment}[1]{ } % hide comments, for final version
\long\def\invis#1{} % make text invisible
\begin{document}
\title{Blah Blah ...}
\author{
\em Student name, Evangelos Milios\\
Faculty of Computer Science,
{\tt \{eem\}@cs.dal.ca}}
\date{} % no date
\maketitle % make the title page here
\begin{abstract}
blah, blah, ...
\end{abstract}
Structure of a \LaTeX\ file: body

\section{Introduction} \label{introduction}

blah, blah, ... In Section \ref{bodyofwork},.... In Section \ref{discussion}...

\section{Body of work} \label{bodyofwork}

blah, blah, ...

\section{Discussion} \label{discussion}

\paragraph{Acknowledgements}

blah, blah,...

\bibliographystyle{plain}
\bibliography{reference} % reference.bib contains the references

\appendix
\section{My code}
\section{Excruciating details about my experiments}

\tableofcontents
\end{document}
References

- Placed in a bibliography file (.bib)
- Each reference has a key
- Cited in the text by \cite{key}
- Bibliography section constructed and formatted automatically
- Items are numbered and correct numbers are placed in the text automatically
Example of a bib file

@BOOK{Lewis1998,
    AUTHOR = "H. Lewis and C. Papadimitriou",
    TITLE = "Elements of the Theory of Computation",
    PUBLISHER = "Prentice-Hall",
    YEAR = "1998",
    ADDRESS = "Upper Saddle River, NJ 07458"
}

@ARTICLE{Muslea2001,
    AUTHOR = "I. Muslea and S. Minton and C. Knoblock.",
    TITLE = "Hierarchical Wrapper Induction for Semistructured Information Sources",
    JOURNAL = "Journal of Autonomous Agents and Multi-Agent Systems",
    VOLUME = "4",
    YEAR = "2001",
    PAGES = "93-114"
}

Other types are available, too: INBOOK, TECHREPORT, INPROCEEDINGS, ...
Slides in \texttt{LATEX}

Recommended when you have equations and figures already in \texttt{LATEX} (simple cutting and pasting between slides and thesis/paper)

The \textit{slides} class:

- Formats appropriately for slides
- No floating bodies (figure, table)
- Allows \texttt{colours} and overlays

Powerpoint-like effects are possible.

For Display, convert to \texttt{pdf} format and use \texttt{Acrobat}.
History of \LaTeX

\TeX was created by Donald Knuth in the late seventies.

\LaTeX was written by Leslie Lamport as a more or less self-contained set of macros for \TeX in the early eighties (1983).

At the same time (early eighties), the American Mathematical Society developed AMS-\TeX, causing a split in the mathematical community.

In 1990, the AMS introduced AMS-\LaTeX, splitting the community even further.

\LaTeXe was introduced in 1993, unifying \LaTeX and AMS-\LaTeX.

In 1995, the AMS released version 1.2 of AMS-LaTeX built on top of \LaTeXe.

Just what is \TeX? http://www.tug.org/whatis.html
Summary

When to use \LaTeX? 

- For a scientific document such as a thesis, textbook, monograph, or paper

- For a document with a complex structure, bibliography and cross-references that will be revised several times

- When typesetting of professional quality is required

- Any document that you want to be able to read many years later
When not to use `\LaTeX`?

- For a letter or short memo of a short lifespan
- For a short document with a simple structure and few and simple, or no, equations
- Foreign language support may be limited. There is support for greek, arabic (arabtex), and Chinese.

What is `\LaTeX` not good at?

- Very small selection of fonts
- Lack of control over the precise layout of the document (if you need it).
References

1. Tim Love: “Why \LaTeX?” , September 2000, University of Cambridge, Department of Engineering
http://www-h.eng.cam.ac.uk/help/tpl/textprocessing/latex_advocacy.html (compares \LaTeX, Microsoft Word and Framemaker).
