Introduction to LaTeX

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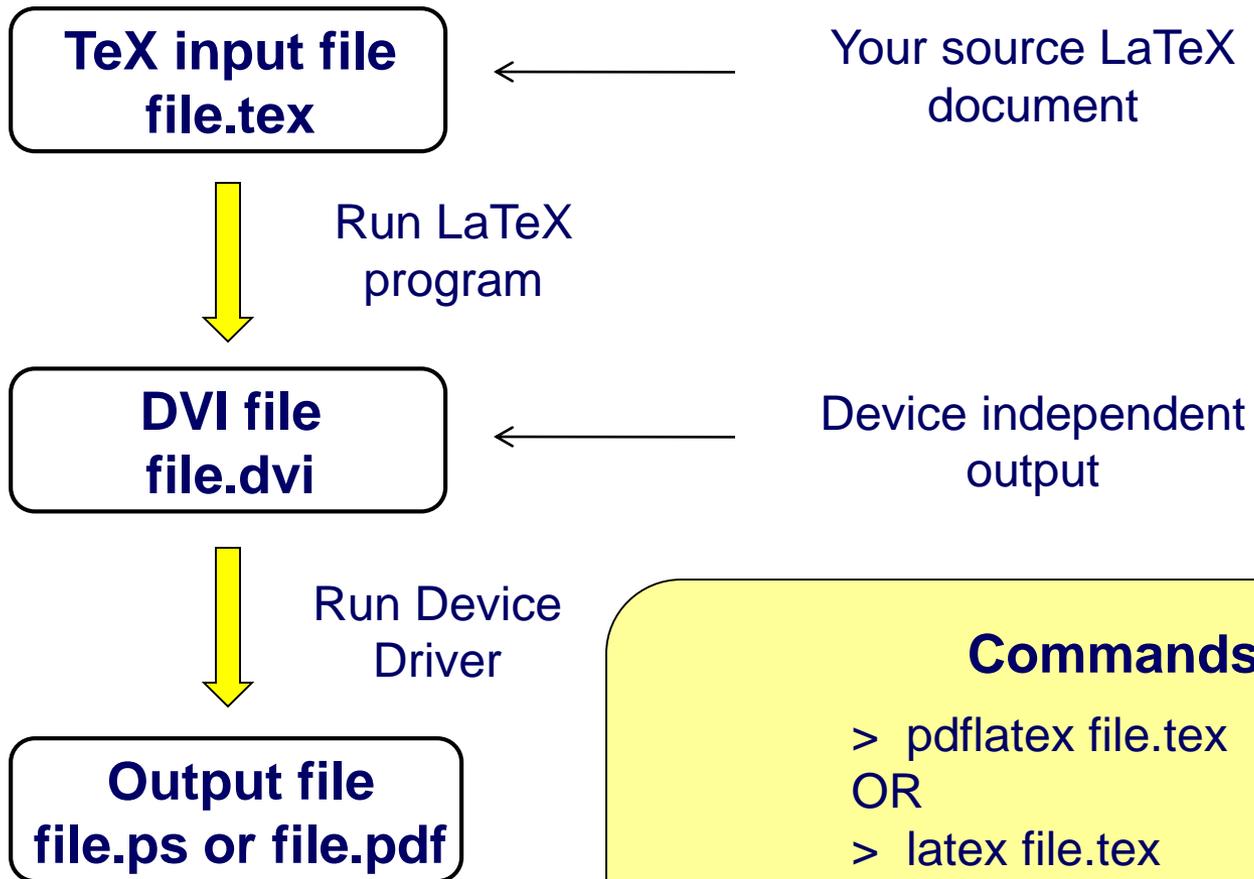http://www.cs.stonybrook.edu/~cse215

LaTeX

- TeX is essentially a Markup Language (like HTML, CSS, and RTF)
- TeX written by Donald Knuth in 70's
  - A revolution in typesetting
- Latex is an extension of TeX
  - Macro packages to make TeX easier to use

LaTeX

- High typeset quality

- Easy to include math formulas

- Latex is free

- Source file format is not bounded to a particular OS or platform
  - Latex implementations exists for all platforms (Windows *MikTex*, Mac OsX, Linux)
  - Web, e.g., https://www.sharelatex.com

Process to Create a Document Using LaTeX

**TeX input file
file.tex** ← Your source LaTeX
document

*Run LaTeX
program*

**DVI file
file.dvi** ← Device independent
output

*Run Device
Driver*

**Output file
file.ps or file.pdf**

Commands

> pdflatex file.tex
OR
> latex file.tex
> dvips file.dvi
> ps2pdf file.ps

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How to Setup LaTeX for Windows

- Download and install MikTeX http://www.miktex.org (also comes with a good editor)

- Install Ghostscript and Gsview http://pages.cs.wisc.edu/~ghost

- Install Acrobat Reader

- For Mac Users: TeXShop, iTexMac, Texmaker

LaTeX in the Cloud

- Make a free account at Overleaf.com
  - it also lets you save your latex sources in your Google Drive or Dropbox

LaTeX

- Start with a skeleton document:

  \documentclass{article}

  \begin{document}
  First document. This is a simple example, with no extra parameters
  or packages included.
  \end{document}

  - The first line of code declares the type of document, in this case is a *article*.
  - Then enclosed in the \begin{document} \end{document} tags you must write the text of your document.

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LaTeX

- The preamble of a document lets you define the type of document you are writing, the language, the size of font

```
\documentclass{article}
\title{Simple Example}
\author{Paul Fodor}
\date{January 2016}

\begin{document}
\maketitle
Hello world!
\end{document}
```

LaTeX

- Basic formatting: abstract, paragraphs and newlines:

\begin{abstract}

This is a simple paragraph at the beginning of the document.

\end{abstract}

Two newlines start another paragraph.

And I can brake\\ the lines \\and continue in a new line.

LaTeX

- Comments: sometimes it's necessary to add comments to your LATEX code for readability
  - put a % before the comment and LATEX will ignore that text

    \documentclass{article}

    % HW document

    \begin{document} % Here begins the body of the document

LaTeX

- Reserved characters

  - The following symbol characters are reserved by LATEX because they introduce a command and have a special meaning

Character	Function	How to print it
#	Macro parameter	\#
$	Math mode	\$
%	Comment	\%
^	Superscript (in math mode)	\^{} or $\textasciicircum$
&	Separate column entries in tables	\&
_	Subscript (in math mode)	_
{ }	Processing block	\{ \}
~	Unbreakable space, use it whenever you want to leave a space which is unbreakable	$\textasciitilde$ or \~{}
\	Starting commands, which extend until the first non-alphanumerical character	$\textbackslash$ or $\backslash$

LaTeX

- LATEX allows two writing modes for mathematical expressions:

  - the inline mode: $ $, \(\), or \begin{math} \end{math}

    In physics, the mass-energy equivalence is stated by the equation $E=mc^2$, discovered in 1905 by Albert Einstein.

    In physics, the mass-energy equivalence is stated by the equation $E = mc^2$, discovered in 1905 by Albert Einstein.

  - the displayed mode: \[\], $$ $$, \begin{displaymath} \end{displaymath} or \begin{equation} \end{equation}

    The mass-energy equivalence is described by the famous equation

    $$E=mc^2$$

    discovered in 1905 by Albert Einstein.

    The mass-energy equivalence is described by the famous equation
    $$E = mc^2$$
    discovered in 1905 by Albert Einstein.

LaTeX

- Common maths symbols:

description	code	examples
Greek letters	\alpha \beta \gamma \rho \sigma \delta \epsilon	$\alpha\ \beta\ \gamma\ \rho\ \sigma\ \delta\ \epsilon$
Binary operators	\times \otimes \oplus \cup \cap	$\times\ \otimes\ \oplus\ \cup\ \cap$
Relation operators	< > \subset \supset \subseteq \supseteq	$<\ >\ \subset\ \supset\ \subseteq\ \supseteq$
Others	\int \oint \sum \prod	$\int\ \oint\ \sum\ \prod$

\[\int\limits_0^1 x^2 + y^2 \ dx \]

$$\int\limits_0^1 x^2 + y^2\, dx$$

\[a_1^2 + a_2^2 = a_3^2 \]

$$a_1^2 + a_2^2 = a_3^2$$

\[\sum_{i=1}^{\infty} \frac{1}{n^s} =
        \prod_p \frac{1}{1 - p^{-s}} \]

$$\sum_{i=1}^{\infty} \frac{1}{n^s} = \prod_p \frac{1}{1 - p^{-s}}$$

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LaTeX

- More examples:

LaTeX markup	Renders as
`a_{n_i}`	a_{n_i}
`\int_{i=1}^n`	$\int_{i=1}^{n}$
`\sum_{i=1}^{\infty}`	$\sum_{i=1}^{\infty}$
`\prod_{i=1}^n`	$\prod_{i=1}^{n}$
`\cup_{i=1}^n`	$\cup_{i=1}^{n}$
`\cap_{i=1}^n`	$\cap_{i=1}^{n}$
`\oint_{i=1}^n`	$\oint_{i=1}^{n}$
`\coprod_{i=1}^n`	$\coprod_{i=1}^{n}$

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Font size

\tiny \scriptsize \footnotesize

\small \normalsize

\large \Large

\LARGE \huge

\Huge

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Tabular

- Columns
  - `\begin{tabular}{|...|...|}`
  - `\end{tabular}`
- Rows
  - `&` - Split text into columns
  - `\\` - End a row
  - `\hline` - Draw line under row
  - e.g. `123123 & 34.00\\ \hline`

Two Columns

l = automatically adjust
   size, left justify
r = automatically adjust
   size, right justify
p = set size
   e.g p{4.7cm}
c = centre text

Example of table

```
\begin{tabular}{|l|r|c|} \hline
Date & Price & Size \\ \hline
Yesterday & 5 & big \\ \hline
Today & 3 & small \\ \hline
\end{tabular}
```

Date	Price	Size
Yesterday	5	Big
Today	3	Small

Standard Environments

\begin{env_name}
 stuff
\end{enc_name}

Environment name (env_name) can be document, itemize, enumerate, tabular, etc.

```
\begin{itemize}
   \item The first item
   \item The second item
\end{itemize}
```

→

- The first item
- The second item

```
\begin{enumerate}
   \item The first item
   \item The second item
\end{enumerate}
```

→

1) The first item
2) The second item

Figures

You can insert figures in pdf, jpg, eps, and other formats into your document.

\begin{figure}
    \centering
    \includegraphics {name of the figure file}
    \caption{Put the caption here}
\end{figure}

Multiple figures can be inserted using \subfigure

Cross Referencing

LaTeX generates numbers for Theorem, Equation, Section, Figure and other environments automatically. You can access them with \label and \ref

\section{Introduction} \label{sec:intro}

....

In Section \ref{sec:intro}, we ....

Reference and Citation

The \thebibliography environment produces a bibliography or reference list. In the article style, this reference list is labeled "References"; in the report style, it is labeled "Bibliography".

```
\begin{thebibliography} {widest-label}

\bibitem[label]{cite_key}
  . . .
\end{thebibliography}
```

widest-label: Text that, when printed, is approximately as wide as the widest item label produces by the \bibitem commands.

Bibliography by hand

\begin{thebibliography} {}

\bibitem[Come95]{Come95} Comer, D. E., {\it Internetworking with TCP/IP: Principles, Protocols and Architecture}, volume 1, 3rd edition. Prentice-Hall, 1995.

\end{thebibliography}

Bibliography using Bibtex

- Bibliography information is stored in a *.bib file, in Bibtex format.
- Include chicago package
  - \usepackage{chicago}
- Set referencing style
  - \bibliographystyle{chicago}
- Create reference section by
  - \bibliography{bibfile with no extension}

Bibliography using Bibtex

@book{Come95,

author="D. E. Comer",

title={Internetworking with TCP/IP: Principles, Protocols and Architecture},

publisher="Prentice-Hall",

year=1995,

volume=1,

edition="Third"}

Bibliography using Bibtex

- Citing references in text
  - `\cite{cuc98}` = (Cuce 1998)
  - `\citeN{cru98}` = Crud (1998)
  - `\shortcite{tom98}` = (Tom, et. al. 1998)
- Creating Bibtex Files
  - Use Emacs with extensions.
  - or copy Bibtex entries from bibliography database.