Introduction to LaTeX

For CSE215 Section 2, Spring 2020

Stony Brook University

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

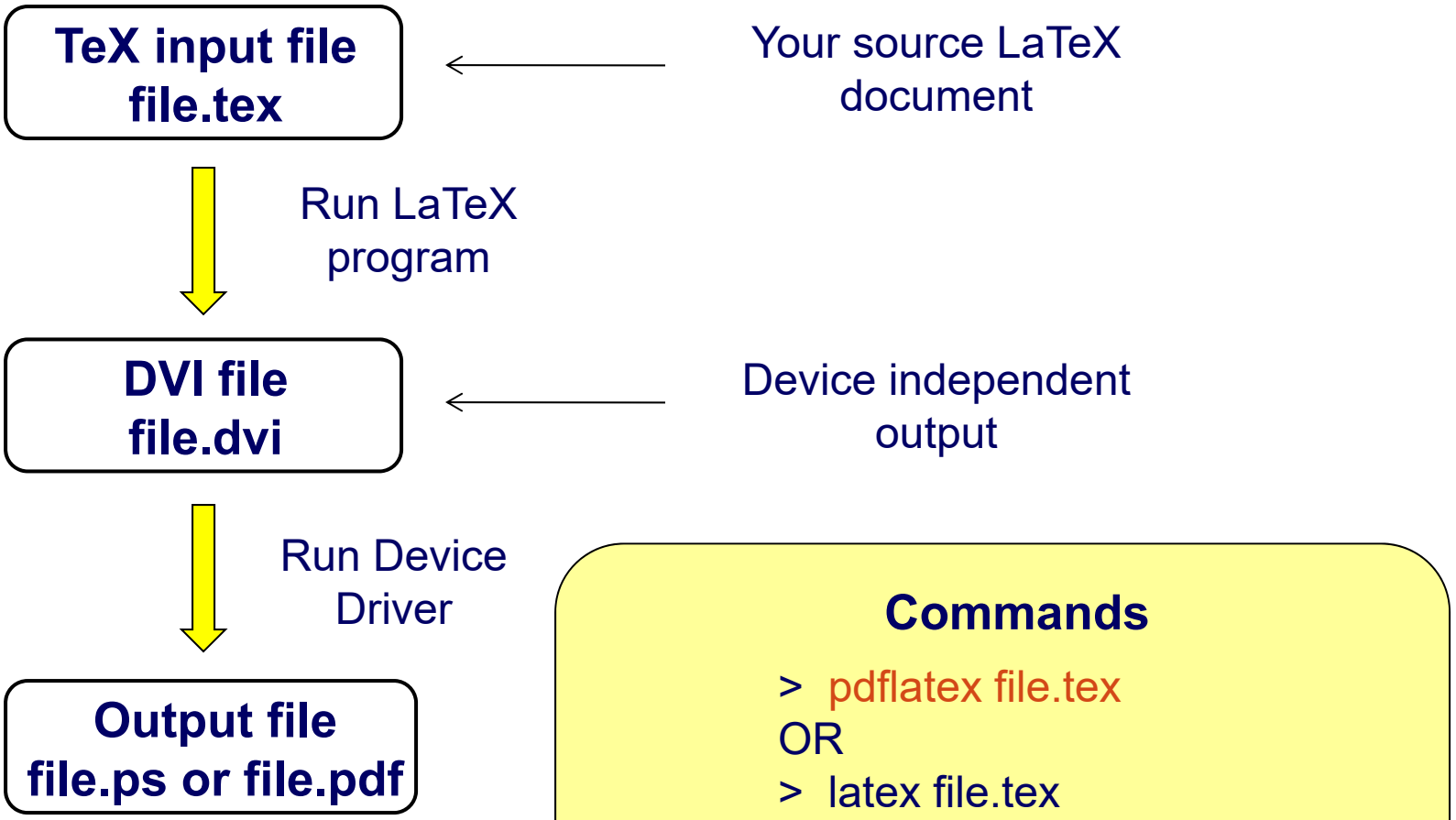
LaTeX

- TeX is essentially a Markup Language (like HTML, CSS, and RTF)
- TeX was written by Donald Knuth in 70's
  - A revolution in typesetting
- Latex is an extension of TeX, and was originally written by Leslie Lamport in 80's
  - Macro packages to make TeX easier to use

LaTeX

- High typeset quality
- Easy to include math formulas
- Free
- Source file format is not bounded to a particular OS or platform
  - Latex implementations exists for all platforms (Windows *MikTex*, Mac OsX, Linux)
  - Online, e.g., https://www.overleaf.com

Process to Create a Document Using LaTeX



Using LaTeX

- Install your own: MikTeX, TeXworks,…
- Or, use the best online:
  - Make a free account at Overleaf.com
  - It also lets you save your latex sources in your Google Drive or Dropbox
  - It is also growing online help document: start by clicking “Help”.

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.

LaTeX

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

```
\documentclass{article}
\title{Simple Example}
\author{Annie Liu}
\date{January 2020}

\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 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 math mode

- 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.

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  - 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.

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LaTeX Common math 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`	$\int \oint \sum \prod$

```
\[ \int\limits_0^1 x^2 + y^2 \ dx \]
\[ a_1^2 + a_2^2 = a_3^2 \]
\[ \sum_{i=1}^{\infty} \frac{1}{n^s} =
        \prod_p \frac{1}{1 - p^{-s}} \]
```

$$\int_0^1 x^2 + y^2 \ dx$$

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

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

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`	$\bigcup_{i=1}^{n}$
`\cap_{i=1}^n`	$\bigcap_{i=1}^{n}$
`\oint_{i=1}^n`	$\oint_{i=1}^{n}$
`\coprod_{i=1}^n`	$\coprod_{i=1}^{n}$

LaTeX font size

\tiny \scriptsize \footnotesize

\small \normalsize

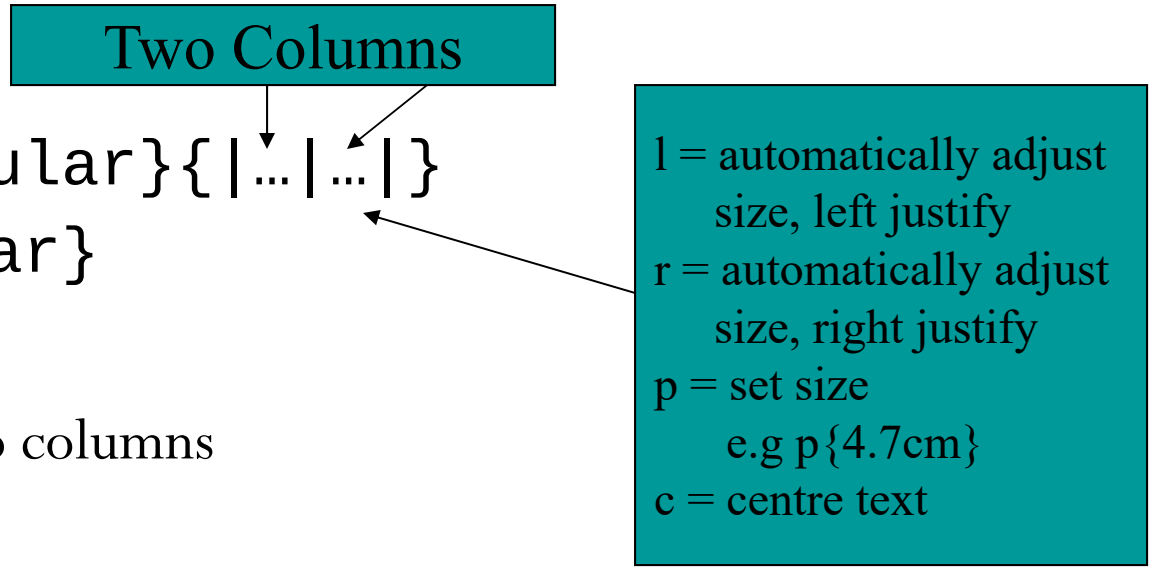
\large \Large

\LARGE \huge

\Huge

LaTeX 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`



LaTeX tablular example

```
\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

LaTex 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

LaTeX 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

LaTeX cross referencing

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

```
\section{Introduction} \label{sec-intro}

....

In Section \ref{sec-intro}, we ....
```

LaTeX 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.

LaTeX 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}
```

LaTeX bibliography using Bibtex

- Bibliography information is stored in a *.bib file, in Bibtex format.
- Include chicago package
  - \usepackage{chicago}
- Set referencing style
  - \bibliographystyle{chicago}
  - Or use built-in bib style without needing another package: \bibliographystyle{abbrv}, …
- Create reference section by
  - \bibliography{bibfile with no extension}

LaTeX 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"
}
```

LaTeX bibliography using Bibtex

- Citing references in text
  - `\cite{cuc98}` = (Cuce 1998)
  - `\citeN{cru98}` = Crud (1998)
  - `\shortcite{tom98}` = (Tom, et. al. 1998)
  - The last two forms are not supported in "abbrv" style
- Creating Bibtex Files
  - Use Emacs with extensions.
  - or copy Bibtex entries from bibliography database.