UTMIST X CSSU Latex Workshop

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What is Latex?

- A typesetting language for writing and formatting text, mathematical equations
- It helps simplify and speed up these tasks with much higher visual quality
- Perfect Tool for:
  - Taking notes for science courses
  - Online math homeworks and labs
  - Paper writing
  - Writing reports or scientific articles

Getting Started

- Latex is similar to a programming language, a compiler takes in your latex code and renders it on a PDF
- There are programs that allow you to type your code and see the compiled PDF file together on one screen. We can call them IDEs.
- Overleaf is an example of such a program (a Latex editor)
- There are also offline IDEs

2 types of Latex elements

- Commands
- Environments

Commands

- Commands do one specific exaction
- All begin with a \ symbol
- Example 1:
  - \alpha \beta → $\alpha \beta$
- Example 2:
  - \textbf{ bolded text right here} →
- Note:
  - Curly brackets are mandatory for a valid command
  - We can add square brackets for optional input

Environments

- An environment is a section of your code where we apply a specific set of rules
- To place a section of your code inside an environment, it must be enclosed by begin and end commands:

```
\begin{nameofenvironment}
Your code is here
\end{nameofenvironment}
```

Starting a document

- Before we start writing anything, we need to define what kind of document you will be writing, so that Latex knows how to properly format your content
- We use a document class statement:

```
\documentclass[option1,option2,...]{ your document style}
```

- There are 10 key document styles available. Book, Article, Report are 3 most commonly used document styles
- Example: a common document style for paper submissions

```
\documentclass[10pt,twocolumn,letterpaper]{article}
```

Let’s start writing text!

- \par → start a new paragraph
- * → new line
- \smallskip **OR** \medskip **OR** \bigskip → add some vertical space
- \section{Header goes here}
- \subsection{Subheader goes here}

Let’s write some math!

- One of Latex’s strengths is the ability to write mathematical expressions
- 3 types of environments that let you write math expressions:
  - Inline math environment
    - Wrap with either **$E = mc^2$** OR **\(E = mc^2\)**
    - Intended for writing math expressions within paragraphs and all symbols, scaled to fit within 1 line
  - Display style environment
    - Wrap with either **$$E = mc^2$$** OR **\[E = mc^2\]**
  - Equation environment
    - **\begin{equation} E = mc^2 \end{equation}**
    - Meant for 1 equation

Some common math commands

- ^{superscript} → placed after the symbol with superscript
- _{subscript} → also placed after the symbol with subscript
- \times → multiplication symbol
- \cdot → multiplication dot
- \cdots → ellipses
- \frac{numerator}{denominator} → fractions
- \sum_{i=0}^{10} → summation
- Greek letters:
  - \alpha, \gamma, \sigma

Images

- Images are not originally a part of the Latex commands, will need a separate package
- Include the package by putting this:
  - **\usepackage{graphicx}**
- When placing the image in your document, use this command:
  - **\includegraphics[options]{file path to your graphic}**
- Figure environment → if you want “floating behaviour”
  - \begin{figure}
  - \includegraphics[options]{file path to your graphic}
  - \caption{a caption for this picture}
  - \end{figure}

Tables

- You can use the tabular environment to create tables in your documents
- Example:

```
\begin{tabular}{|l|c|}
\hline
\textbf{Name} & \textbf{Age}\\ \hline
Ambrose & 3 \\ \hline
Donald & 6 \\ \hline
\end{tabular}
```

- l → left aligned
- c → center aligned
- | → add vertical lines btw columns
- \hline → horizontal lines
- \\ → new row

Algorithms

- You can use write algorithms using the **algpseudocode** and the **algorithmic** packages
- \begin{algorithmic} YOUR ALGORITHM \end{algorithmic}
  - \State - Basic statement
  - \If{condition} ... \EndIf
  - \For{condition} ... \EndFor
  - \While{condition} ... \EndWhile
  - \Function{name}{parameters} ... \EndFunction
  - \Return

Citations

- Ways to manage your citations on Latex
  - BibTex (much better and more organized)
  - Manual bibliography
- Need to include with this command:
  - **\usepackage[style=ieee]{biblatex}**
    - specify the citation style (IEEE,APA, ACM are some of the most common)
  - **\addbibresource{refs.bib}**
    - Specify where your bib file is (stores all your citations)
- Place **\printbibliography** for where you want to render the references list

Break (10 min)

Now Is Your Chance to Practice Your Latex

Problem:

You are a ML researcher at a world renowned research lab that analyzes mac and cheese stirring patterns with Deep Learning. Your research group is prepared to submit a paper to ICMC (International Conference on Mac and Cheese) one of the world's most renowned Machine Learning conferences. You are tasked to migrate your research from a google doc to Latex.

https://docs.google.com/document/d/10CGgO0SWH8XiBn-5Gqhx6iIbeQglvNeNLpL9svbRx8E/edit?usp=sharing

For students interested in pursuing research and learning more about paper reading in the ML space….

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