Guide to LaTeX

Installing LaTeX

- What is LaTeX?
  - Text Editor for researchers.
  - Type in a source code – to render a document in PDF.
  - You can make presentations with Beamer
- Why LaTeX?
  - It's free, light, indestructible.
  - It handles long documents well
  - It supports math & graphs (with TikZ), citations, cross-referencing.
- Install a distribution package
  - Windows: use MikTeX
  - Mac: use MacTeX. Homebrew: use `brew install -cask mactex`
- Install a TeX editor
  - Texifier: $40 (perpetual), very fast, WYSIWYG, Grammarly-enabled
  - TeXstudio: free, okay fast, not WYSIWYW, PDF is navigatable.
  - Overleaf: free, online, not fast, support 2-author collaboration.

Structures

- Preambles
  - Define the document class and customized commands `\documentclass[11pt,a4paper]{article}`
  - Declare packages to use `\usepackage{amsmath}`
  - Declare title, authors, etc. `\author{}, \title{}`
- Content
  - Make title by typing `\maketitle`, ToC by `\tableofcontents`
  - Special characters such as `_, %, $` and commands start with `\`
  - The whole content must be nested between `\begin{document}` and `\end{document}`. To make new page `\newpage`
  - Use `\section{<name>}`, `\subsection{<name>}`, `\subsubsection{<name>}` for automatic sectioning.
  - use % to make comments. (which are not rendered)
  - use `\includefigure{path}` to insert figures, see here for Tables.
- Bibliography
  - "Author(year)" – use `\citet{}` , for "(Author, year)" – use `\citep{}`
  - to print bibliography, use `\bibliography{file.bib}` at the end.

Math

- Basics
  - inline: nested between $ $ or \[\], for example: $y_i = x^{-1}_i + a^2$ produces $y_i = x_i^{-1} + a^2$
  - single: nested between \begin{equation} and \end{equation}
  - alignable: nested between \begin{align} and \end{align}
  - lines are separated by \\, aligned by putting & at the alignment.
  - Putting a * at the commands \begin{align*} – \end{align*}, all maths will be unnumbered. Use \nonumber to turn it off individually.
- Syntax:
  - fractions: \frac{a}{b} $\rightarrow \frac{a}{b}$
  - superscript: a^b $\rightarrow a^b$, subscript: a_ b $\rightarrow a_b$
  - Greeks: \gamma $\rightarrow \gamma$, \Gamma $\rightarrow \Gamma$
  - For more commands, check: LaTeX Mathematical Symbols
- Referencing
  - to label an equation, use \label{eq_foc}
  - to reference that equation, use \eqref{eq_foc}
  - you can label sections or theorems and reference them with \ref{sec}

Exercises

- Try it yourself by rendering the code uploaded here on your computer. You can find it at the boot camp's site https://github.com/thanhqtran/tohoku_bootcamp/tree/main
- Exercises: See https://guides.nyu.edu/LaTeX/exercises
  Today, do
  - Exercise 4: Creating Sections and Referencing Equation
  - Exercise 5: Creating Matrix Equations

optional Exercise 6: Tables and Figures
optional Exercise 7: Bibliography
optional Additional Exercises: `\newcommand`

- For this class, I encourage you to type everything in LaTeX after you finish solving with pen and paper.
- You can use this template, it has everything you need.