Development Data Boot Camp: LaTeX: Quick Start

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Outline

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What is LaTeX?

- LaTeX is a high-quality typesetting system suitable for producing scientific and mathematical documents.
- How LaTeX works? Basic procedure includes:
  1. write "code" in *.tex files,
  2. compile *.tex files,
  3. produce a *.pdf file.

Why LaTeX?

- The philosophy of LaTeX is to separate **content** from **format**. Once we determined the format of the article and tell it to LaTeX, we can focus on writing instead of distracted by adjusting the format.
- Easy to type mathematical formula.
- High quality output. It makes your document look like journal articles!
- Portability, stability, and interchangeability. LaTeX can work on MacOS, Windows, and Linux. In addition, a *.tex file will produce exactly the same *.pdf files no matter which operating system it works on.

How to write my first LaTeX document?

- It seems complex (but actually not!) to use LaTeXto produce a document, but the online LaTeXediting platform Overleaf can help us simplify the whole process.
- Open Overleaf (https://www.overleaf.com), use Notre Dame email account to create an Overleaf account!

Outline

documentclass

- There are several classes in LaTeX, we can use

$$\setminus documentclass\{name\_class\}$$

  to decide which class we want to use.
  1. article
  2. beamer
  3. book
- The class *article* are most frequently used classes. *artical* can be employed to write assignments or proposals.
- The class *beamer* should be used when you want to report your working process by slides.

packages

- Packages provide more powerful tools to implement various functions.
- We cannot use a package unless declaring that we need to use it in the document.

$$\backslash usepackage\{name\_packages\}$$

- Some useful packages:
  - *amsmath*: mathematical formula
  - *geometry*: customize page layout
  - *hyperref*: add hyper references
  - *graphicx*: figures
- Different class documents may need different kinds of packages.

environment

- The *environment* in LaTeX is a block in which you can take specific actions. For example
  1. *document* environment is where you place the body and actual content of your document,
  2. *equation* environment is where you can type mathematical formula,
  3. *figure* environment is where you insert pictures.

  $\backslash$*begin*{*name_environment*}

    content

    . . .

  $\backslash$*end*{*name_environment*}

Basic setting of a document

- ▶ The preamble of a document:
    $\backslash$*documentclass*[12*pt*, *letterpaper*, *twoside*]{*article*}
    $\backslash$*usepackage*{*amsmath*}
    $\backslash$*usepackage*{*graphicx*}
- ▶ Adding a title, author and date
- ▶ Setting the environment
    $\backslash$*begin*{*document*}
    $\backslash$*maketitle*
    $\backslash$*end*{*document*}

Structure of a document

Section setting:

$\backslash$*section*{*sectiontitle*}
  $\backslash$*subsection*{*subsectiontitle*}
    $\backslash$*subsubsection*{*subsubsectiontitle*}

- ▶ to remove the section number $\backslash$*section* $*$ {*sectiontitle*}
- ▶ to change the form of section: package "titlesec"

Structure of a document

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Exercise 1
Let's write your fist LATEXdocument!

Text formatting commands

- **Bold**: Bold text in LATEX is written with the \textbf{...} command.
- *Italics*: Italicised text in LATEX is written with the \textit{...} command.
- <u>Underline</u>: Underlined text in LATEX is written with the \underline{...} command.
- \emph: inside normal text the emphasized text is italicized, inside italicized text the emphasized text is normal.

Generate list

- Unordered lists:
  \begin{itemize}
  \item xxxxxxxxx
  \item xxxxxxxxx
  \end{itemize}
- Ordered lists:
  \begin{enumerate}
  \item xxxxxxxxx
  \item xxxxxxxxx
  \end{enumerate}

Exercise 2

Make one ordered list and one unordered list, play with the text formatting commands!

Inserting mathematical equations

- LATEX allows two writing modes for mathematical expressions: the inline mode and the display mode.
  - The first one is used to write formulas that are part of a text.
  - To put your equations in inline mode, use $ ...$
  - The second one is used to write expressions that are not part of a text or paragraph, and are therefore put on separate lines.
  - To put your equations in display mode, use math environments
    - equation
    - eqnarray

- subscript and superscript
- fraction, sqrt, and integral
- Greek alphabet
- circle, bracket, and curly braces
- lim, log, sum ∞
- mathcal, mathbf
- bar, hat, tilde
- insert words into equation

Inserting mathematical equations

Exercise 3
use "eqnarray" environment to write the following equation:

$$
\begin{aligned}
\log y &= \beta_0 + \beta_1 x_1 + \beta_2 x_2^2 + \epsilon \\
\bar{y} &= \frac{1}{N} \sum_{i=1}^{N} y_i \\
\mathcal{B} &= \sqrt{\left(\frac{x_1}{2}\right)^2 + (x_2)^2}
\end{aligned}
$$

Figure and Table blocks

Exercise 4
Add a figure into your document and refer it the paragraph.

Figure and Table blocks

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Exercise 5
Recreate the following summary statistics table:
Hint: use "booktabs" package at the beginning and the command
for the bottom line is $\backslash bottomrule$

Variable	Mean	Std	# of obs	Min	Max	Median
wages (\$)	$\bar{y}$	11.414	6,550	.297	187.5	6

Notice:

* put backslash in front of \$ and #
* You can use $\backslash textbf\{variables\}$ to modify your table

Other tips

- # \$ % { } have special meanings in LaTeX, in order to display them "normally", put a slash in from of them.
- Quotation marks:` '