A LaTeX Power Up

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August 29, 2018

Today

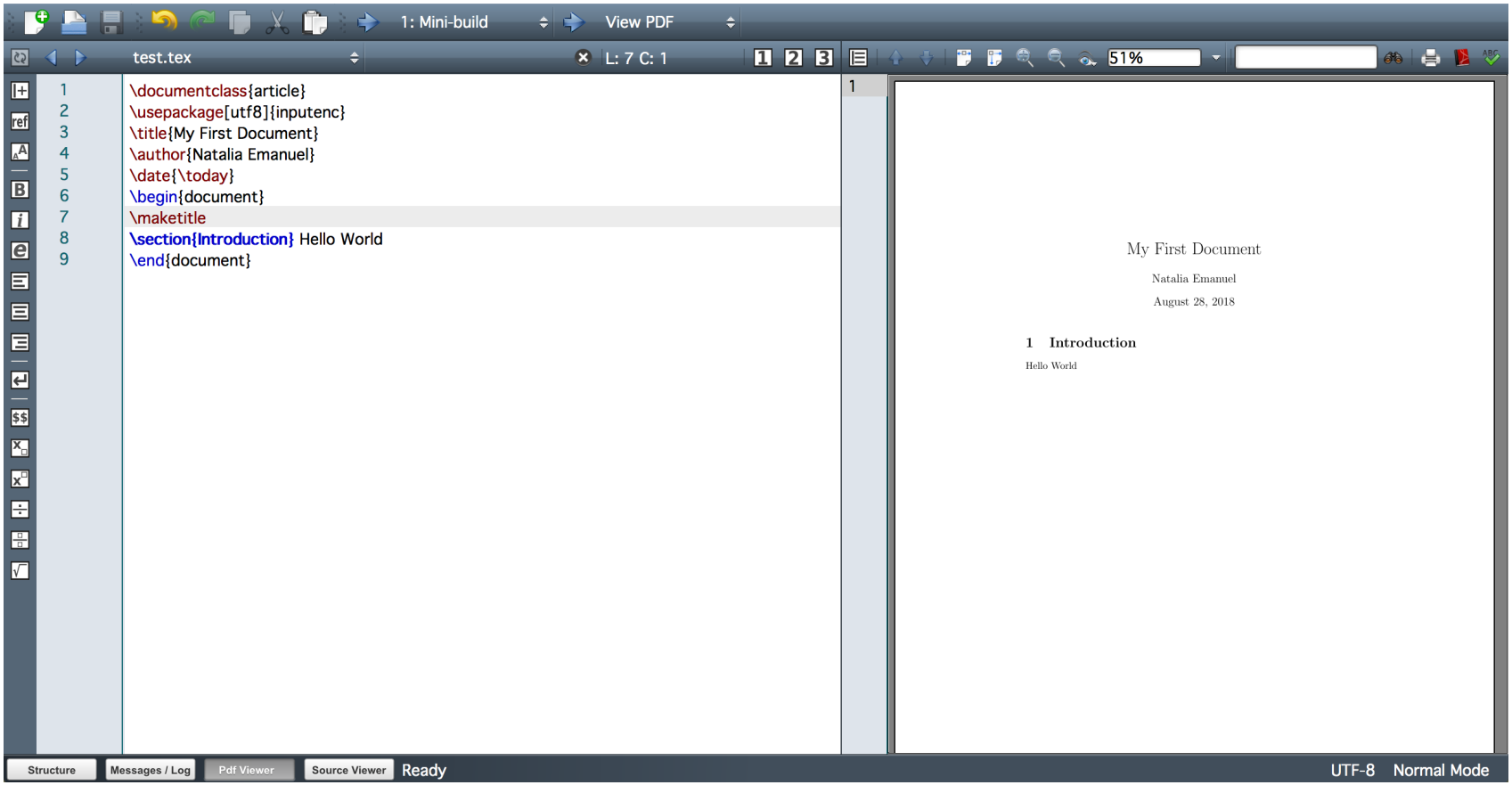
Goal: Put together a problem set, memo, or paper draft in LaTeX.

Software: Overleaf.com (Sharelatex.com) and/or TexMaker.

Not today:

- Beamer presentations
- Making figures from scratch inside LaTeX
- Adjusting templates

TeXMaker


1: Mini-build
View PDF
test.tex
L: 7 C: 1
51%
\documentclass{article}
\usepackage[utf8]{inputenc}
\title{My First Document}
\author{Natalia Emanuel}
\date{\today}
\begin{document}
\maketitle
\section{Introduction} Hello World
\end{document}
My First Document
Natalia Emanuel
August 28, 2018
1 Introduction
Hello World
Structure
Messages / Log
Pdf Viewer
Source Viewer
Ready
UTF-8
Normal Mode

Minimal Working Example

```
\documentclass{article}
\usepackage[utf8]{inputenc}

\title{My First Document}
\author{Natalia Emanuel}
\date{\today}

\begin{document}
\maketitle

\section{Introduction}
Hello World

\end{document}
```

Packages

```
\usepackage{amsmath, amssymb} % equations
\usepackage{bbm} % equations
\usepackage{graphicx} % images
\usepackage{threeparttable, booktabs} % tables
\usepackage{paralist} % compact lists
```

Sections

```
\section{Introduction}
\subsection{Background}
Text explaining your context
```

I. Introduction

A. Background

Text explaining your context

Sections

```
\section{Introduction}
\subsection{Background}
Text explaining your context

\subsection*{Data}
```

I. Introduction

A. Background

Text explaining your context

Data

Math & Equations

Math Environments

You can only access math symbols if you enclose it in a math environment:

```
a^2 + b^2 = c^2
```

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```
a^2 + b^2 = c^2
```
Error

```
$a^2 + b^2 = c^2$
```
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Acceptable environments are created by surrounding your math with:

- `$ $`
- `$$ $$`
- `\[ \]`
- `\begin{equation} \end{equation}`

Econometrics Symbols (an incomplete list)

	Code	Rendering
Greater Than	`\geq`	$\geq$
Subscripts	`Y_{ijc}`	Y_{ijc}
Superscripts	`X^2`	X^2

Econometrics Symbols (an incomplete list)

	Code	Rendering
Greater Than	`\geq`	$\geq$
Subscripts	`Y_{ijc}`	Y_{ijc}
Superscripts	`X^2`	X^2
Expectation	`\mathbb{E}`	$\mathbb{E}$
Indicator	`\mathbb{1}`	$\mathbb{1}$
Implies	`\implies`	$\implies$
Infinity	`\infty`	∞

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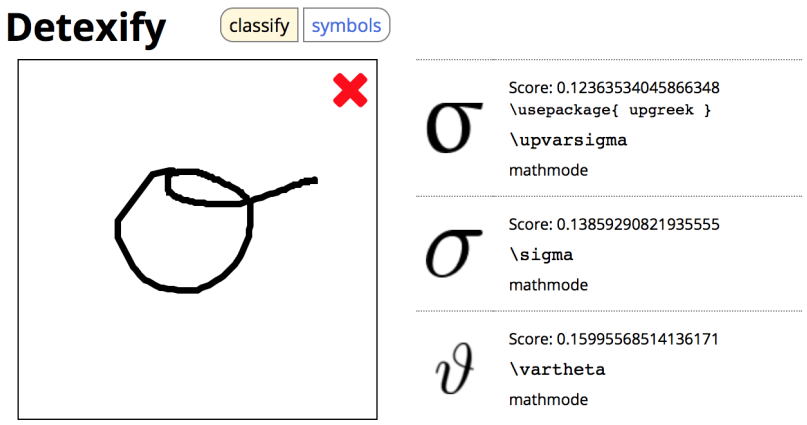
Expectation	`\mathbb{E}`	$\mathbb{E}$
Indicator	`\mathbb{1}`	$\mathbb{1}$
Implies	`\implies`	$\Longrightarrow$
Infinity	`\infty`	∞
Sums	`\sum_{j=0}^J`	$\sum_{j=0}^{J} X_j$
Large Brackets	`\left[ and \right]`	$\left[\sum_{j=0}^{J} X_j\right]$

Typing Math

Greek letters are usually accessible by writing its name `\psi` $\rightarrow \psi$

If you don't know a symbol, look it up on wikipedia or detexify.kirelabs.org/classify.html:



Defining New Variable Commands

If you get bored of typing `\mathbbm{E}` every time you need to write an expectation, you can define a few command in the header. Just make sure not to write over an existing command.

In the header: `\newcommand{\E}{\mathbb{E}}`

In the document: `\E` $\rightarrow$ $\mathbb{E}$

Equation Formatting

\begin{align*} will get you well-aligned equations. Use the & to show where to align them:

```
\begin{align *}
A & = \frac{\pi r^2}{2}
& = \frac{1}{2} \pi r^2
\end{align*}
```

$$\begin{aligned} A &= \frac{\pi r^2}{2} \\ &= \frac{1}{2}\pi r^2 \end{aligned}$$

Using \begin{align} will number your equations.

Equation Explaining: the Underbrace

You can explain or sign a formula like so:

```
\underbrace{R(x)y - Q(x)}_{\geq 0}
```

$$\underbrace{R(x)y - Q(x)}_{\geq 0}$$

Fractions

Create a fraction with `$\frac{numerator}{denominator}$`

Using `\dfrac` will force display mode: $\dfrac{1}{2}$

Using `\tfrac` will force text mode: $\tfrac{1}{2}$

Images

Images

```
\begin{figure}[h]
\includegraphics[scale=0.75]{ed.jpg}
\caption{Mischief Afoot}
\end{figure}
```

Figure: Mischief Afoot

Size

```
\includegraphics[scale=0.75]{ed.jpg}
```

Other ways of adjusting size include:

- `width = \textwidth`
- `width = 0.75\textwidth`
- `width = 2cm`
- `height = 4cm`

Placement

```
\begin{figure}[h]
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Placement

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\caption{Mischief Afoot}
\end{figure}
```

- `h` places the image approximately here
- `H` places the image at precisely that location. It need you to put `\usepackage{float}` in your header
- `t` places it at the top of a page
- `b` places the image at the bottom of a page
- `p` places it on a page designated only for floats

Image Paths

TeX will assume that your image is in the same folder as your .tex document. If that is not true, you can remedy it with the following options:

- Absolute file path: `{/Users/nemanuel/Maskin/pset2/images/ed.jpg}`
- Relative to your tex file: `{../images/ed.jpg}` where the `..` brings you back one file folder and `images` brings you into the images file folder
- In the header, place `\graphicspath{{"../../figs/"} {"../images"}}` to tell it which folder(s) to look for your images in

Lists

Lists

```
\begin{itemize}
\item Thing one
\item Thing two
\end{itemize}
```

- Thing one
- Thing two

Numbered lists

```
\begin{enumerate}
\item Thing one
\item Thing two
\end{enumerate}
```

1. Thing one
2. Thing two

Compact Lists

You can change the spacing in your lists by using `compactitem` from the package `paralist`

Or you can change settings globally with the following line in your header:

```
\setitemize{noitemsep, topsep=0pt, parsep=0pt,
partopsep=0pt}
```

Tables

A Table

```
\begin{tabular}{cc}
\toprule
Variable & Mean \\
\midrule
Age & 67.6 \\
Female & 53.2 \\
\bottomrule
\end {tabular}
```

Variable	Mean
Age	67.6
Female	53.2

If you opt not to use the packages `threeparttable` and `booktab`, replace `\toprule`, `\midrule`, `\bottomrule` with `\hline`

Table's structure

The {cc} specifies (1) the number of columns, (2) if columns are left-justified, centered, or right-justified, (3) where vertical lines are.

```
\begin{tabular}{ccc}
```

Variable	Mean	SE
Age	67.6	5.6

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```
\begin{tabular}{ccc}
```

Variable	Mean	SE
Age	67.6	5.6

```
\begin{tabular}{lr}
```

Variable	Mean
Age	67.6

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```
\begin{tabular}{ccc}
```

Variable	Mean	SE
Age	67.6	5.6

```
\begin{tabular}{lr}
```

Variable	Mean
Age	67.6

```
\begin{tabular}{c|c}
```

Variable	Mean
Age	67.6

Rough 'n' Ready Tables

To get someone else to do the hard stuff for you, you should

- Output tables from Stata or R into LaTeX and include them using `\input{OLS.tex}`
  - In Stata, consider using `esttab`
  - In R, consider using `stargazer` or `xtable`
- Input them by hand using tablesgenerator.com

Document Structure

Inputting Sections

If you have a large paper/problem set with many sections, you may want to make your TeX file more modular:

```
\begin{document}
\input{Problem1.tex}
\input{Problem2.tex}
\input{Code.tex}
\end{document}
```

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\end{document}
```

Overleaf will still compile nicely. In TexMaker, use `Options > Define Current Document as Master` so that you don't need to toggle away from `Problem1.tex` to compile.

Referencing

If you want to reference another object (a section, a figure), it needs two parts: a label and a reference.

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Labels:

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- ```
  \begin{figure}[h]
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  \label{fig:ed}
  \end{figure}
  ```
  ```

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Labels:

- `\section{Data} \label{sec:data}`
- ```
  \begin{figure}[h]
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  \caption{Mischeif Afoot}
  \label{fig:ed}
  \end{figure}
  ```

Reference:

- `As seen in Figure \ref{fig:ed}` → as seen in Figure 1
  ```

References formatting

You can make your references working links using the package `hyperref`:

```
\usepackage{hyperref} % links and hyperlinks
\hypersetup{
    colorlinks=true,
    citecolor = blue, % turns references blue
    linkcolor=black, % turn all internal links black
    urlcolor=blue, % turn external links (URLs) blue
}
```

Bibliography Documents

You need a document in the same folder that has bibliographic information such as `bibliography.bib`. It may look like so:

```
@article{Doyle2010,
title={Returns to physician human capital:  Evidence from
patients randomized to physician teams},
author={Doyle, Joseph J and Ewer, Steven M and Wagner, Todd H},
journal={Journal of health economics},
volume={29},
number={6},
pages={866--882},
year={2010},
publisher={Elsevier}
}
```

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}
```

Protip: grab these from google scholar/cite/bibTeX.

Bibliography Packages

Natbib

- In preamble, `\usepackage{natbib}`
- In preamble, `\bibliographystyle{aer}`
- At end of document `\bibliography{bib.bib}`
- `\citet{}` → Doyle et al (2010)
- `\citep{}` → (Doyle et al 2010)
- Backend: bibtex

Biblatex

- In preamble, `\usepackage[backend=biber, style=authoryear, sorting=nyt]{biblatex}`
- In preamble, `\addbibresource{bib.bib}`
- At end of document `\printbibliography`
- `\textcite{}`
- `\parencite{}`
- Backend: bibtex or biber

Compiling Bibliographies

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If you're working in TexMaker, you need to run pdfLaTeX, then run bibtex or biber (depending on which backend you're using; here you're using biber as you can see from the usepackage command in the TeX file), then run pdfLaTeX twice.

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- If you're using TexMaker, you can modify what "Quick Build" does using Texmaker/ Preferences/Quick Build/Option 2. If that doesn't work, you may need to make certain that the appropriate backend (biber or bibtex) is written in the Texmaker/Preferences/Commands/Bib(la)tex field.

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- Write and run a bash file that lives the same directory and can be executed directly on the terminal by calling `bash buildpdf.sh`. The bash file called `buildpdf.sh` would look like so:

```
pdflatex main.tex
biber main
pdflatex main.tex
pdflatex main.tex
```

Etc

Margins

To adjust your margins, use the package `geometry`. In your header, you'll include something like:

```
\usepackage[lmargin=1in,
rmargin=1in,
tmargin=0.9in,
bmargin=1in]{geometry} % adjusting margins
```

Linespacing

To adjust the spacing of your document, use the package `setspace`. Your preamble would include:

```
\usepackage{setspace}
\doublespacing % or \onehalfspacing
```

N.B.: This package sets spacing for your normal text, but not for footnotes, captions etc.

Spacing cont'd

- You can create a new line by using \\
- You can create more horizontal space by using \hspace{3pt}
- Likewise for vertical space: \vspace{3pt}

Quirks, Commands & Tips

- Quotes: In order to get quotes to render correctly, surround your quote with two backtics and two apostrophes, not with quotes
- You can only use & by writing `\&`
- Use `\today` to get the day's date
- `\textbf{bold}` yields **bold**
- `\textit{italics}` yields *italics*
- `\tableofcontents` will get you a table of contents
- Compile frequently so that you can identify typos early

Preamble, pt 1

```
\usepackage[utf8]{inputenc} % core essential
\usepackage{amsmath, amssymb} % equations
\usepackage{bbm} % equations
\usepackage{graphicx} % images
\usepackage{threeparttable, booktabs} % tables
\usepackage{paralist} % compact lists
\usepackage{float} % precise fig placement

% Bibliography packages:
\usepackage[backend=biber, style=authoryear,
sorting=nyt]{biblatex}
\addbibresource{bibliography.bib}
%\usepackage{natbib}
%\setcitestyle{authoryear, open={(},close={)}}
```

Preamble, pt 2

```
\graphicspath{{``../figs''}{``../slides''}} % fig location

\usepackage{setspace} % line spacing
\doublespacing % or \onehalfspacing

\usepackage[lmargin=1in,
   rmargin=1in,
   tmargin=0.9in,
   bmargin=1in]{geometry} % adjusting margins

\usepackage{hyperref} % links and hyperlinks
\hypersetup{
   colorlinks=true,
   citecolor=blue, % turns references blue
   linkcolor=black, % turn all internal links black
   urlcolor=blue} % turn external links (URLs) blue

% Any commands you're redefining
```