

Introduction to \LaTeX

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PML Workshop

MIT

What is LaTeX and why use it?

- LaTeX (pronounced “lah-tech” or “lay-tech”) is a document preparation system for high-quality typesetting that is free, available across platforms
- Allows users to prepare documents of various kinds, such as articles, books, and presentations
- Accommodates all of what you need for scientific publishing (equations, tables, figures, etc).
- Makes it simple to incorporate in-text citations and produce bibliographies consistent with a variety of style guides (e.g., Chicago, APSA, MLA)
- It’s an industry norm for us – we kind of throw the “don’t judge a book by its cover” saying out the window

Getting Started with LaTeX

You can use LaTeX locally on your computer if you prefer – for this, you need to download and install a LaTeX distribution and an editor.

- Mac users:

1. Download and install the MacTeX distribution (tug.org/mactex). MacTeX includes the TeXShop and TeXworks editors. TeXstudio (www.texstudio.org) is my preferred editor.

- PC users:

1. Download and install MiKTeX (miktex.org).
2. Download and install an editor, such as TeXstudio, Texmaker, WinEdt, Lyx, among others. The TeXworks editor comes with the MiKTeX distribution, but most users prefer a more user-friendly editor.

While you could use LaTeX locally, many prefer to use Overleaf (overleaf.com) to produce documents in LaTeX.

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Disclaimer: the materials for this workshop were produced in Overleaf and all exercises are designed with the intention that they will be done in Overleaf.

Plans for This Workshop

1. Basics of a LaTeX document

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2. Setting up a project in Overleaf

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1. Basics of a LaTeX document
2. Setting up a project in Overleaf
3. Producing papers and bibliographies
4. Producing slide decks with Beamer

- Document drafting is done in a `.tex` file
- When you compile your `.tex` file, a PDF file is produced with all of your content with desired formatting
- All bibliographical information for your document must be stored within a `.bib` file in your directory – when your `.tex` file is compiling, it will call your `.bib` file for formatting in-text citations and bibliography

There are 3 essential parts to a LaTeX document:

1. **Preamble:**

- ▶ Specifies your document type (article, presentation, etc.)
- ▶ Lists the packages that need to be loaded

2. **Front matter:** title, date, author, abstract, acknowledgements

3. **Document body:** contents of your document

Preamble

The **preamble** is the first part of your document. This is where you declare the type of document you are producing and load all packages needed to control document appearance.

```
\documentclass[12pt]{article}

% ----- page setup ----- %
\usepackage[margin=1in]{geometry}
\usepackage{setspace}

% ----- citation setup ----- %
\usepackage[authordate,isbn=false,doi=false]{biblatex-chicago}
\addbibresource{references.bib}

% ----- math setup ----- %
\usepackage{amsmath}
\usepackage{siunitx}

% ----- figure and table setup ----- %
\usepackage{graphicx}
\usepackage{placeins}
\usepackage{lscapex}
\usepackage{bbm}
\usepackage{tabularx, booktabs}
\usepackage{multirow}
\usepackage{longtable}
\usepackage{float}
\usepackage{subcaption}
\usepackage{caption}
```

The **front matter** is where you begin to fill in the content of your document. All content goes between `\begin{document}` and `\end{document}`.

- Title: `\title{}`
- Author: `\author{}`
- Date: `\date{}`
- Abstract: Between `\begin{abstract}` and `\end{abstract}`

`\maketitle` will take this info and produce title page

The **body** will be where the main text of your document will appear.

- Use `\section{Section title}`, `\subsection{Section title}`, etc. to make section headers
 - ▶ By default, LaTeX numbers sections – to remove section numbering use `\section*{Section title}` instead (the `*` removes numbering)
- Separate paragraphs by skipping a line
- **Bold** your text with `\textbf{YOUR TEXT}`; *italicize* with `\textit{YOUR TEXT}`
- Set line spacing with `\singlespacing`, `\onehalfspacing`, or `\doublespacing`
- For in-line mathematical expressions, surround them in `$`; most Greek letters have their own commands
 - ▶ Example: `$X_i + \alpha = 0.05$` makes $X_i + \alpha = .05$

To add figures, load the **graphicx** package and include the following:

```
\begin{figure}[POSITION] %h for hold; t for top of page; b for bottom of page
\centering
\includegraphics{PATH_TO_IMAGE}
\caption{\textbf{IMAGE TITLE.} Some extra text that describes what we should be looking at.}
\label{FIGURE_VAR_LABEL} %Internal reference
\end{figure}
```

The `\label{}` command allows you to reference that figure throughout the text.

- e.g., if you use `\label{my_scatter_plot}`, you can reference that figure with the `\autoref{}` command, as follows:
“In `\autoref{my_scatter_plot}`, we can see that”

Tables are inserted in a similar fashion as figures – you can position them, add captions, and add labels.

While there is a way to produce tables manually in LaTeX, you shouldn't spend the time.

If working in R, allow a package like **kable** or **tinytable** to make tables for you.

Otherwise, use a tool like *Tables Generator* (**tablesgenerator.com**) that has a GUI to help design your table.

A few other tips for using R for helping you build your paper:

- Use `kable` or `tinytable` packages for making summary tables
- Use `stargazer` or `modelsummary` for making regression tables
- Save table outputs as `.tex` files – either paste the LaTeX into your paper or place them in your paper with `\input{PATH_TO_TABLE}`

To include references in your paper, you need to create a **.bib** file. Use Zotero (or other reference managers) to help build the file.

- If you use Overleaf, the built-in Zotero integration will allow you to automatically sync your **.bib** file as you add references

In your **.tex** file, there are many ways to include references. In this department, two popular ways are:

1. **natbib** – most popular
2. **biblatex** – better supports author-date, Chicago styles

When using **natbib**, your document will roughly look like:

```
\documentclass[11pt]{article}
\usepackage[margin=1in]{geometry}
\usepackage{hyperref}
\usepackage{natbib}
\usepackage{cite}

\begin{document}
\maketitle
\clearpage

\section*{Introduction}
\textcite{achen_democracy_2016} argue elections often hinge on factors unrelated to policy,
such as economic performance or partisan loyalty. This aligns with earlier insights from
\textcite{campbell_american_1960} and \textcite{converse_nature_1964}.
The idealized model of the voter as a rational and informed agent is at odds with empirical evidence
\parencite{lodge_rationalizing_2013}. Instead, public opinion may be seen as a reaction to cues
rather than a deliberate expression of policy preferences \parencite{berinsky_two_1999, achen_mass_1975}

\bibliographystyle{apsr}
\bibliography{references.bib}

\end{document}
```

In-text citations added using `\citet{reference_key}`,
parenthetical citations added using `\citep{reference_key}`, and
bibliography added using `\bibliography{references.bib}`

When using `biblatex`, your document will roughly look like:

```
\documentclass[11pt]{article}
\usepackage[margin=1in]{geometry}
\usepackage{hyperref}
\usepackage[authordate,isbn=false,doi=false]{biblatex-chicago}
\addbibresource{references.bib}

\begin{document}
\maketitle
\clearpage

\section*{Introduction}
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rather than an expression of policy preferences \parencite{berinsky_two_1999, achen_mass_1975}.

\printbibliography

\end{document}
```

In-text citations added using `\textcite{reference_key}`,
parenthetical citations added using
`\parencite{reference_key}`, and bibliography added using
`\printbibliography`

Let's create our first paper!

Exercise #1: Create a new Overleaf project

1. On the Overleaf “Your Projects” page, click **New Project** → **Blank Project**.
2. Once your project has been created, you will see a file called **main.tex**. Paste the contents from the **paper_template.tex** file in the workshop materials folder into this document. Note that this template uses **biblatex** for citations.
3. Use the upload menu to bring the **references.bib** file from the workshop materials folder into this document.

Let's create our first paper!

Exercise #2: Personalizing your paper

In the front matter of your paper, update the following:

- Title
- Author
- Acknowledgements
- Date

Let's create our first paper!

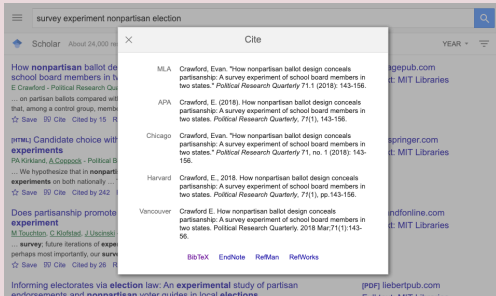
Exercise #3: Copy this paragraph (formatting and all) into your paper

The notion that **elections** are *mechanisms* for translating public will into policy outcomes has been challenged by numerous scholars. Achen and Bartels (2016) argue that rather than reflecting informed voter preferences, elections often hinge on factors unrelated to policy, such as economic performance or partisan loyalty. This aligns with earlier insights from Campbell et al. (1960) and Converse (1964), who documented the limited **political knowledge and ideological coherence** among the American electorate. Zaller (1992) expands on this by showing that **mass opinion is shaped more by elite discourse** than by genuine voter agency. Similarly, Downs (1957) economic theory posits that rational voters often remain uninformed due to the minimal impact of a single vote.

Let's create our first paper!

Exercise #4: Adding to your bibliography

1. Go to Google Scholar and find 3 articles relevant to your work. For each one, retrieve the BibTeX entry and paste the text into your `references.bib` file



2. Write a few sentences incorporating in-text and parenthetical citations to these new articles.

Let's create our first paper!

Exercise #5: Adding viz for the skimmers

1. In Overleaf, create a folder called **Figures** and a folder called **Tables**
2. Choose a **.png** file from the workshop materials folder, upload it to the **Figures** folder and then insert it into your paper
3. Similarly, Choose a **tables.tex** file from the workshop materials folder, upload it to the **Tables** folder and then insert it into your paper

Beamer is LaTeX class for making slides and presentations. It's basically LaTeX's version of PowerPoint where you can customize colors and theme, add transitions, etc.

The document structure is mostly the same and many of the commands we've talked about so far also apply to Beamer.

Beamer Basics

```
\documentclass[10pt]{beamer}
\usetheme[progressbar=frametitle]{metropolis}
\usepackage{appendixnumberbeamer}

\title{The title}
\subtitle{The subtitle}
\author{your name}
\begin{document}
\maketitle
\\begin{frame}{1st Slide}
  \begin{itemize}
    \item This is a list
    \item This is a list
  \end{itemize}
  \begin{enumerate}
    \item This is a numbered list
    \item This is a numbered list
  \end{enumerate}
\\end{frame}
\end{document}
```

Customizing Beamer

There are range of customizable themes for Beamer.

This deck was made with the **Metropolis** theme, with custom colors for MIT and added footer. The example slide deck uses this theme.

See this [Beamer theme gallery](#) for available options.

On the Complexity of SNP Block Partitioning Under
the Perfect Phylogeny Model

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Roded Sharan⁴ Till Tantau⁵

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Workshop on Algorithms in Bioinformatics, 2006

Gramm, Hartman, Nierhoff, Sharan, Tantau: Block Partitioning and Perfect Phylogenies WABI 2006 1 / 22

Sometimes you want to add transitions.

Adding Transitions

Sometimes you want to add transitions.
Like this.

Adding Transitions

Sometimes you want to add transitions.

Like this.

Or this.

Sometimes you want to add transitions.

Like this.

Or this.

To do so, use `\pause` on its own line where you want your content to be broken up.

When your document is compiled, the resulting PDF will have separate pages to include your transitions. If you want to create a PDF that ignores your transitions (e.g., creating handouts for classes), then use the following document class declaration:

```
\documentclass[handout]{beamer}
```

When job talks start rolling around, you might see two things:
appendix slides and content buttons.

► Appendix

Add content buttons with the code like this to make it easy to navigate between sections:

```
\begin{frame}[label = slide_1]{1st Slide}
  CONTENT
  \hspace{0em}\hyperlink{slide_2}{\beamergotobutton{Slide 2}}
\end{frame}
\begin{frame}[label = slide_2]{2nd Slide}
  CONTENT
  \hspace{0em}\hyperlink{slide_1}{\beamergotobutton{Slide 1}}
\end{frame}
\end{document}
```

Let's create our first slide deck!

Exercise #6: Making the theme your own

1. Paste the contents from the `slides_template.tex` file in the workshop materials folder into a new file in your Overleaf project.
2. Put your own title, name, institution, etc. in the document. See how the short vs. full versions of these values change the look of the presentation.
3. Try changing the color scheme, Beamer theme, removing the footer, etc.

Let's create our first slide deck!

Exercise #7: Adding content to a slide

1. Create a new slide
2. As content, insert short list with transitions, add a figure
3. Create a second slide and add content buttons to transition between your first and second slides

- When in doubt, Google it! More often than not, the [Overleaf documentation](#) has what you're looking for
- LaTeX errors are really annoying to comprehend and fix – compile often and try to isolate which change created your error
- Quarto/RMarkdown has the capacity to produce much of this (with some work) – the slides you see for Quant recitations that look just like this were produced in Quarto

Appendix

Example Appendix Slide

This is an Appendix Slide

► [Return](#)