Introduction to LaTeX

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Outline

- What is LaTeX?
- How does it work?
- Why should I use it?

Main Components of LaTeX

Typesetting engine: MiKTeX for PC; MacTeX for Mac; TeX Live for Unix

Source code file: A text file (.tex) that contains commands—analagous to a .m file for Matlab or .do file for Stata

Compiler: A program that tells the typesetting engine to process your source code file(s)

How to get from source to PDF

- Most compilers (e.g. LyX, TeXnicCenter, TeXworks) integrate a source code text editor for ease of processing
- LyX provides a What-You-See-Is-What-You-Get interface that makes things much simpler
- `pdflatex` is the typesetting engine's command to convert your .tex source file to a PDF
- Your compiler of choice will typically have some button that executes a command to `pdflatex`

Anatomy of a source code file

A LaTeX source file is broken up into two main sections

1. Preamble (where user declares which packages and global options will be used)
2. Document (the content of your document)

Example

```
\documentclass{article}
\title{The Pythagorean Theorem Revisited}
\author{Nicholas Halden}
\date{July 31, 2011}

\begin{document}
   \maketitle
   The Pythagorean Theorem states that $a^{2}+b^{2}=c^{2}.$
\end{document}
```

Power of LaTeX

- Documents produced in LaTeX are typeset—meaning there is no need for the user to worry about spacing between paragraphs, margins, etc.—the typesetting engine takes care of where to optimally place objects
- Academic publishers use LaTeX to typeset books and journals, so your product can look just as professional
- Math equations look especially nice
- Automatic export to PDF, a universally viewable file format
- Millions of users, so if you run into a problem, Google can easily find a solution
  - Note: I have never found a problem that someone else hasn't already encountered and solved on some discussion board somewhere

Drawbacks of LaTeX

- Somewhat of a learning curve (though this is greatly mitigated with WYSIWYG programs like LyX and Scientific Workplace)
- Typesetter may not always put objects where you want them
- Can be finicky if you try to get too fancy

Typesetting your first LATEX document

- For beginners, I highly recommend LyX—it works on all platforms, doesn't require you to know any LATEX commands, and is already installed on all of the Econ department machines in the Bowling Alley and the Driving Range.
- LyX's WYSIWYG structure allows the user to see updates to his document without having to re-compile.
- For more advanced users, LyX has limitations in what it can do.
- LyX has great documentation and tutorials for first-timers. When first opening LyX go to Help▶Introduction and Help▶Tutorial. Nothing else I can say will help you more than going through the Introduction and Tutorial on your own.
- We'll go through this today.

Anatomy of a LaTeX document: Environments

- LaTeX has what are called *environments*
- These include things like:
    - Section headings
    - Section subheadings
    - Numbered lists
    - Mathematical equations
    - Quotations
    - Normal text
- In LyX, you can access these in the top left (just below the 'File' menu)

LaTeX has different document classes which organize content in different ways:

- article (scientific journal article; the default class)
- book (allows for chapters and front/back matter)
- presentation (presentation slides)
- letter (includes extra environments for address lines, signature, etc.)

In LyX, change the document class by going to Document▶Settings

Anatomy of a LaTeX document: Labels and Cross-References

One of the great things about LaTeX is that users can create "links" within a document to other parts of the document. e.g. if I referenced a equation 1 on page 5, I can create a link that the reader can click on and go back to page 3 where equation 1 was first defined. The following items can be referenced:

- mathematical equations
- chapters and sections and subsections (and subsubsections and ...)
- footnotes
- bibliographic references

LaTeX also makes tables of contents, bibliographies and indexes very easy to generate.

- Bibliographies are managed through BibTeX
- BibTeXcan accommodate any citation style (e.g. MLA, APA, Chicago, etc.)
- Most professional journals require a BibTeXdatabase of your references before publication
- Tables of contents and indexes are typically only used in books (not journal articles)

LaTeX was primarily invented to handle mathematical formulas

- Many commands for many types of formulas
- Greek letters invoked with, e.g.

  `{\beta}`
- Can do equations, matrices, fractions, accent marks (like $\tilde{x}$ and $\hat{y}$)
- Other crazy stuff like

$$a_0 + \cfrac{b_1}{a_1 + \cfrac{b_2}{a_2 + \cfrac{b_3}{a_3 + \cdots}}}$$

Floats, Figures, Tables, Graphics

- Tables and figures look best when inserted in a float
- Graphics images need to be certain file types: .jpg, .eps, .png
- Can't use .gif
- LaTeX automatically numbers the floats
- It's also possible to create sub-figures and sub-tables that are numbered (a), (b), etc.

Exporting/Importing LaTeX documents into LyX

- You can easily import into LyX a .tex document that someone else has written
- File▶Import▶LaTeX (plain)
- Exporting a .lyx document into a .tex document (for someone else to read) is just as easy:
- File▶Export▶LaTeX (plain)

Beamer

- Beamer is the "PowerPoint" of LaTeX
- These slides were made in Beamer
- To use Beamer in LyX, select article(beamer) as the document class
- For a tutorial in Beamer, go to
  `http://www.uncg.edu/cmp/reu/presentations/Charles%20Batts%20-%20Beamer%20Tutorial.pdf`
- For a graphical table of Beamer slide styles, go to
  `http://www.hartwork.org/beamer-theme-matrix/`