Introduction to LaTeX
Advanced Topics

Introduction

Assumptions

Configuration

Use Cases

Start with discipline-specific use-cases, e.g. mathematics typesetting.

Math typesetting can be especially difficult in most document processing systems. In LaTeX, it isn't much easier—in fact, it's harder—but the precision control it affords is without equal.

For instance, consider the example on the right (L'Hôpital's Rule). This was produced within the MATH ENVIRONMENT, of which there is two flavors (accessible by a few different notations). The following is the code which produced the expression representing L'Hôpital's Rule:

```
\begin{equation*}

\lim_{x \rightarrow 0}{\frac{e^x - 1}{2x}}
\overset{\left[\frac{0}{0}\right]}{\underset{\mathrm{H}}{=}}
\lim_{x\rightarrow 0}{\frac{e^x}{2}} = {\frac{1}{2}}

\end{equation*}
```

Engine	Format	Output
TeX	Plain TeX	DVI
pdfTeX		PDF
XeTeX		
LuaTeX		
LaTeX	LaTeX	DVI
pdfLaTeX		PDF
XeLaTeX		
LuaLaTeX		

$$\lim_{x \to 0} \frac{e^x - 1}{2x} \overset{\left[\frac{0}{0}\right]}{\underset{\mathrm{H}}{=}} \lim_{x \to 0} \frac{e^x}{2} = \frac{1}{2}$$

Taking Note

Now let's say you want to use LaTeX for notetaking, modeling, or general day-to-day use, but perhaps the math markup is slowing you down. We can get around this by defining our own commands.

Annotated Bibliographies

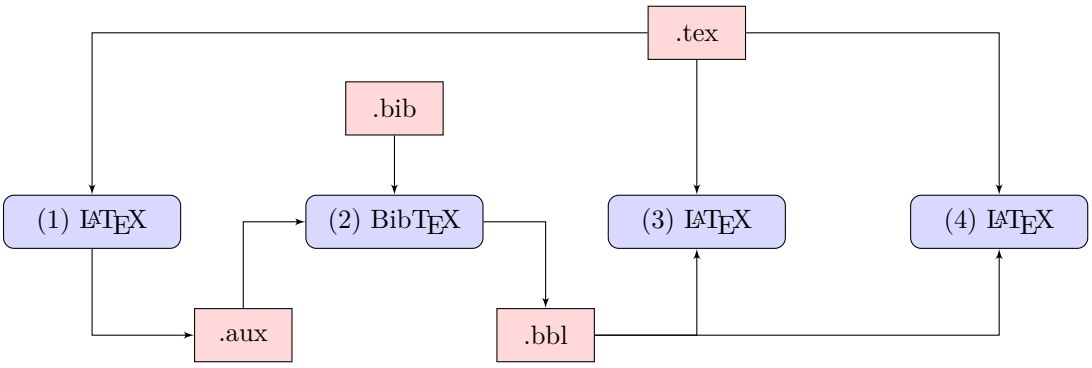
Drafting Manuscripts

Presenting Your Work

Beamer and posters

Under The Hood

When compiling a document that has a bibliography file, the situation is a fair bit more complex. Rather than running a single instance of the engine program on the master `.tex` file, we must run several instances of both the LaTeXengine (or some variant) and at least one instance of the BibTeXengine (or some variant). This is schematized in the following figure:



As before, we first run LaTeX as in step (1). The LaTeX engine reads the master `.tex` file and outputs a PDF as before, but it also outputs a `.aux` file which contains a list of citation keys found in the main document.

This `aux` file is critical for step (2). BibTeX reads the `.bib` file to get the bibliographical information relevant to the citekeys found in the `.aux` file. BibTeX outputs a `.bbl` file, which factors into step (3).

A second run of the LaTeX engine is required to read the `.bbl` file, which now has the necessary information to correctly position the citations and references with the correct formatting.

Finally, in step (4), *at least* one last run of LaTeX must be performed in order to update any crossreferences within the document. If your document has a table of contents, as many do, the addition of the citations and references in step (3) is likely to have shifted where the page breaks fall with respect to the document content. This final step is crucial for factoring in this shift.

Class Packages