

A Simple Introduction to L^AT_EX

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Getting Started

A basic L^AT_EX file has a two major sections: the preamble to set the style options, define variables and new commands, followed by the guts of the document, as shown below in the file `latex-graphics.tex`:

```
\documentclass[12pt]{article}
\usepackage{graphicx, fullpage}
\title{Intoduction to Graphics in \LaTeX}
\author{Merlise Clyde}
\date{September 10, 2003}

% end of preamble

\begin{document}
\maketitle
Here is my first document!

\end{document}
```

The first line indicates that the document will be in a 12 point font and follows the `article` style file. There are other options for style files, including `seminar` (for slides), `book` and `thesis` styles.

The `\usepackage` command is used to add additional packages, in this case a package for including graphics and a package for formatting pages with one inch margins. There are lots of other packages! The `\author`, `\title`, and `\date` commands are included in the preamble to define the author, title, and date and are used in making a title for the document, using the `\maketitle` command. You can omit the date, and by default the `\maketitle` command will use today's date. The `\maketitle` command is also useful in conjunction with `\begin{titlepage}` and `\begin{abstract}`, useful for technical reports. These are optional in the article environment. Comments can be included anywhere after `%`. In case you are wondering about any typesetting commands used to produce this handout, this file `latex-intro.tex` is also available on the web page, and you can peruse it at your leisure.

Creating a DVI File

Once you have created a \LaTeX file, there are two ways to “Compile” a \LaTeX file to create a DeVice Independent (dvi) file, which can be previewed. The first that will work on both ISDS and ACPUB machines involves running \LaTeX from a UNIX terminal window:

```
> latex latex-graphics
```

Note, it is not necessary to specify the `.tex` file ending.

The second way is to use a special \LaTeX mode in emacs called **AUCTeX**. In emacs, you should see “ \LaTeX ” on the info bar near the bottom of the screen when you open a file ending in `.tex`. This mode will also highlight functions and text in different colors, which can be useful in debugging a tex file with errors.

In this mode, you can use **C-c C-c** to access a set of useful \LaTeX commands. For example, **C-c C-c latex** will run \LaTeX on the current file. If it compiles successfully and completely (sometimes you need to run it more than once if there are internal references), then **C-c C-c View** will bring up an xdvi window so that you can preview the dvi file. Note that Emacs is pretty good at guessing what you want to do when you hit **C-c C-c**, so if the default is correct, you can just hit enter. Other useful commands are **Print** and **Spell**. For a complete list of choices, you can hit **C-c C-c** and hit the tab key. Note that you can use tab-completions for the options.

If you are not using emacs, then you can preview the dvi file by entering after the unix prompt

```
> xdvi latex-graphics &
```

in a unix terminal window. Again, the dvi file ending is not necessary. Keep this window open; as you add to the \LaTeX file and re-compile, the dvi window will be updated. You may need to click on the Reread button to reload the file and update the window, if the changes do not automatically appear.

Printing

There are two options for creating a file that can be printed.

Creating a Postscript File

The first option uses the unix command **dvips** to create a postscript (`.ps`) file from the `.dvi` file. On some systems, it will send this file directly to the printer, and not save anything to disk unless you explicitly tell it to with the `-o` switch. In ISDS if you use **dvips** from the unix prompt, it will only create a postscript file, and not send anything to the printer. You can then print by using **lpr -Pmyprinter myfile.ps**, where `-Pmyprinter` specifies sending the output to the printer named `myprinter`.

You can print two pages in smaller print one one piece of paper (sideways) with the **psnup** command. One way to do this at the unix prompt is to run **dvips** and then *pipe* the output to the **psnup** function and then *pipe* that output to the **lpr** function:

```
dvips latex-example -f | psnup -n 2 | lpr -P211
```

where the printer name here is 211.

Note that `dvips` has many options. Important ones include those that specify a print range, such as `-p`, `-n`, and `-f`. For more info, see the `man` page for `dvips`,

```
man dvips
```

Creating a PDF File

While postscript is meant to be portable across many environments/printers, in reality this is not always the case. The Adobe Portable Document Format is meant to be a better solution (but doesn't always succeed either). To create a PDF file, there are a couple of options. The easiest way is to use the command

```
> pdflatex latex-graphics
```

to create a PDF file. This option will require that all graphs in any figure are in a PDF format or non-postscript format as described later.

Other Parts of the Document

All of the commands below should be contained within the document environment between the

```
\begin{document}
```

```
\section{Introduction}
```

```
Let's get started!
```

```
\subsection{How to add sections}
```

```
use the command....
```

```
\section{Adding Figures}
```

```
etc
```

```
\end{document}
```

Sections

To create section and subsection headings use the command

```
\section{EDA}
```

```
\subsection{Quantile-Quantile Plots}
```

You will note that all the sections and subsections in this document are not numbered. If you do not want numbered sections, you can instead use `\section*` and `\subsection*`.

Comments

Comments are started by the percent sign (%). Anything that appears on a line after a % is ignored by L^AT_EX. This can be helpful when making changes to a document. But this is why you must always remember to put a backslash before a percent sign when you want a percent sign in your text, i.e., \%. Try removing the backslash in the example file before the percent sign of 4\% margin of error, recompile, and see what happens. To comment out a large block of text include it in a comment environment by using

```
\begin{comment}
text to comment out
\end{comment}
```

To use this environment, add `comment` to the list of packages in the `\usepackage` command.

Equations and Mathematics

Within the text you may want to include formulae or Greek symbols. To do this, you need to invoke math mode with a single dollar sign and type in the expression, for example for a fraction 1/2 use `$$\frac{1}{2}$$` command, which takes two arguments, the numerator and the denominator. For an expression using Greek letters, $E[Y_i] = \beta_0 + \beta_1 X_i$, use `$$\rm E}[Y_i] = \beta_0 + \beta_1 X_i$`. If in doubt about how to get the right text for an expression, use the L^AT_EXmenu in emacs to invoke Math Mode (under Miscellaneous) or use `C-c`, and of course look it up in your favorite L^AT_EXbook.

For a more complicated expression you may want to offset it from the text using a displayed equation environment.

$$p(x_i|\theta) = \theta^{x_i}(1-\theta)^{1-x_i} = \begin{cases} \theta & \text{if } x_i = 1, \\ 1-\theta & \text{if } x_i = 0. \end{cases} \quad (1)$$

by using

```
\begin{equation}
p(x_i|\theta) = \theta^{x_i}(1-\theta)^{1-x_i} = \left\{ \begin{array}{ll}
\theta & \text{\mbox{if } $x_i=1$,} \\
1-\theta & \text{\mbox{if } $x_i=0$.} \end{array} \right.
\end{equation}
```

To get a curly brace to print, you must use `\{`, since the curly brace is used within L^AT_EX to bound action areas. You can mix and match your `\left` and `\right`, as long as you have one of each. You can also use `\left.` to match any `\right` but to not print anything (since they must be balanced). Note that an `array` is just like a `tabular`, except that it must be used in math mode, and everything inside is automatically in math mode. Also note that `\mbox{}` is a method of including regular text (not in math mode) inside of math mode. Try the above expression so you can see all of the parts in action.

With the equation environment, equations are automatically numbered throughout the document. To skip numbers, you could equally use `$$` and `$$\[` and `\]`, or `\begin{equation*}` and `\end{equation*}`. This is analogous to the difference between `\begin{section}` and `\begin{section*}`. You can get L^AT_EX to make an automatic reference with the `\label{eq:bernoulli}` and `\ref{eq:bernoulli}` commands.

Figures

To include a figure in a document, use the figure and centering environments.

```
\begin{figure}[htb]
\begin{center}
\includegraphics[height=1in,width=1in,angle=-90]{foo}
\caption{This is a figure.}
\end{center}
\end{figure}
```

The syntax of the `\includegraphics` command is as follows:

```
\includegraphics[parameters]{filename}
```

where parameters is a comma-separated list of any of the following:

```
bb=llx lly urx ury (bounding box),
width=h_length, height=v_length,
angle= angle,  scale=factor,
clip=true/false, draft=true/false.
```

Use the `\includegraphics` command with the name of the graphic file `foo` without extension. By doing so each of **latex** and **pdflatex** will choose the correct version of the file to be included, i.e., `foo.ps` and `foo.pdf` (or `foo.png`, or whatever graphic format you have chosen).

Other Environments

The AUCTeX mode for LaTeX has several built in function to insert LaTeX commands. You can explore options under the LaTeX menu. Most of these are “bound” to particular Control or Meta key sequences when in LaTeX mode.

Finishing Up

When you are done, make sure to close any `xdvi` windows and exit emacs before logging off. Failure to do so could spawn runaway processes that gobble up memory!