Writing in LaTeX: An Introduction

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January 31, 2008

Outline

- What is LaTeX?
- Why should I use LaTeX?
- What do I need to get started?
- Basics
  - Text
  - Mathematical Equations
  - Arrays and Matrices
- Special Features
  - Tables
  - Figures
  - Labeling and Referencing
- Prosper / Slide Show

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- LaTeX simply adds to the commands of the TeX language in a somewhat more user friendly style. LaTeX was originally written by Leslie Lampart.

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- You may be required to write your thesis in LaTeX.

`http://sci.odu.edu/sci/about/information/thesis/Thesis_Templates.shtml`

What Do I Need to Use LaTeX?

You will need to download the following items:

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- Winedit ($30 for students) or Scientific Workplace, are user interface programs.

  `http://www.winedt.com/`

Basics

- One of the benefits of using LaTeX over other word processing units is that it is much easier to use Greek letters and symbols. For instance, instead of using your mouse to search through a window of characters, you can simply write the code

`\alpha`	$\Rightarrow$	α	`\sum`	$\Rightarrow$	$\sum$
`\beta`	$\Rightarrow$	β	`\infty`	$\Rightarrow$	∞
`\gamma`	$\Rightarrow$	γ	`\Gamma`	$\Rightarrow$	Γ
`\delta`	$\Rightarrow$	δ	`\Delta`	$\Rightarrow$	Δ
`\lambda`	$\Rightarrow$	λ	`\Lambda`	$\Rightarrow$	Λ
`\star`	$\Rightarrow$	$\star$	`\circledR`	$\Rightarrow$	$\circledR$
`\propto`	$\Rightarrow$	$\propto$	`\in`	$\Rightarrow$	$\in$

Basics

There are also many special commands in LaTeX that make word processing much easier.

`\today` $\longrightarrow$ January 31, 2008

```
These \ldots \cdots
  \vdots and \ddots
  are various ellipses
```

$\longrightarrow$ These $\ldots$ $\cdots$ $\vdots$ and $\ddots$ are various ellipses

There are also various accents that are easy to implicate.

`\b{o}`	$\Rightarrow$	o̲	`\hat{a}`	$\Rightarrow$	$\hat{a}$
`o'`	$\Rightarrow$	o'	`\tilde{a}`	$\Rightarrow$	$\tilde{a}$
`\c{o}`	$\Rightarrow$	o̧	`\d{a}`	$\Rightarrow$	ạ

Basics

You can also write in many different type-sizes

`{\tiny Math}`	$\longrightarrow$	{\tiny Math}
`{\scriptsize Math}`	$\longrightarrow$	{\scriptsize Math}
`{\footnotesize Math}`	$\longrightarrow$	{\footnotesize Math}
`{\small Math}`	$\longrightarrow$	{\small Math}
`{\normalsize Math}`	$\longrightarrow$	{\normalsize Math}
`{\large Math}`	$\longrightarrow$	{\large Math}
`{\Large Math}`	$\longrightarrow$	{\Large Math}
`{\LARGE Math}`	$\longrightarrow$	{\LARGE Math}

as well as `\huge` and `\Huge`.

Basics

The following is a list of fonts:

`{\rm Math}`	$\longrightarrow$	Math
`{\it Math}`	$\longrightarrow$	*Math*
`{\sc Math}`	$\longrightarrow$	MATH
`{\em Math}`	$\longrightarrow$	*Math*
`{\sl Math}`	$\longrightarrow$	*Math*
`{\tt Math}`	$\longrightarrow$	`Math`
`{\bf Math}`	$\longrightarrow$	**Math**
`{\sf Math}`	$\longrightarrow$	Math

Basics

Portions of a document can be easily formatted by using the following commands:

Centering $\Rightarrow$
```
\begin{center}
    ⋮
\end{center}
```

Itemize $\Rightarrow$
```
\begin{itemize}
    ⋮
\end{itemize}
```

Enumerate $\Rightarrow$
```
\begin{enumerate}
    ⋮
\end{enumerate}
```

Documents can also be partitioned merely by specifying `\part`, `\chapter`, `\section`, `\subsection`, etc.

Mathematical Equations

- Where LaTeX really shines is in writing mathematical equations or formulas, which can be done in either the "\begin{equation}" or "\begin{eqnarray}" settings. The "equation" command numbers equations automatically, while the "eqnarray" command gives you the option of not numbering by specifying "`\nonumber`".

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- You can also write equations within text by wrapping dollar signs ($) around an equation, such as:

  `$4\times8=32$` $\rightarrow$ $4 \times 8 = 32$.

Mathematical Equations

There are also many mathematical symbols that make writing equations easy. For example:

`\sqrt[3]{4xy}`	$\Longrightarrow$	$\sqrt[3]{4xy}$
`\frac{x}{1-x}`	$\Longrightarrow$	$\frac{x}{1-x}$
`(r)^{2t-1}`	$\Longrightarrow$	$(r)^{2t-1}$
`A_{1}-A_{2}=A`	$\Longrightarrow$	$A_1 - A_2 = A$
`\sum_{i=1}^{n}p^{i}`	$\Longrightarrow$	$\sum_{i=1}^{n} p^i = \frac{p-p^{n+1}}{1-p}$
`=\frac{p-p^{n+1}}{1-p}`		
`x\nleq\,y`	$\Longrightarrow$	$x \nleq y$

These symbols can be used in both the text and “equation” environments.

Mathematical Equations

An example:

```
\begin{eqnarray}
S & = & \frac{(1-\rho)(1+\rho+\rho^{2}+\ldots+\rho^{n-1})}
            {(1-\rho^{n})}\nonumber \\
      & = & \frac{(1-\rho)(1-\rho^{n})}{(1-\rho^{n})(1-\rho)} =
            1\end{eqnarray}
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Gives us the following aligned equation.

$$
\begin{aligned}
S &= \frac{(1-\rho)(1+\rho+\rho^2+\ldots+\rho^{n-1})}{(1-\rho^n)} \\
&= \frac{(1-\rho)(1-\rho^n)}{(1-\rho^n)(1-\rho)} = 1
\end{aligned} \tag{1}
$$

Special Features

One useful feature for mathematicians and statisticians is the use of arrays. One particular example of this is in designing matrices. For example:

```
\begin{eqnarray}\left(\begin{array}{l|cr}
    1 & \rho & \rho^{2}+2 \\ \hline
    \rho+2 & 1+\alpha & \alpha \\
    \rho^{2}+\rho-1 & \alpha^{2}-\alpha+8 & 1-\alpha\rho+\rho
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Special Features

LaTeX is also good for making tables. For example:

```
\begin{center}\begin{tabular}{c|c|c|c}\hline\hline
    Parameter & $\phi$ & $\rho$ & $\alpha$ \\ \hline
    MLE & 0.520 & 0.425 & 0.348 \\
        & (0.009) & (0.028) & (0.021) \\
        & < 0.001 & < 0.001 & < 0.001 \\ \hline
    QLS & 0.519 & 0.324 & 0.390 \\
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Special Features

Importing figures is also very strait forward. For example

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\begin{center}\begin{Figure}
    \includegraphics[width=2.0in]{Figures/2areMLMOrho}
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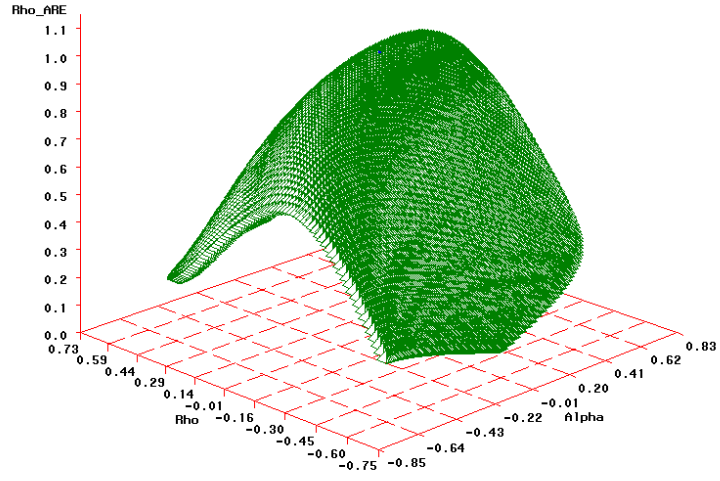

Note you must save pictures as ".eps" files within the same folder as the LaTeX file.

Special Features

One of the most useful features of LaTeX is that it allows you to label equations, Figures and Tables that you wish to have numbered, so that you only need to make reference to the equation (rather than the number). For instance, the following code labels an equation:

```
\begin{eqnarray}
    Y=2X-3 \label{eq:line}
    \end{eqnarray}
```

And the following code references it `\ref{eq:line}`, such that we can now reference equation (2), which is found below.

(2) $$Y = 2X - 3$$

Prosper

- The Prosper class of documents, incorporated with the command `\documentclass{prosper}`, allows you to make a slide show. Like creating a paper or thesis, using LaTeX to make a slide show gives you a lot of freedom and flexibility. This is especially true if your work is mathematically intensive.

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- Writing text and mathematical equations, and incorporating Tables and Figures is the same in Prosper as it is in other document classes. However, there are a few differences.
- Slides are created by first typing `\begin{slide}{title}`, entering the material to be found on the slide, and then typing `\end{slide}`.

Prosper

Prosper has many different transition styles to change from one slide to the next. For instance:

- `\begin{slide}[Split]{title}`:
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- `\begin{slide}[Box]{title}`:
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- `\begin{slide}[Replace]{title}`: simply replaces the old slide with the new.

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Now onto the examples!