22S:166
Computing in Statistics

Introduction to LaTeX

Lecture 3
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Why learn LaTeX?

- easy to produce professional-looking mathematical formulas
- easy to label equations, citations, figures, tables, etc. to automate cross-referencing
- can be used on any type of computer (PC, workstation, mainframe)
- freely available
- installed in many universities and research institutions
- `.tex` files are plain text: can be produced with any text editor and emailed to co-authors
  - doesn't require that all have same type of computer or same word-processing software

- `.dvi` files produced in LaTeX processing can be viewed on screen and printed on almost all kinds of printers
  - `dvi` is short for *device independent*
- particularly useful to academics; many journals now want electronic submission of manuscripts in LaTeX format

Using LaTeX in the UI Mathematical Sciences educational laboratories

1. prepare source file : `<name>.tex` in text editor
   - filename extension must be `.tex`
2. spell check source file:
   `ispell <name>.tex`
3. process source file:
   `latex <name>`
4. check that the following files exist: `<name>.log`, `<name>.aux`, `<name>.dvi`
5. view .dvi file (background job):
   `xdvi <name> &`
   - check document on screen before printing to save paper and money
6. convert .dvi file to Postscript (.ps) file:
   `dvips <name> -o <ps file name>.ps`

7. view .ps file (background job):
   `ghostview <ps file name>.ps &`
8. (optional) format multiple pages into a single sheet:

   ```
   psnup -nup <number of pages> -m<margin size> <ps file name>.ps <new ps file name>
   ```

9. (optional) convert .ps file to .pdf file:

   ```
   ps2pdf <ps file name>.ps <pdf file name>.pdf
   ```

10. (optional) view .pdf file (background):
    `acroread <pdf file name>.pdf &`
11. `.dvi` and especially `.ps` and `.pdf` files can be large, so smart to delete them when you're done using them
    - don't delete the `.tex` file!

Note: There is no need to restart the viewing application after you have modified a file. The content of these windows will be updated automatically, or by using File/Reopen or File/Open.

Basic LaTeX

- current version of LaTeX is LaTeX 2_ε.
- previous version was LaTeX 2.09.
- lines that must appear in *every* LaTeX document:

```
\documentclass{ <class> }
\begin{document}
\end{document}
```

- classes of documents producing different default formats
  - article
  - report
  - book
  - slides
  - letter

Sample .tex file

```
% articletemplate.tex

\documentclass[12 pt]{article} % statement required; 12 pt opti

%preamble
\usepackage[dvips]{graphics}
\usepackage{amssymb, amsmath}
\makeindex

% start document
\begin{document}  % required

% article heading
  \title{ Example of \LaTeX\ document  }
  \author{ Kate Cowles }
  \date{ \today }
  \maketitle

%  \tableofcontents

  \begin{abstract}
       This article demonstrates usage of basic \LaTeX\ feature

  \end{abstract}
```



```
\section{Automatic paragraph formatting} \label{autoform}

     This is paragraph 1.

     To start a new paragraph, simply leave one or more
     blank lines.  \LaTeX\ will do the indenting
     automatically.  \LaTeX\ automatically indents the
     first line in all paragraphs except the first in a
     section.

     It doesn't matter how many spaces                you
     leave in between
     words or   where you break
     lines---
     \LaTeX\ considers a carriage return (where you pressed
     ``Enter")
     as just another space between words.

\section{Special characters in \LaTeX} \label{specchar}

     The following characters are special codes in \LaTeX:
     \&, \$. \%, \~, \_. \{, \}, \#, and \^.  To print
     one of these characters literally, you must put a
     backslash before it.  The backslash itself obviously
     also is a special character.

  \subsection{\%} \label{pcntsign}
```

```
      The percent sign is used to insert comments in a
      {\tt .tex} file.  It tells \LaTeX\ to ignore
      everything that comes after it on the line.  My most
      common error in \LaTeX\ is to forget to put the backsl
      before the % sign, so that several words are
      omitted from the output.

\section{Mathematical expressions} \label{mathexp}

      Mathematical expressions may be included in the text
      of a paragraph by putting a dollar sign at the
      beginning and the end of each, like this: $e = mc^2$.
      The special backslash character is printed with
     $\backslash$.

      Alternatively, a mathematical expression may be set
      off on its own line like this:

      \[
          e = mc^2
      \]

Also, \LaTeX\ can number equations and keep track
of the numbering for you, like this:

\begin{equation}\label{equa}
      e = mc^2
\end{equation}
```



```
\section{Using labels} \label{labels}

    Because we have used labels on our sections and
    equation, we can refer to them without having to
    remember the numbers ourselves.  For example,
    equation~(\ref{equa}) appeared in section \ref{mathexp}.
    This capability is particularly handy when we add
    sections or equations, or reorganize a document.

\section{Environments}\label{envi}

    An \emph{environment} is a section of a \LaTeX\ document
    that is processed in a special way.  Usually the section
    begins with
    \begin{verbatim}
            \begin{ < environment name > }
    \end{ver*batim}

    and ends with

    \begin{verbatim}
           \end{ < environment name > }
    \end{ver*batim}

\subsection{Lists}

    \LaTeX\ has two list environments:
```



```
\begin{itemize}
  \item bulleted lists
  \item numbered lists
         \begin{enumerate}
              \item differ from bulleted lists in th
                 environment name
              \item lists can be nested within lists
          \end{enumerate}
      \end{itemize}


    \subsection{Tables}

    The {\tt tabulate} environment formats the rows and columns
    while the {\tt table} environment provides captions, that i

    \begin{table}[h]
     \begin{center}
     \begin{tabular}{ll}
      environment name & function \\
      \hline
      tabular & define rows, columns, titles \\
      table   & add captions; make environment ``floating'' \\
      \hline
      \end{tabular}
\end{center}
     \caption{Environments for Tables}\label{tabl}
     \end{table}
```



```
    Options concerning table placement may appear in square bra
    the environment name {\tt table}.  The choices are:
\begin{itemize}
            \item {\tt [h]} --- here (where typed in document)
            \item {\tt [t]} --- top of page
            \item {\tt [b]} --- bottom of page
                \item {\tt [p]} --- on separate page with other fl
          \end{itemize}


\end{document} % required
```