

# Introduction to L<sup>A</sup>T<sub>E</sub>X

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This introduction will walk you through the basic commands of L<sup>A</sup>T<sub>E</sub>X using as an example the article, “Did Illegally Counted Overseas Absentee Ballots Decide the 2000 U.S. Presidential Election?” Its purpose is to give you information necessary to write an article with L<sup>A</sup>T<sub>E</sub>X. You should read this introduction along with that document and its code, so you can see the the outcome of each bit of code cited here. However, readers may consult with additional materials such as “Not so short introduction to L<sup>A</sup>T<sub>E</sub>X” (available online at CTAN archive) and Helmut Kopka, Patrick W. Daly “Guide to L<sup>A</sup>T<sub>E</sub>X Document Preparation for Beginners & Advanced Users,” (Addison-Wesley, 1999; ISBN: 0201398257) for more comprehensive introductions. This introduction assumes that you have an access to the UNIX/LINUX operating system that has L<sup>A</sup>T<sub>E</sub>X type setting system installed.

## 1 Getting started

### 1.1 Files

The first step is to download the example file archive, `tex.tar.gz`, from the website to your local directory. Make sure you downloaded the archive and it is located in your working directory. Type “`ls`” to list the contents of your directory (see example):

```
[mathpre@course1 ~]$ ls
```

And you should see the archive file `tex.tar.gz`. Next you need to unzip it. Type:

```
[mathpre@course1 ~]$ gunzip -v tex.tar.gz
tex.tar.gz:          69.1% -- replaced with tex.tar
```

Next, extract the archive. The archive is set to automatically create a subdirectory called, `tex_example` and place all the files into it.

```
[mathpre@course1 ~]$ tar -xvf tex.tar
tex_example/
tex_example/pa.bst
```

---

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```
tex_example/nyt.tex
tex_example/pa.sty
tex_example/stat.bib
tex_example/polisci.bib
tex_example/fit.ps
tex_example/margin.ps
tex_example/sensitivity.ps
tex_example/tomog.ps
```

Finally, open the  $\text{T}_{\text{E}}\text{X}$  file with Emacs.

```
[mathpre@course1 ~]$ cd tex_example
[mathpre@course1 ~/tex_example]$ emacs nyt.tex &
```

If  $\text{AUC}_{\text{T}_{\text{E}}\text{X}}$  is installed, Emacs window will look like this.

## 1.2 Syntax

Commands in  $\text{L}_{\text{A}}\text{T}_{\text{E}}\text{X}$  are always begun with a forward-slash: `\`. Other much-used characters are the braces: `{ }` which set off the text affected by a given command or name the environment in which you want  $\text{L}_{\text{A}}\text{T}_{\text{E}}\text{X}$  to display a portion of text. Brackets: `[ ]` often contain optional settings for a command. Finally, the percent sign: `%` is used to insert comments into the code that  $\text{L}_{\text{A}}\text{T}_{\text{E}}\text{X}$  will not read display, so that you can leave notes in the code explaining it. If you type `%` in a line,  $\text{L}_{\text{A}}\text{T}_{\text{E}}\text{X}$  will ignore the rest of the line.

## 2 Preambles

### 2.1 Document class

$\text{L}_{\text{A}}\text{T}_{\text{E}}\text{X}$  documents can be of several class. The command:

```
\documentclass[11pt,titlepage]{article}
```

sets the class to the `article` class, the most useful for our purposes. `[11pt,titlepage]` specifies some options within the pre-arranged layout of the `article` class; it uses 11pt font and creates a separate title page. (Alternatively, you could specify `[notitlepage]`). Remember not to leave spaces around the comma.

### 2.2 Packages

$\text{L}_{\text{A}}\text{T}_{\text{E}}\text{X}$  has many optional packages one can use to perform useful functions. We use some of the most essential packages.

```
% === graphic packages ===
\usepackage{graphicx}
```

allows one to include `.eps` and `.ps` graphic files.

```
% === bibliography package ===
\usepackage{natbib}
```

creates bibliography by commands such as `citet` and `citep`.

```
% === margin and formatting ===
\usepackage{setspace}
\usepackage{vmargin}
\setpapersize{USletter}
```

`setspace` comes with `doublespacing`, `frenchspacing`, and `singlespacing`. `setpapersize` sets the default margins.

```
% === math packages ===
\usepackage[reqno]{amsmath}
\usepackage{amssymb}
```

`reqno` puts equation numbers on the right.

```
% === dcolumn package ===
\usepackage{dcolumn}
\newcolumntype{.}{D{.}{.}{-1}}
\newcolumntype{d}[1]{D{.}{.}{#1}}
```

`dcolumn` package lines up decimals in tables.

(Remember that in all of the above fragments of code, the lines beginning with `%` are just comments, not actual code. They are there to remind you what’s going on in the code).

You can also download additional packages to your local directory if they are not already installed on the server. In such situations, you can simply specify the local directory you put the package files in. For example,

```
\usepackage{/home/login/mathpre/BibTeX/natbib}
```

## 2.3 (Re)New commands

You can define your own commands as `newcommand`. You can also redefine the existing commands using `renewcommand`.

```
% === newcommands ===
\newcommand{\EI}{\ensuremath{\{\mathfrak{EI}\}}}
% === renewcommands ===
\renewcommand{\P}{\text{P}}
```

These commands create shortcuts `\EI` and `\P` for producing two nifty little symbols within math mode (math mode will be covered in Section 3.6):  $\mathfrak{EI}$ <sup>1</sup> and `P`.

---

<sup>1</sup>This represents Gary King’s program “Ecological Inference”.

## 2.4 Title and author information

Before starting the main text, we need to provide the title and author information. `thanks` will display the acknowledgment at the bottom of the title page.

```
% === title, author, etc. ===
\title{Did Illegally Counted Overseas Absentee Ballots Decide the 2000
  U.S.\ Presidential Election?\thanks{Thanks to Jim Alt and Jonathan
    Wand for helpful discussions and the National Science Foundation
    (IIS-9874747), the National Institutes of Aging (P01 AG17625-01),
    and the World Health Organization for research support. Software
    to implement the methods in this paper is available from
    \texttt{http://GKing.Harvard.Edu}.}}

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  Harvard University. (Center for Basic Research in the Social
  Sciences, 34 Kirkland, Cambridge MA 02138;
  \texttt{http://www.people.fas.harvard.edu/~\,kimai},
  \texttt{KImai@Fas.Harvard.Edu}).}
\and %
Gary King\thanks{Professor of Government, Harvard University and
  Senior Science Advisor, Evidence and Information for Policy Cluster,
  World Health Organization (Center for Basic Research in the Social
  Sciences, 34 Kirkland Street, Harvard University, Cambridge MA
  02138; \texttt{http://GKing.Harvard.Edu}, \texttt{King@Harvard.Edu},
  (617) 495-2027).} }
```

## 3 Main text

```
\begin{document}
```

ends preambles and starts the main text.

```
% === title ===
\maketitle
```

creates the separate title page because we specified `titlepage` as an option of `article` class.

```
% === spacing ===
\doublespacing
```

double-spaces all subsequent text. This is a command from the `setspace` package. You can also use `frenchspacing` (which makes smaller spaces between sentences) or `singlespacing`.

You can also create an abstract after the title. `clearpage` will start a new page, and place the abstract there.

```
% === abstract ===
\clearpage
\begin{abstract}
  Although not widely known until much later, Al Gore received 202
  more votes than George W.\ Bush on election day in Florida. George
  W.\ Bush is president because he overcame his election day deficit
  with overseas absentee ballots that arrived and were counted after
  election day...

  We also present a variety of new empirical results that delineate
  the precise conditions under which Al Gore would have been elected
  president, and offer new evidence of the striking effectiveness of
  the Republican effort to convince local election officials to count
  invalid ballots in Bush counties and not count them in Gore
  counties.
\end{abstract}
```

### 3.1 Sectioning

The `article` class comes with `section`, `subsection`, `subsubsection` commands. The section title goes between the `{ }` and `LATEX` keeps track of all the numbers. (If you don't want to title your sections, just type `section{}`.)

```
\section{Introduction}
```

If you do not want to print out section numbers, you can use `section*` command.

### 3.2 Citations

We use `natbib` package to create citations and bibliography. `citep` creates the form of (Johnson, 2000) and `citet` creates the form of Johnson (2000). You can also put multiple citations in the brackets as follows.

For example, we know how the butterfly ballot in Palm Beach County led to the disqualification of many votes that were apparently intended for Gore `\citep{wand:schot:sekh:meba:herr:brad:01,AdaFas00}`.

There are other citation commands such as `nocite`. See `natbib` documentation for details.

### 3.3 Footnotes

Creating footnotes is very easy.

Indeed, after the `\emph{Times}` story appeared, commentators and partisans from both sides did not contradict these factual claims.`\footnote{The only exception seems to have been Zelnick (2001)\nocite{Zelnick01}.}`

(The `emph` command puts the designated text into *italics*.)

### 3.4 Tables

An example of a table appears below. The command `table` tells L<sup>A</sup>T<sub>E</sub>X that the entity you’re about to create is a table, and the option `[t]` tells L<sup>A</sup>T<sub>E</sub>X only at the top of a page. You can provide multiple layout options by using, for example, `[hbt]` for “here, bottom, top,” which lets L<sup>A</sup>T<sub>E</sub>X select the most aesthetic placement. Never use `[h]` alone because if the table doesn’t fit exactly there, L<sup>A</sup>T<sub>E</sub>X won’t know where to put it and will react badly. The `\begin{tabular}` tells L<sup>A</sup>T<sub>E</sub>X that you’re starting to type in then contents of the table. The second set of braces `{lcccc}` defines the number and justification of the columns. This table will have five columns, the first one left-justified, and the next four center-justified. The `&` sign tells L<sup>A</sup>T<sub>E</sub>X that you’re about to type text for the next column of the given row. Thus, the first column of the first row of this table will be blank, the second will read “Gore”, the third “Bush”, etc. The `\\` calls for a line-break, and indicates you’ve finished with that row of the table, and the next text will start a new row. The `hline` command puts a horizontal line between rows. If you want vertical lines separating the rows, you can insert a `|` between the letters defining the columns, like this:

```
\begin{tabular}{l|c|c|c|c}
```

In this example, the author has tried to line up the column text in the code, which is a good coding practice, but is not required. `caption` allows one to add a brief explanation of the table.

```
\begin{table}[t]
\begin{center}
\begin{tabular}{lcccc}
& Gore & Bush & margin \\
\hline
Ballots cast/received by Nov. 7 & 2,911,417 & 2,911,215 & Gore leads by 202 \\
Late overseas absentee ballotsa & 836 & 1,575 & Bush leads by 739 \\
\hline
Total & 2,912,253 & 2,912,790 & Bush leads by 537 \\
\end{tabular}
\caption{Official results of the 2000 presidential election in
Florida. Source: Florida Secretary of State’s office.
aBallots counted from November 7th to 26th.}
\label{tb:official}
\end{center}
\end{table}
```

We can also use `dcolumn` package to line up the decimals. Here is an example. When using this package, we need to use `multicolumn` command to display texts that are not numbers. `multicolumn` can also be used to put text over several columns. Its first option indicates how many columns the text should go over, and the second option indicates the whether the text should be justified to the center, left or right (`c`, `l`, or `r`).<sup>2</sup>

---

<sup>2</sup>Note: in this next table you will see some dollar signs. `$` toggles the math mode on and off, and will be converted later, in Section 3.6.

```

\begin{table}[t]
\begin{center}
\begin{tabular}{l...|.}
& \multicolumn{1}{c}{military}
& \multicolumn{1}{c}{Republican}
& \multicolumn{1}{c}{Bad ballot}
& \multicolumn{1}{c}{Bad Ballots}
\\
& \multicolumn{1}{c}{ballots}
& \multicolumn{1}{c}{vote}
& \multicolumn{1}{c}{acceptance$^a$}
& \multicolumn{1}{c}{counted for Bush$^b$}
& \multicolumn{1}{c}{all ballots}\\ \hline
\multicolumn{4}{l}{\bf Republican pressure to count} \\
\hspace{1em}Collier & 46.7\% & 65.6\% & 53.7\% & 64.5\% & 60 \\
\hspace{1em}Duval & 83.8 & 57.5 & 62.3 & 67.8 & 637 \\
\hspace{1em}Escambia & 88.6 & 62.6 & 64.2 & 80.3 & 272 \\
\hspace{1em}Okaloosa & 88.9 & 73.7 & 42.0 & 69.4 & 189 \\
\hspace{1em}Pasco & 62.3 & 48.0 & 60.5 & 76.4 & 53 \\
\hspace{1em}Santa Rosa & 90.3 & 72.1 & 84.6 & 84.4 & 93 \\
\hspace{1em}\emph{Average} & \emph{83}.\emph{4} & & & & & \\
\emph{60}.\emph{0} & \emph{61}.\emph{5} & \emph{74}.\emph{3} & & & & \\
1304 \\
\multicolumn{5}{l}{\bf Counties not mentioned by the \emph{Times}}
& \\
\hspace{1em}\emph{Average} & \emph{67}.\emph{6} & \emph{51}.\emph{8} & & & & \\
\emph{30}.\emph{0} & \emph{71}.\emph{5} & 1751\\
\multicolumn{4}{l}{\bf Republican pressure not to count}\\
\hspace{1em}Alachua & 46.8 & 39.8 & 12.5 & 54.5 & 77 \\
\hspace{1em}Broward & 46.9 & 30.9 & 21.8 & 54.3 & 213 \\
\hspace{1em}Miami Dade & 44.4 & 46.3 & 11.7 & 57.1 & 306 \\
\hspace{1em}Palm Beach & 45.3 & 35.3 & 40.7 & 56.2 & 53 \\
\hspace{1em}\emph{Average} & \emph{45}.\emph{6} & & & & & \\
\emph{38}.\emph{1} & \emph{17}.\emph{2} & \emph{55}.\emph{4} & & & & \\
649 \\
\hline
\end{tabular}
\caption{Counties classified by whether the \emph{New York Times}
reported evidence of Republican pressure to count or not count the
overseas absentee ballots, compared to an average for the
remaining counties not mentioned. Averages are weighted by the
number of ballots. $^a$The percent of bad ballots that arrived
with local election officials and were included in the official
count. $^b$This column is estimated by our Bayesian model

```

```

    averaging ecological inference procedure.}
\label{t:cty}
\end{center}
\end{table}

```

### 3.5 Figures

Below is an example of how to insert a Figure. We use a `graphics` package to include .eps or .ps file as figures. Options such as `width`, `height`, `angle`, allow you to adjust the size and orientation of the figure. Like tables, one can add a `caption` to a figure.

```

\begin{figure}[t]
\begin{center}
\includegraphics[width=3in,height=4.5in,angle=-90]{margin}
\caption{Posterior distribution of Bush's margin of victory without the
680 invalid overseas absentee ballots} \label{fg:margin}
\end{center}
\end{figure}

```

### 3.6 Math and equations

Math mode allows you to aesthetically display mathematical notation not easily available in most word processors. To toggle math mode within the text, use the dollar sign delimiters: one `$` to turn on math mode, and a second `$` to turn it off:

For each county  $i$  ( $i=1, \dots, 67$ ), we denote the proportion of invalid ballots among all overseas absentee ballots as  $X_i$ , and the total number of overseas absentee ballots which were counted as  $N_i$ .

To create numbered equations, use `equation` command. For multiple equations listed in one spot, use `eqnarray` command.

```

\begin{equation}
\bb=\frac{\sum_{i=1}^{67}N_i\bb_i}{\sum_{i=1}^{67}N_i},
\end{equation}

\begin{eqnarray}
\bbeta_i^b &= & [\phi_1 (\sigma^2_b + 0.25) + 0.5] + (Z_i^{\text{bad}} - \\
&& \bar{Z}_i^{\text{bad}}) \alpha^{\text{bad}} \\
\bbeta_i^g &= & [\phi_1 (\sigma^2_g + 0.25) + 0.5] + (Z_i^{\text{good}} - \\
&& \bar{Z}_i^{\text{good}}) \alpha^{\text{good}},
\end{eqnarray}

```

### 3.7 Cross-referencing

L<sup>A</sup>T<sub>E</sub>X allows you to create convenient references to Sections, Tables, Figures, Footnotes, Page numbers, and Equations by using the `label` command to attach a distinct marker to

each object. Then, by using the `ref` command to call the invoke the marker,  $\LaTeX$  will refer to the labeled item by the correct number, automatically keeping track even if you change the order within the document. See the previous examples of Tables and Figures. Similarly, one can label sections and equations.

```
\subsection{The Minor Effects of Minor Candidates and Prior Densities}
\label{s:sens}

\begin{equation}
  \mathcal{P}(\Theta|T) \propto \prod_{i=1}^{67} N(T_i|\mu_i, \sigma_i^2)
  \frac{S(\beta, \Sigma)}{R(\beta, \Sigma)}, \label{eq:likelihood}
\end{equation}
```

To refer to these objects in the text, we use `ref` command.<sup>3</sup>

Section~\ref{s:ballots} reviews the illegal overseas absentee ballots in Florida and their importance in the course of events following the election. It also provides the description of the data set we received from \textit{The New York Times}. Section~\ref{s:ecinf} introduces our statistical model, Bayesian modeling averaging, and our estimation procedure. Section~\ref{s:outcome} discusses our substantive results. Section~\ref{s:concl} concludes.

We begin by thinking about the data in terms of the \emph{possible} values of the  $(\mathbf{b}_i, \mathbf{bb}_i)$  points for each county as line segments (defined by Equation~\ref{eq:identity}) in the tomography plot in Figure~\ref{fg:tomog}.

There is no set syntax for the label *{marker}*s. You can come up with any system you like (the author of this paper is partial to colons).

### 3.8 Appendix

Appendices can be created by issuing the `appendix` command once you are finished with the main text. It will label each appendix section alphabetically rather than numbering them.

```
\clearpage
\appendix
\section{Technical Issues in Modeling and Estimation} \label{appx:king}
```

---

<sup>3</sup>Note that a tilde `~` appears in this example after the text “Section” and before the `\` of the `ref` command. The `~` is a spacing command that forces  $\LaTeX$  to put a space between the word you’ve just typed and the results of the `ref` command. It is also used after periods that are not the ends of sentences—say the word “Mr.” appears in the middle of a sentence—to tell  $\LaTeX$  not to leave a big, between-sentences space after the word. This may come up quite a bit if you use “p.” to give page references (see Section 4.3).

## 4 References and Citations

Citations and Bibliographies are among the greatest conveniences of  $\text{\LaTeX}$ , but they require a bit of an initial time investment. They function similarly to cross references (see section 3.7), but the items labeled for referencing exist in a separate file that you can create in `emacs` with the extension `.bib` (see below).

### 4.1 Calling for the Bibliography (the easy part)

We use `BibTeX` and `natbib` package to create the bibliography. First, we specify the bibliography style. Here we use Political Analysis style, `pa`. Other packages such as `achicago` can be downloaded from CTAN and used.

```
\clearpage
\singlepage
\bibliographystyle{pa}
\bibliography{stat,polisci}
```

Make sure you know the directory where the files `pa.bst` and `pa.sty` are located (if you only specify the filename,  $\text{\LaTeX}$  will only look in the working directory). Use the unix command `pwd` to figure out the entire path of the files, and if they are in a different directory from your `.tex` files, then put it into the  $\text{\LaTeX}$  like this:

```
\bibliographystyle{/nfs/home/data/mathpre/tmp/pa}
```

### 4.2 Composing the bibliography files

These two `.bib` files contain the reference information. Open `stat.bib` or `polisci.bib` file in Emacs by typing `C-x C-f` and specifying the file name. You will see the entries like the following

```
@Book{king:97,
  author =      {King, Gary},
  ALTEditor =   {},
  title =       {A Solution to the Ecological Inference Problem:
  Reconstructing Individual Behavior from Aggregate Data},
  publisher =   {Princeton University Press},
  year =        {1997},
  address =     {Princeton, NJ},
}

@article{arsl:cons:kent:93,
  author =      {Arslan, Olcay and Constable, Peter D.L. and Kent, John T.},
  title =       {Domains of Convergence for the {E}{M} Algorithm: A Cautionary
  Tale in a Location Estimation Problem},
  journal =     {Statistical Computation},
  year =        {1993},
```

```

    volume =    {3},
    pages =    {103--108}
}

```

Goodman53 and king:97 are the distinct markers used to cite these references via `natbib` package (analogous to those created with the `label` command when cross-referencing).

Here is a good set of guidelines on how to name your markers systematically to keep them all in order:

- one author: use last name and last 2 digits of the year, Tobler79
- if multiple authors, use 1st 3 letters of each of UP TO the first authors and the last 2 digits of the year: KinTomWit01
- if necessary add lower-case letters: King02a, King02b
- feel free to use the abbreviations at the start, or add to them
- Use authors full names when known

If you want to enter a new entry, simply choose `Entry-types` from Emacs menubar and enter required information. Be careful to make sure that capitalized prefixes `ALT` or `OPT` are eliminated from the fields that you actually want to appear. As you see, the `author` field can be entered either as `{firstname lastname}` or as `{lastname, firstname}`. When filling in the author field for multiple authors, make sure to put an “and” between each author and the next (see the second example above). When you create your own `.bib` files, you can use them for multiple papers. The beauty of `LATEX` is that as long as you remember to use the citation commands correctly, `LATEX` will only include the works actually cited in the paper.

### 4.3 The Citation commands

There are two basic citation commands, `citet` and `citep`. The former simply cites the author and year of the work in the text, as part of a sentence. The latter creates a parenthetical reference. If you prefer to cite with footnotes instead of parenthetical references, use one of the citations commands together with the `footnote` command.

```
Dahl queries ‘‘Does it matter how a competitive regime is
inaugurated?’’ \footnote{\citet{dahl:71}}
```

Here `dahl:71` is the distinctive marker indicated in the `.bib` file for Robert Dahl’s classic treatise *Polyarchy* and all its citation details. The `footnote` command is also useful for simple notes on the text (look for its use in this document on page 6).

There exist some useful options for these citation commands (and others), which are activated by inserting bracketed text between the `citet` and the `{...}`. If you insert a single bit of bracketed text, it will appear after the citation, separated by a comma (if used with `citep` it will appear inside the parentheses). This is useful for citing specific page or chapter numbers. If I wanted to give the page reference for the quote in the above example, I would type:

Dahl queries ‘‘Does it matter how a competitive regime is inaugurated?’’ \footnote{\citet[p.~43]{dahl:71}}

If you insert two bits of bracketed text before the citation marker, then the first bit goes before the citation, and the second afterwards. If you only want text before the citation, then insert an empty pair of bracket as the second set:

Dahl queries ‘‘Does it matter how a competitive regime is inaugurated?’’ \footnote{\citet[See] []{dahl:71}}

Another citation command option is to put an asterisk `*` immediately after the command. This will tell  $\LaTeX$  to show all the authors for a multi-author work, instead of just ‘‘et al.’’. For example, using `citet*` instead of just `citet` for the second example from the `.bib` file above would produce a citation reading ‘‘Arlsan, Olcay, and Kent (1993)’’ instead of just ‘‘Arlsan et al. (1993).’’

There are also other citations commands besides `citet` and `citep` that you may want to use.

`citealt` is just like `citet` but without parentheses around the year.

`citeauthor` will give just the author and not the year.<sup>4</sup>

`citefullauthor` will cite all the authors (like `citet*`), but without the year.

`citeyear` will cite just the year.

One last citation command that may be important is `nocite`. Use this command when you want to refer to a work without using the exact Bib $\TeX$  format. You can type out the reference manually, and stick `nocite` in there right after it so that  $\LaTeX$  will still keep track of the reference and include it in your bibliography.

We now give a brief qualitative overview of King’s (1997) models of ecological inference \nocite{king:97} and their assumptions in the context of our overseas absentee ballot analysis.

## 5 Compiling

The final step is to compile the `tex` file you created.

### 5.1 Bib $\TeX$

To do this, first get the citations by issuing the following command at the command prompt.

```
[mathpre@course1 ~/tex_example]$ bibtex nyt
This is BibTeX, Version 0.99c (Web2C 7.3.1)
The top-level auxiliary file: nyt.aux
```

---

<sup>4</sup>this can be especially useful for theorists citing a recently published edition of some long-dead author, so that it does not look like Marx wrote *The Communist Manifesto* in 1978.

The style file: pa.bst  
Database file #1: stat.bib  
Database file #2: polisci.bib

This will read two reference database files, `stat.bib` and `polisci.bib`, and create two new files that contain the reference information, `nyt.bbl` and `nyt.blg`. You could manually edit `nyt.bbl` to change the appearance of the bibliography, but it is not recommended. If you update these files, you should compile BibTeX again to refresh your reference information, `nyt.bbl`.

## 5.2 L<sup>A</sup>T<sub>E</sub>X

Then, compile with L<sup>A</sup>T<sub>E</sub>X as follows. The output looks like below if there is no error. If there is an error at a particular line, then it will stop at that line or issue a warning message. Type `h` to get some hints about how to fix the error, and type `q` to quit the process of compilation and go back to the `.tex` file to fix that problematic line. You may want to compile the file with L<sup>A</sup>T<sub>E</sub>X a couple of times in order to complete the process.

```
[mathpre@course1 ~/tex_example]$ latex nyt
This is TeX, Version 3.14159 (Web2C 7.3.1)
(nyt.tex
LaTeX2e <2000/06/01>
Babel <v3.7h> and hyphenation patterns for american, french, german, ngerman, i
talian, nohyphenation, loaded.
(/usr/share/texmf/tex/latex/base/article.cls
Document Class: article 2000/05/19 v1.4b Standard LaTeX document class
(/usr/share/texmf/tex/latex/base/size1.clo))
(/usr/share/texmf/tex/latex/graphics/graphicx.sty
(/usr/share/texmf/tex/latex/graphics/keyval.sty)
(/usr/share/texmf/tex/latex/graphics/graphics.sty
(/usr/share/texmf/tex/latex/graphics/trig.sty)
(/usr/share/texmf/tex/latex/config/graphics.cfg)
(/usr/share/texmf/tex/latex/graphics/dvips.def)))
(/usr/share/texmf/tex/latex/natbib/natbib.sty)
(/usr/share/texmf/tex/latex/misc/setspace.sty
Package: 'setspace' 6.4 <1998/11/26>
) (/usr/share/texmf/tex/latex/misc/vmargin.sty
Package 'vmargin', V2.2, <1999/06/01>
) (/usr/share/texmf/tex/latex/amsmath/amsmath.sty
For additional information on amsmath, use the '?' option.
(/usr/share/texmf/tex/latex/amsmath/amstext.sty
(/usr/share/texmf/tex/latex/amsmath/amsgen.sty))
(/usr/share/texmf/tex/latex/amsmath/amsbsy.sty)
(/usr/share/texmf/tex/latex/amsmath/amsopn.sty))
(/usr/share/texmf/tex/latex/amsfonts/amsymb.sty
(/usr/share/texmf/tex/latex/amsfonts/amsfonts.sty))
```

```

(/usr/share/texmf/tex/latex/tools/dcolumn.sty
(/usr/share/texmf/tex/latex/tools/array.sty))
(/usr/share/texmf/tex/latex/html/url.sty) (nyt.aux)
(/usr/share/texmf/tex/latex/amsfonts/umsa.fd)
(/usr/share/texmf/tex/latex/amsfonts/umsb.fd)
Underfull \hbox (badness 10000) in paragraph at lines 66--66
[] []\OT1/cmr/m/n/10 Ph.D. can-di-date, De-part-ment of Gov-ern-ment, Har-vard U
ni-ver-sity. (Cen-ter

Underfull \hbox (badness 10000) in paragraph at lines 66--66
\OT1/cmr/m/n/10 for Ba-sic Re-search in the So-cial Sci-ences, 34 Kirk-land, Ca
m-bridge MA 02138;
[1] [1] [1] [2] [3] [4] (/usr/share/texmf/tex/latex/base/omscmr.fd) [5]
[6] [7]
Overfull \hbox (10.63736pt too wide) in paragraph at lines 454--468
[]
[8] [9] <tomog.ps>
Overfull \hbox (80.89178pt too wide) in paragraph at lines 580--590
[] $[]$
[10] [11] [12] [13] <margin.ps> [14] [15] [16] [17] [18]
Overfull \hbox (11.9521pt too wide) in paragraph at lines 997--1025
[]
[19] <fit.ps> [20] <sensitivity.ps> [21] [22] [23] [24]
(/usr/share/texmf/tex/latex/amsfonts/ueuf.fd) [25] [26] (nyt.bbl [27]) [28]
(nyt.aux) )
(see the transcript file for additional information)
Output written on nyt.dvi (30 pages, 96072 bytes).
Transcript written on nyt.log.

```

### 5.3 Viewing the file

Once we successfully compile the `nyt.tex` file, we can view the `nyt.dvi` file which is generated by  $\text{\LaTeX}$ . `xdvi` can be used to view the file.

```
[mathpre@course1 ~/tex_example]$ xdvi nyt.dvi &
```

### 5.4 Do it all in Emacs

In Emacs, `bibtex`, `latex`, `xdvi` commands can be launched sequentially by using the command, `C-c C-c`. It also generates useful messages such as

```
You should perhaps run LaTeX again to get citations right.
LaTeX : successfully formatted {12} pages.
```

## 6 Converting

Now, we convert .dvi file to postscript and pdf files so that others can view and print the files easily.

### 6.1 from dvi to ps

To generate postscript file, use the following command

```
[mathpre@course1 ~/tex_example]$ dvips nyt.dvi -o nyt.ps
This is dvips(k) 5.86 Copyright 1999 Radical Eye Software (www.radicaleye.com)
' TeX output 2002.08.22:0130' -> nyt.ps
<texc.pro><texnansi.enc><8r.enc><special.pro>. [1] [1] [1] [2] [3] [4] [5]
[6] [7] [8<tomog.ps>] [9] [10] [11<margin.ps>] [12] [13] [14] [15<fit.ps>]
[16<sensitivity.ps>] [17] [18] [19] [20] [21]
```

-o specifies the output file name. To view the postscript file, use the following command,

```
[mathpre@course1 ~/tex_example]$ gv nyt.ps &
```

### 6.2 from dvi to pdf

We can also generate pdf file by typing

```
[mathpre@course1 ~/tex_example]$ dvi2pdf nyt.dvi -o nyt.pdf
```

To view the pdf file, use one of the three following commands (which use Adobe Acrobat, Ghostviewer, and the xwindows viewer, respectively):

```
[mathpre@course1 ~/tex_example]$ acroread nyt.pdf &
[mathpre@course1 ~/tex_example]$ gv nyt.pdf &
[mathpre@course1 ~/tex_example]$ xpdf nyt.pdf &
```

## 7 Miscellaneous

### 7.1 Spell-checking

To spell check the .tex file, we can use the interactive spell-checking program `ispell`. To use this program, go to Tools in the menu bar of Emacs and choose Spell Checking.

### 7.2 Word count

To count words in the text, you can use `wc nyt.tex` command in UNIX. The problem of this generic command is that it cannot distinguish L<sup>A</sup>T<sub>E</sub>X commands from other words. So, it will end up counting all commands as words. You need a program like `detex`, which is available at <http://www.cs.purdue.edu/homes/trinkle/detex/>.

### 7.3 $\LaTeX$ on Windows system

The most useful site I found for this purpose is Claus Dethlefsen's website at <http://www.math.auc.dk/~dethlef/Tips/>.