Writing Academic Documents

Peter D. Miller

Department of Mathematics
University of Michigan

January 9, 2009 / Math 501
Outline

1. About Academic Writing
   - What we write and why
   - Writing strategy

2. Tools For Manuscript Preparation
   - \TeX\ and \LaTeX\
   - Workflow and tools
   - Hints and applications

3. Assignment
Outline

1. **About Academic Writing**
   - What we write and why
   - Writing strategy

2. **Tools For Manuscript Preparation**
   - \( \text{T}_{\text{EX}} \) and \( \text{LATEX} \)
   - Workflow and tools
   - Hints and applications

3. **Assignment**
The kinds of academic documents we must most frequently prepare include:

- Academic papers and monographs (books).
- Grant and project proposals (e.g. AIM thesis proposal).
- Research and teaching statements (job and fellowship applications).
- Presentations (slides and guides).
The kinds of academic documents we must most frequently prepare include:

- Academic papers and monographs (books).
- Grant and project proposals (e.g. AIM thesis proposal).
- Research and teaching statements (job and fellowship applications).
- Presentations (slides and guides).
What We Write

The kinds of academic documents we must most frequently prepare include:

- Academic papers and monographs (books).
- Grant and project proposals (e.g. AIM thesis proposal).
- Research and teaching statements (job and fellowship applications).
- Presentations (slides and guides).
The kinds of academic documents we must most frequently prepare include:

- Academic papers and monographs (books).
- Grant and project proposals (e.g. AIM thesis proposal).
- Research and teaching statements (job and fellowship applications).
- Presentations (slides and guides).
Why We Write

Several reasons:

- For ourselves: to archive our thoughts and work.
- For our closest colleagues: to communicate with collaborators and co-workers.
- For the scientific community at large: to announce results and advertise progress.
- For the bean-counters: to build a publication list for employment and promotion.
Why We Write

Several reasons:

- For ourselves: to archive our thoughts and work.
- For our closest colleagues: to communicate with collaborators and co-workers.
- For the scientific community at large: to announce results and advertise progress.
- For the bean-counters: to build a publication list for employment and promotion.
Why We Write

Several reasons:

- For ourselves: to archive our thoughts and work.
- For our closest colleagues: to communicate with collaborators and co-workers.
- For the scientific community at large: to announce results and advertise progress.
- For the bean-counters: to build a publication list for employment and promotion.
Why We Write

Several reasons:

- For ourselves: to archive our thoughts and work.
- For our closest colleagues: to communicate with collaborators and co-workers.
- For the scientific community at large: to announce results and advertise progress.
- For the bean-counters: to build a publication list for employment and promotion.
Outline

1. About Academic Writing
   - What we write and why
   - Writing strategy

2. Tools For Manuscript Preparation
   - TEX and LATEX
   - Workflow and tools
   - Hints and applications

3. Assignment
With it being so easy to write professional-looking papers these days (see below), there is an enormous amount of material available (for example, on the preprint archive www.arxiv.org) on any given topic.

This means that anything we write will be competing for the attention of those to whom the work is directed.

Therefore: clarity and ease of reading should be viewed as being of equal importance with academic scholarship and the quality of the mathematics and science.
What’s Important

- With it being so easy to write professional-looking papers these days (see below), there is an enormous amount of material available (for example, on the preprint archive [www.arxiv.org](http://www.arxiv.org)) on any given topic.

- This means that anything we write will be competing for the attention of those to whom the work is directed.

- Therefore: clarity and ease of reading should be viewed as being of equal importance with academic scholarship and the quality of the mathematics and science.
What’s Important

- With it being so easy to write professional-looking papers these days (see below), there is an enormous amount of material available (for example, on the preprint archive www.arxiv.org) on any given topic.

- This means that anything we write will be competing for the attention of those to whom the work is directed.

- Therefore: clarity and ease of reading should be viewed as being of equal importance with academic scholarship and the quality of the mathematics and science.
Structure of an Academic Paper

The basic structure of an academic paper should be familiar:

- **Frontmatter**: Title, authors and affiliations, abstract, and possibly acknowledgements (funding, dedication, etc.)

- **Introduction**: History of problem, review of literature, prior work by author and others, outline of rest of paper, simple examples and toy problems.

- **Paper body**: Here is where the new contribution of the paper goes. Think carefully about how to structure your presentation if you want anyone else to read it!

- **Conclusion**: Relate the results back to ideas developed in the introduction section. Propose extensions of this work and future work on the subject. Formulate conjectures.
Structure of an Academic Paper

The basic structure of an academic paper should be familiar:

- **Frontmatter**: Title, authors and affiliations, abstract, and possibly acknowledgements (funding, dedication, etc.)
- **Introduction**: History of problem, review of literature, prior work by author and others, outline of rest of paper, simple examples and toy problems.
- **Paper body**: Here is where the new contribution of the paper goes. Think carefully about how to structure your presentation if you want anyone else to read it!
- **Conclusion**: Relate the results back to ideas developed in the introduction section. Propose extensions of this work and future work on the subject. Formulate conjectures.
Structure of an Academic Paper

The basic structure of an academic paper should be familiar:

- **Frontmatter**: Title, authors and affiliations, abstract, and possibly acknowledgements (funding, dedication, etc.)

- **Introduction**: History of problem, review of literature, prior work by author and others, outline of rest of paper, simple examples and toy problems.

- **Paper body**: Here is where the new contribution of the paper goes. Think carefully about how to structure your presentation if you want anyone else to read it!

- **Conclusion**: Relate the results back to ideas developed in the introduction section. Propose extensions of this work and future work on the subject. Formulate conjectures.
Structure of an Academic Paper

The basic structure of an academic paper should be familiar:

- **Frontmatter**: Title, authors and affiliations, abstract, and possibly acknowledgements (funding, dedication, etc.)
- **Introduction**: History of problem, review of literature, prior work by author and others, outline of rest of paper, simple examples and toy problems.
- **Paper body**: Here is where the new contribution of the paper goes. Think carefully about how to structure your presentation if you want anyone else to read it!
- **Conclusion**: Relate the results back to ideas developed in the introduction section. Propose extensions of this work and future work on the subject. Formulate conjectures.
Outline

1. About Academic Writing
   - What we write and why
   - Writing strategy

2. Tools For Manuscript Preparation
   - TeX and LaTeX
   - Workflow and tools
   - Hints and applications

3. Assignment
\LaTeX

- is a computer program originally written by computer science guru Donald Knuth in the late 1970's
- translates a plain text file containing commands to generate a typeset document into a hard copy of the target document (or a file equivalent to it, \textit{e.g.} a \texttt{pdf} file).
- has become a standard tool for writing mathematics because, in particular, it makes formatting of mathematical formulae completely standard.
**TEX**

- is a computer program originally written by computer science guru Donald Knuth in the late 1970’s.
- translates a plain text file containing commands to generate a typeset document into a hard copy of the target document (or a file equivalent to it, *e.g.* a pdf file).
- has become a standard tool for writing mathematics because, in particular, it makes formatting of mathematical formulae completely standard.
\textsc{TEX}

- is a computer program originally written by computer science guru Donald Knuth in the late 1970’s
- translates a plain text file containing commands to generate a typeset document into a hard copy of the target document (or a file equivalent to it, \textit{e.g.} a pdf file).
- has become a standard tool for writing mathematics because, in particular, it makes formatting of mathematical formulae completely standard.
More information:

- The usual way to submit a paper to the preprint archive (www.arxiv.org) is to upload the TeX (or LaTeX, see below) source file. As these are based on plain text (ASCII) they are more robust than the document files they generate. Also, many journals will assume that you prepare your manuscript using TeX (or LaTeX).

- Wikipedia entry for TeX: en.wikipedia.org/wiki/TeX.

More information:

- The usual way to submit a paper to the preprint archive (www.arxiv.org) is to upload the TEx (or LATEX, see below) source file. As these are based on plain text (ASCII) they are more robust than the document files they generate. Also, many journals will assume that you prepare your manuscript using TEx (or LATEX).

- Wikipedia entry for TEx: en.wikipedia.org/wiki/TeX.

More information:

- The usual way to submit a paper to the preprint archive ([www.arxiv.org](http://www.arxiv.org)) is to upload the **TEX** (or **LaTEX**, see below) source file. As these are based on plain text (ASCII) they are more robust than the document files they generate. Also, many journals will assume that you prepare your manuscript using **TEX** (or **LaTEX**).


TEX is fundamentally concerned with \emph{typesetting}. We as authors are, however, more concerned with \emph{writing}. \LaTeX{} is a macro package for \TeX{} that operates as a stand-alone typesetting program and is designed to allow the author to focus on meaning (\LaTeX{} thinking) instead of formatting (\TeX{} thinking). An example to make this clearer:

<table>
<thead>
<tr>
<th>Desired Output</th>
<th>\TeX{} thinking</th>
<th>\LaTeX{} thinking</th>
</tr>
</thead>
<tbody>
<tr>
<td>The eigenvalues are \emph{not} real numbers!</td>
<td>“The word ‘not’ should be typeset in italics.” \TeX{} code: \texttt{are {\textit{not}} real}</td>
<td>“The word ‘not’ should be emphasized somewhat.” \LaTeX{} code: \texttt{are \textbf{not} real}</td>
</tr>
</tbody>
</table>
Mathematical formulas are expressed in text code that get translated into nice-looking images of the desired mathematical symbols. For example, the code:

\begin{displaymath}
\frac{\partial^2 \phi}{\partial x^2} + \frac{\partial^2 \phi}{\partial y^2} + \frac{\partial^2 \phi}{\partial z^2} = 0
\end{displaymath}

produces Laplace’s equation:

$$\frac{\partial^2 \phi}{\partial x^2} + \frac{\partial^2 \phi}{\partial y^2} + \frac{\partial^2 \phi}{\partial z^2} = 0$$

Other examples can be found in HelloWorld.tex.
Outline

1. About Academic Writing
   - What we write and why
   - Writing strategy

2. Tools For Manuscript Preparation
   - \TeX\ and \LaTeX
   - Workflow and tools
   - Hints and applications

3. Assignment
Workflow in \TeX and \LaTeX

The usual workflow algorithm in using \TeX or \LaTeX consists of the following steps (similar to writing code or software):

1. Use a text editor (not a word processor) to create or edit a source file, say HelloWorld.tex.

2. Use one or more programs to translate the source file into the target document. For example, the command `latex HelloWorld.tex produces HelloWorld.dvi (Device Independent) as output. Then to produce, say, a pdf file one runs `dvipdf HelloWorld.dvi to get HelloWorld.pdf. Or, one can use a version of \LaTeX designed to directly produce pdf output by running `pdflatex HelloWorld.tex to get HelloWorld.pdf.

3. View the output and (if necessary) return to step 1.
Many of these steps are automated by some higher-level programs. Some of these are:

- **TeXShop.** Download free from [www.uoregon.edu/~koch/texshop](http://www.uoregon.edu/~koch/texshop).
- **Emacs (with \TeX and \LaTeX tools) and TeXniscope.** Download free from [www.apple.com/downloads/macosx/unix_open_source/carbonemacspackage.html](http://www.apple.com/downloads/macosx/unix_open_source/carbonemacspackage.html) and [www2.ing.unipi.it/~d9615/homepage/texniscope.html](http://www2.ing.unipi.it/~d9615/homepage/texniscope.html).
Many of these steps are automated by some higher-level programs. Some of these are:

- **TeXShop.** Download free from [www.uoregon.edu/~koch/texshop](http://www.uoregon.edu/~koch/texshop).
- **Emacs (with TeX and LaTeX tools) and TeXniscope.** Download free from [www.apple.com/downloads/macosx/unix_open_source/carbonemacspackage.html](http://www.apple.com/downloads/macosx/unix_open_source/carbonemacspackage.html) and [www2.ing.unipi.it/~d9615/homepage/texniscope.html](http://www2.ing.unipi.it/~d9615/homepage/texniscope.html).

Many of these steps are automated by some higher-level programs. Some of these are:

- **TeXShop.** Download free from [www.uoregon.edu/~koch/texshop](http://www.uoregon.edu/~koch/texshop).
- **Emacs (with \TeX{} and \LaTeX{} tools) and TeXniscope.** Download free from [www.apple.com/downloads/macosx/unix_open_source/carbonemacspackage.html](http://www.apple.com/downloads/macosx/unix_open_source/carbonemacspackage.html) and [www2.ing.unipi.it/~d9615/homepage/texniscope.html](http://www2.ing.unipi.it/~d9615/homepage/texniscope.html).
Outline

1. About Academic Writing
   - What we write and why
   - Writing strategy

2. Tools For Manuscript Preparation
   - \TeX{} and \LaTeX{}
   - Workflow and tools
   - Hints and applications

3. Assignment
Some Additional Comments

- The basic programs of TEX and LATEX are in the public domain, and many add-on packages are free as well. Visit the TEX Users Group website (www.tug.org) for a comprehensive list of what you can get!

- The American Mathematical Society (AMS) has developed their own extensions to TEX and LATEX, packages called \texttt{amstex} and \texttt{amslatex}. Try putting \texttt{\usepackage{amsmath}} in the preamble of your source file. See www.ams.org/tex for more details.

- A great web tool is NASA’s hypertext help with LATEX: www.giss.nasa.gov/tools/latex.

- Another useful tool is TeXFoG, providing TEX and LATEX syntax for various symbols at the push of a button.
Some Additional Comments

- The basic programs of \TeX{} and \LaTeX{} are in the public domain, and many add-on packages are free as well. Visit the \TeX{} Users Group website (www.tug.org) for a comprehensive list of what you can get!

- The American Mathematical Society (AMS) has developed their own extensions to \TeX{} and \LaTeX{}, packages called \texttt{amstex} and \texttt{amslatex}. Try putting \texttt{\usepackage{amsmath}} in the preamble of your source file. See www.ams.org/tex for more details.

- A great web tool is NASA’s hypertext help with \LaTeX{}: www.giss.nasa.gov/tools/latex.

- Another useful tool is \TeX{}FoG, providing \TeX{} and \LaTeX{} syntax for various symbols at the push of a button.
Some Additional Comments

- The basic programs of \TeX and \LaTeX are in the public domain, and many add-on packages are free as well. Visit the \TeX Users Group website (www.tug.org) for a comprehensive list of what you can get!

- The American Mathematical Society (AMS) has developed their own extensions to \TeX and \LaTeX, packages called amstex and amslatex. Try putting \texttt{\usepackage{amsmath}} in the preamble of your source file. See www.ams.org/tex for more details.

- A great web tool is NASA’s hypertext help with \LaTeX: www.giss.nasa.gov/tools/latex.

- Another useful tool is TeXFoG, providing \TeX and \LaTeX syntax for various symbols at the push of a button.
Some Additional Comments

- The basic programs of \TeX{} and \LaTeX{} are in the public domain, and many add-on packages are free as well. Visit the \TeX{} Users Group website (www.tug.org) for a comprehensive list of what you can get!

- The American Mathematical Society (AMS) has developed their own extensions to \TeX{} and \LaTeX{}, packages called \texttt{amstex} and \texttt{amslatex}. Try putting \texttt{\usepackage{amsmath}} in the preamble of your source file. See www.ams.org/tex for more details.

- A great web tool is NASA’s hypertext help with \LaTeX{}: www.giss.nasa.gov/tools/latex.

- Another useful tool is TeXFoG, providing \TeX{} and \LaTeX{} syntax for various symbols at the push of a button.
Computer Presentations in \LaTeX

There are many ways to prepare a computer presentation using \LaTeX. The most popular way of doing this now is to use a package called \texttt{beamer}. You can get all the information you want and more by visiting the website

\texttt{latex-beamer.sourceforge.net}

This presentation was prepared using \texttt{beamer}. As you’ve seen it is easy to incrementally build slides or “uncover” a slide piece-by-piece. It is also easy to include images (like the logo at the bottom of the screen) or even movies:
As an exercise in learning to write mathematics with \LaTeX{}, your job is to prepare a homework assignment for one of your other courses with \LaTeX{}. Choose a homework set that is due before the Winter Break, and when you turn in the assignment to your instructor, also turn in a copy to me. (If you are not a first-year student and you have not already given a student talk in Math 501, your assignment is to prepare a 25-minute talk on a subject of your choice using beamer and present it to this class.)