Advanced Formatting in LaTeX

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What is LaTeX

LaTeX is a document preparation system. When writing, the writer uses plain text as opposed to the formatted text found in WYSIWYG ("what you see is what you get") word processors like Microsoft Word[a].

---

[a]https://en.wikipedia.org/wiki/LaTeX

```
\begin{document}

% paper title
\title{Our first paper in \LaTeX}

\author{\IEEEauthorblockN{Michael Shell}
\IEEEauthorblockA{School of Electrical and\\Computer Engineering\\
Georgia Institute of Technology\\
Atlanta, Georgia 30332--0250\\
Email: http://www.michaelshell.org/contact.html}
\and
\IEEEauthorblockN{Homer Simpson}
\IEEEauthorblockA{Twentieth Century Fox\\
Springfield, USA\\
Email: homer@thesimpsons.com}
\and
\IEEEauthorblockN{James Kirk\\ and Montgomery Scott}
\IEEEauthorblockA{Starfleet Academy\\
San Francisco, California 96678--2391\\
Telephone: (800) 555--1212\\
Fax: (888) 555--1212}}
```

Our first paper in LaTeX

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Abstract—The abstract goes here.

About this workshop

Why you are here:

- Your advisor gets mad when he/she sees MS Word documents!!
- Papers written by your peers look a lot fancier than yours!!!

This workshop:

- Provides useful references to start using LaTeX
- Discusses the usage of templates, and how to start using them
- LaTeX is a lot of "guess-and-check"
- The most effective way is to learn by doing

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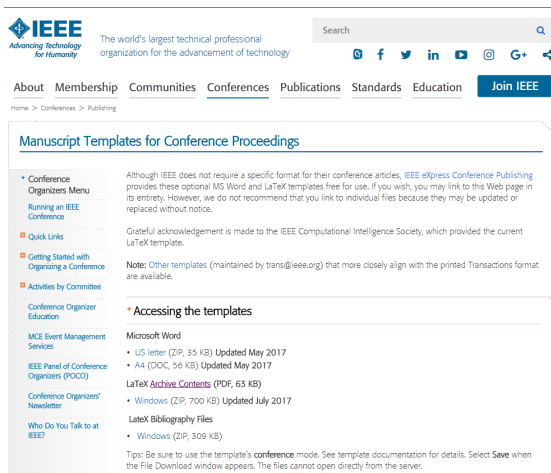
Advanced Formatting in LaTeX: Outline

1. Using Templates

2. Document Body

3. Citations Using BibTeX

Using Templates

Articles template: IEEE

Most scientific paper venues provide templates for manuscripts:

For instance: IEEE templates link

UCR thesis template

Another template you may be looking for:

[UCR thesis template link](#)

Components of a template or LaTeX documents

Source code file:
- .tex file (source code)
  - ⇒ the only document you should edit

Formatting files:
- .cls file (document class file)
- .clo file (class option file)
- .sty file (style file)
- .bst file (BibTeX style file)
- .bib file (BibTeX file)

Document Body

Sectioning

The main matter of a typical shorter document is divided into sections

- LaTeX is instructed to start a section with the `\section{title}` command
- A section may be subdivided into subsections, which may themselves be divided into subsubsections, paragraphs, and subparagraphs

```
1  \section{}
2      \subsection{}
3          \subsubsection{}
4              \paragraph{}
5                  \subparagraph{}
```

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```

Sectioning

Any `\section` command may be followed by a `\label` command, so that you can refer to the section number generated by LaTeX

```
1 \section{Introduction}
2 \label{Sec:intro}
3 The command \ref{S:intro} refers to the number of the section
      and the command \pageref{S:intro} refers to the number of
      the typeset page where the section title appears.
```

The Backslah operator is used for

- Commands
  `\section{}, \cite{}, \ref{}, \label{}, \begin{}, \end{}`
- Formatting (discuss double backslash)
  `\tetxit{}, \textbf{}, \\`
- Special characters and math
  `\sigma, \Phi, \frac{}{},\sum_{}^{}`
- Show reserved characters
  `\#, \$, \^, \%, \&, \{, \}`

Numbered lists

A numbered list is created with the `enumerate` environment:

> This space has the following properties:
>
> (1) Grade 2 Cantor;
>
> (2) Half-smooth Hausdorff;
>
> (3) Metrizably smooth.
>
> Therefore, we can apply the Main Theorem.

```
1 This space has the following properties:
2 \begin{enumerate}
3 \item Grade 2 Cantor;                    \label{Cantor}
4 \item Half-smooth Hausdorff;             \label{Hausdorff}
5 \item Metrizably smooth.                 \label{smooth}
6 \end{enumerate}
7 Therefore, we can apply the Main Theorem.
```

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5  \item Metrizably smooth.             \label{smooth}
6  \end{enumerate}
7  Therefore, we can apply the Main Theorem.
```

Bulleted lists

A bulleted list is created with the `itemize` environment:

We set out to accomplish a variety of goals:
- To introduce the concept of smooth functions.
- To show their usefulness in differentiation.
- To point out the efficacy of using smooth functions in Calculus.

```
1 We set out to accomplish a variety of goals:
2 \begin{itemize}
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4 \item To show their usefulness in differentiation.
5 \item To point out the efficacy of using smooth functions in
    Calculus.
6 \end{itemize}
```

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5  \item To point out the efficacy of using smooth functions in
      Calculus.
6  \end{itemize}
```

Floating: tables and figures

Figures and tables are treated in a special way in LaTeX since they cannot be broken across pages

- LaTeX moves (floats) a table or an illustration to the top or bottom of the current or the next page if possible
- Further away otherwise

Placing tables and figures is often a tedious guess-and-check process, that **requires extensive help from Google**

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Tables

A table environment is set up as follows:

```
1 \begin{table}
2 Place the table here
3 \caption{title }
4 \label{Ta:xxx }
5 \end{table}
```

where \ref{Ta:xxx } references the table in the text

Most templates have strict rules on tables formatting (see conference.tex)

Figures

A figure environment is set up as follows:

```
1  ( \usepackage{graphicx} )
2
3  \begin{figure}
4  Place the graphics here
5  \caption{title }
6  \label{Fi:xxx }
7  \end{figure}
```

where \ref{Fi:xxx } references the figure in the text

Most templates have strict rules on figures formatting (see conference.tex)

In-Line vs Displayed formulas

This is an in-line formula $\sum_{k=0}^{\infty} r^k$, while the following is a displayed formula:

$$\sum_{k=0}^{\infty} r^k \tag{1}$$

- Large symbols appear in a "compact" version in in-line formulas.

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Displayed formulas

The equation environment creates a displayed formula and automatically generates an equation number

$$\int_0^\pi \sin x \, dx = 2 \tag{1}$$

```
1  \begin{equation}
2  \label{E:firstIntegral}
3  \int_{0}^{\pi} \sin x \, dx = 2
4  \end{equation}
```

The equation number, which is automatically generated, depends on how many numbered displayed formulas occur before the given equation

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Displayed formulas: referencing

To reference a formula without having to remember its number (which also can change when you edit your document) give the equation a symbolic label by using the `\label` command and refer to the equation in your document by using

```
see~(\ref{E:firstIntegral}) on page~\pageref{E:firstIntegral}.
```

Aligned formulas

Alignment is very important for multi-line formulas, especially when working with double column documents. LATEX has many ways to typeset multiline formulas. One of these is the `align` environment.

$$r^2 = s^2 + t^2,$$
$$2u + 1 = v + w^\alpha,$$
$$x = \frac{x + z}{\sqrt{s + 2u}}$$

```
1  \begin{align*} % Non-starred version will add multiple numbers
2  r^{2} = \sqrt{s},\\
3  2u + 1 = v + w^{\alpha},\\
4  x = \frac{x+z}{\sqrt{s+2u}}\\
5  \end{align*}
```

Aligned formulas

The `align` environment provides a way for horizontal alignment

```
r^{2}  &= s^{2} + t^{2},          \label{E:Pyth}\\
2u + 1 &= v + w^{\alpha},         \label{E:alpha}\\
     x &= \frac{y + z}{\sqrt{s + 2u}};  \label{E:frac}
```

alignment points
of formulas

$$(2) \qquad r^2 = s^2 + t^2,$$

$$(3) \qquad 2u + 1 = v + w^{\alpha},$$

$$(4) \qquad x = \frac{y + z}{\sqrt{s + 2u}};$$

Citations Using BibTeX

BibTeX: Basics

There are two ways of composing a bibliography in LaTeX:

- Package thebibliography (manual)
- Package BibTeX (automated)

BibTeX: Basics

Three elements of a bibliography in BibTeX:

- Bibliographic database file
- A bibliographic style
- Citations in the text

BibTeX: The Database

A BibTeX database is a text file (with extension .bib) containing bibliographic entries

```
@BOOK{gM68,
author = "George A. Menuhin",
title = "Universal Algebra",
publisher = "D.~Van Nostrand",
address = "Princeton",
year = 1968,
}

@ARTICLE{eM57,
author = "Ernest T. Moynahan",
title = "On a Problem of {M. Stone}",
424 Chapter 15 BIBTEX
journal = "Acta Math. Acad. Sci. Hungar.",
pages = "455-460",
volume = 8,
year = 1957,
}
```

The keyword `gM68` is a TAG, and will be used to cite the book in the text

BibTeX: Creating a Database

Common ways to (quickly) create a database are:

- Google Scholar
- Paper Management apps (Paperpile, Mendeley)

BibTeX: Bibliographic style and defining the Database

The following two lines (to include before the command `\end{document}`) declare the style and database of your bibliography:

```
1 \bibliographystyle{styleOfYourBibliography}
2 \bibliography{nameOfYourBibliographyFile}
```

Common styles and layouts can be found here

BibTeX:Citing in the text

For example, `\cite{myBook}` includes the reference in the bibliography and cites the entry with label `myBook` , whereas `\nocite{pK57}` includes the reference in the bibliography but does not cite the entry

Compiling LaTeX documents directly in your computer

Compiling documents directly in your computer may be desirable for faster file management (images), faster compiling times, online app licence, ...

Installing LaTeX on your computer requires two steps:

1. Install the typesetting environment
   (MikTeX for Windows, MacTeX for Mac)
2. Use a text editor to create a .tex source file

GradQuat at UCR

GradQuant:

- Website: http://gradquant.ucr.edu
- Hours: Monday Thursday, 9 am - 3 pm
- Location: Life Sciences Building, Room #1425

If you seek help with LaTeX:

- Drop-in hours (Gianluca): Thursday 12pm-2pm
- Schedule a consultation (Gianluca)
- Email: GQstaff1@ucr.edu

LaTeX resources:
http://gradquant.ucr.edu/gq-calendar/workshop-resources/