

Introduction to L^AT_EX

Yelda Serin, PhD

UCR GradQuant

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Outline

- 1 Introduction
- 2 Editors & Compilers
- 3 L^AT_EX Document Components
- 4 L^AT_EX Formatting
- 5 L^AT_EX Resources

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Introduction: What is L^AT_EX?

- Pronounced either “Lay-tech” or “Lah-tech”
- Portable document formatting system based on T_EX(pronounced “tech”), a typesetting language originally designed especially for math and science.
- A programming language, which means you can create your own commands to simplify and customize it.

Introduction: How L^AT_EX Works

- You create a file using a plain text editor.
 - Type the text of your document.
 - Type the commands to format it.
 - Type the commands to insert figures, tables, lists, and more.
- Provide additional files, such as your bibliography list, if you want to create a reference list.
- Compile your text to create a pdf file for viewing or printing.

Introduction: Why Use L^AT_EX?

- Your document will look good.
 - Better hyphenation
 - Optimized justification
 - Figures where you want them
- Content and form are separated; L^AT_EX gives you an opportunity to focus on content.
- Writing in mathematics is easy in L^AT_EX.
- Inserting figure/table legends has never been this easy!
- Citing figures/tables is effortless.
- Adding a bibliography is quick & easy.
- You can open/write your code in any text editor.

Introduction: Why *Not* to Use L^AT_EX?

- L^AT_EX is **not** WYSIWYG -*what you see is what you get*.
- L^AT_EX could be time-consuming.
- There is a lot of guess-and-check in L^AT_EX.
 - Learn by practicing hands-on.
 - Find answers by searching the internet or contacting GradQuant.
- L^AT_EX is not the best option for more graphic-heavy documents.

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Editors & Compilers

- To install in your machine:
 - Visit <https://www.latex-project.org/get/>

TeX Distributions

If you're new to TeX and LaTeX or just want an easy installation, get a full TeX distribution. The TeX Users Group (TUG) has a [list of notable distributions](#) that are entirely, or least primarily, free software.

Linux

Check your Linux distributions software source for a TeX distribution including LaTeX. You can also install the current [TeX Live distribution](#) directly—in fact this may be advisable as many Linux distributions only contain older versions of TeX Live, see [Linux TeX Live package status](#) for details.

Mac OS

The [MacTeX](#) distribution contains everything you need, including a complete TeX system with LaTeX itself and editors to write documents.

Windows

Check out the [MiKTeX](#) or [proTeXt](#) or [TeX Live](#) distributions; they contain a complete TeX system with LaTeX itself and editors to write documents.

Online

LaTeX online services like [Papeeria](#), [Overleaf](#), [ShareLaTeX](#), [Datazar](#), and [LaTeX base](#) offer the ability to edit, view and download LaTeX files and resulting PDFs.

Editors & Compilers

- In the cloud:

- Overleaf: <https://www.overleaf.com>



Over 17 million projects, authors from 3600 institutions and more than 2400 templates

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L^AT_EX Document Components

- Document Layout
- Document Class
- Packages
- Commands
- Environments
- Comments

Document Layout

The diagram illustrates the structure of a LaTeX document. On the left, red line numbers from 1 to 20 are listed vertically. A red arrow points from the text "Line numbers" to the first line number. To the right of the code, a large red bracket groups the lines into two main sections: "Preamble" (lines 1-9) and "Document body" (lines 11-20). The Preamble section includes commands for document class, encoding, and packages. The Document body section begins with \begin{document}, followed by \maketitle and two \section{ } commands, each with a descriptive text block.

```
1 \documentclass[a4paper,11pt]{article}
2 \usepackage[utf8]{inputenc}
3 \usepackage{amsmath}
4 \usepackage{graphicx}
5
6
7 \title{Sample Document}
8 \author{Kathryn Janeway}
9 \date{September 2018}
10
11 \begin{document}
12
13 \maketitle
14
15 \section{Introduction}
16 Your document starts here.
17
18 \section{Conclusion}
19 Your conclusions go here.
20 \end{document}
```

Line numbers

Preamble

Document body

Sample Document

Kathryn Janeway

September 2018

1 Introduction

Your document starts here.

2 Conclusion

Your conclusions go here.

Document Class

- Entered in the preamble of the document.
- Denotes which document layout standard to use.

```
\documentclass[11pt,twoside,a4paper]{article}
```

- Article, report (for multi-chapter documents), book, beamer (for presentations) entered in curly brackets.
- Document class options listed in square brackets.

Packages

- Entered in the preamble of the document.
- Provide sets of commands or affect the appearance of the output document.

```
1 \documentclass[12pt]{article}
2 \usepackage{amsmath}%for writing math symbols
3 \usepackage{textgreek}%for writing Greek letters
4 \usepackage{setspace}%for setting space between lines
5 \usepackage{gensymb}%for generic symbols
6 \usepackage{textcomp}
7 \usepackage{graphicx}%for inserting images
8 \graphicspath{ {Images/} }%for defining a path for image files
9 \usepackage{listings}
10 \usepackage[T1]{fontenc}
11 \usepackage[version=4]{mhchem}%always include version.
12 \usepackage[margin=1in]{geometry}%to setup page layout, paper size, margins, etc.
```

Commands

- Entered throughout the document.
- Provide markup.
- Start with a backslash.
- Some commands take arguments, which are enclosed in curly brackets:

```
\usepackage{packagename}  
\textbf{this text will be bold}
```

```
\begin{itemize}  
  \item Star Trek TNG  
  \item Star Trek DS9  
  \item Star Trek Voyager  
\end{itemize}  
  
\titlepage  
\author{Jane Doe}  
\date{\today}  
  
\newpage  
\textbf{Banana}  
\textit{Apple}  
\section{Methods}  
\subsection{Genotyping}  
\cite{Lamport86}  
\includegraphics{A.png}}
```

Environments

- Receive special processing based on the characteristics of the environment.
- Defined by *begin* and *end* commands:

```
\begin{environment name}  
...  
\end{environment name}
```

```
\begin{itemize}  
  \item Star Trek TNG  
  \item Star Trek DS9  
  \item Star Trek Voyager  
\end{itemize}
```

```
\begin{figure}  
  \centering  
  \includegraphics[]  
  \caption{Caption}  
  \label{fig:my_label}  
\end{figure}
```

Comments

- Preceded by a % sign.
- Does not appear in the final document.

```
45 \subsection{Western blot analysis}
46 DRG were dissected from E13.5 embryos. Total DRG lysates were prepared
   in 20 mM HEPES (pH 7.4), 150 mM NaCl, 2% SDS, and 5% glycerol
   supplemented with the Halt protease and phosphatase inhibitor cocktail
   (Thermo Scientific). The following primary antibodies were used: Nf2
   (Sigma, HPA003097; rabbit, 1:1,000) and GAPDH (Sigma, G8795, mouse;
   1:10,000).
47 %I will add information for more antibodies in this paragraphs: Tuj1,
   TrkA, TrkB, and TrkC.
```

Western blot analysis

DRG were dissected from E13.5 embryos. Total DRG lysates were prepared in 20 mM HEPES (pH 7.4), 150 mM NaCl, 2% SDS, and 5% glycerol supplemented with the Halt protease and phosphatase inhibitor cocktail (Thermo Scientific). The following primary antibodies were used: Nf2 (Sigma, HPA003097; rabbit, 1:1,000) and GAPDH (Sigma, G8795, mouse; 1:10,000).

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L^AT_EX Formatting

- Document Components
- Backslash Operator in L^AT_EX
- Creating Chapters, Sections, and Subsections
- Numbered Lists
- Bulleted Lists
- Writing Mathematical Equations
- Inserting Figures
- Inserting Tables
- Adding a Table of Contents

Document Components

Main source file:

- .tex file (source code)*

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)*
- .lof (list of figures file)

⇒ * *the only document components you should edit*

Backslash Operator in L^AT_EX

- Commands

`\section{}, \cite{}, \ref{}, \label{}, \begin{}, \end{}`

- Formatting

`\textit{} (italic), \textbf{} (bold), \\ (new line)`

- Special characters and math

`\sigma, \Phi, \frac{}{}, \sum_{}^{}{}`

- Display reserved characters

`\#, \$, ^, %, &, {, }`

Creating Chapters, Sections, and Subsections

```
\section{Section name}
  \subsection{Subsection name}
    \subsubsection{Subsubsection name}
```

1 Section name

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt
ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation
ullamco laboris nisi ut aliquip ex ea commodo consequat.

1.1 Subsection name

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt
ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation
ullamco laboris nisi ut aliquip ex ea commodo consequat.

1.1.1 Subsubsection name

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt
ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation
ullamco laboris nisi ut aliquip ex ea commodo consequat.

Creating Chapters, Sections, and Subsections

```
\section*{Section name}
  \subsection*{Subsection name}
    \subsubsection*{Subsubsection name}
```

Section name

 Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt
 ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation
 ullamco laboris nisi ut aliquip ex ea commodo consequat.

Subsection name

 Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt
 ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation
 ullamco laboris nisi ut aliquip ex ea commodo consequat.

Subsubsection name

 Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt
 ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation
 ullamco laboris nisi ut aliquip ex ea commodo consequat.

Numbered Lists

NASA missions to explore Mars:

```
\begin{enumerate}
    \item Mariner program
    \item Mars Exploration Rovers
    \item Mars Pathfinder
    \item Mars Polar Lander
    \item Mars Science Laboratory (MSL)
    \item Mars Scout program
    \item Viking program
\end{enumerate}
```

NASA missions to explore Mars:

1. Mariner program
2. Mars Exploration Rovers
3. Mars Pathfinder
4. Mars Polar Lander
5. Mars Science Laboratory (MSL)
6. Mars Scout program
7. Viking program

Bulleted Lists

NASA missions to explore Mars:

```
\begin{itemize}
    \item Mariner program
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    \item Mars Pathfinder
    \item Mars Polar Lander
    \item Mars Science Laboratory (MSL)
    \item Mars Scout program
    \item Viking program
\end{itemize}
```

Bulleted Lists

NASA missions to explore Mars:

- Mariner program
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- Mars Pathfinder
- Mars Polar Lander
- Mars Science Laboratory (MSL)
- Mars Scout program
- Viking program

Writing Mathematical Equations

L^AT_EX has several modes for writing and formatting mathematical equations. When in a math mode, L^AT_EX follows different rules:

- All letters are set in the math italic font.
- Special mathematical symbols are printed easily.
- All spaces in the input are ignored.

Writing Math: In-Line Equations

The simplest mode in which you can write mathematical equations is **in-line math**. The formulas are about the same size as the text they are in. To use it, we enter:

```
$ math expression $
```

Example:

```
Pythagorean equation is $a^2+b^2=c^2$, where c represents the length of the  
hypotenuse and a and b the lengths of the triangle's other two sides.
```

Pythagorean equation is $a^2 + b^2 = c^2$, where c represents the length of the hypotenuse and a and b the lengths of the triangle's other two sides.

Writing Math: Displayed Equations

Displayed equations appear in a separate line of text and are automatically numbered. To enter them, we use *amsmath* package in the L^AT_EX document:

```
\usepackage{amsmath}
```

Then, we use the equation environment to enter the equation.

Example:

```
\begin{equation}
\frac{a^2-b^2}{a+b}=a-b
\end{equation}
```

produces:

$$\frac{a^2 - b^2}{a + b} = a - b \quad (1)$$

Writing Math: Displayed Equations

Example:

```
\begin{equation}
\int \frac{d\theta}{1+\theta^2} = \tan^{-1}\theta + C
\end{equation}
```

produces:

$$\int \frac{d\theta}{1+\theta^2} = \tan^{-1}\theta + C \quad (2)$$

Writing Math: Displayed Equations

Example:

```
\begin{equation}
\sum_{n=1}^{\infty} 2^{-n} = 1
\end{equation}
```

produces:

$$\sum_{n=1}^{\infty} 2^{-n} = 1 \tag{3}$$

Writing Math: Displayed Equations

Example:

```
\begin{equation}
\lim_{x \rightarrow \infty} f(x)
\end{equation}
```

produces:

$$\lim_{x \rightarrow \infty} f(x) \quad (4)$$

Inserting Figures

In the preamble...

- Use graphicx package:

```
\usepackage{graphics}
```

- Define a path for your image files:

```
\graphicSPATH { {Folder name/} }
```

```
1 \documentclass{article}
2 \usepackage[utf8]{inputenc}
3 \usepackage{amsmath}% to enter mathematical formulas
4 \usepackage{graphicx}
5 \graphicSPATH{ {Images/} }
```

Inserting Figures

```
\begin{figure}[h]
    \centering
    \includegraphics[height=2cm]{GHalloween.jpg}
        \caption{Google Halloween Doodle.}
        \label{fig:GHalloween}
    \vspace{1cm}
    \includegraphics[height=2cm]{GThanksgiving.jpg}
        \caption{Google Thanksgiving Doodle.}
        \label{GThanksgiving}
\end{figure}
```

Inserting Figures



Figure 1: Google Halloween Doodle.



Figure 2: Google Thanksgiving Doodle.

Inserting Figures

The 2010 Halloween doodle (Figure \ref{fig:GHalloween}) featured the mystery-solving team in a short 5-panel doodle working to solve the mystery of the missing Google logo.

```
\begin{figure}[h]
  \centering
  \includegraphics[height=2cm]{GHalloween.jpg}
  \caption{Google Halloween Doodle.}
  \label{fig:GHalloween}
\end{figure}
```

Inserting Figures

The 2010 Halloween doodle (Figure 4) featured the mystery-solving team in a short 5-panel doodle working to solve the mystery of the missing Google logo.



Figure 4: Google Halloween Doodle.

Inserting Tables

On this page, you can see the first table in this document (`\ref{samptable}`)

```
\begin{table}[h]
\centering
\begin{tabular}{ c | c | c }\hline
\textbf{Column1} & \textbf{Column2} & \textbf{Column3} \\ \hline
cell1 & cell2 & cell3 \\ \hline
cell4 & cell5 & cell6 \\ \hline
cell7 & cell8 & cell9 \\ \hline
\end{tabular}
\caption{Sample Table}
\label{samptable}
\end{table}
```

Inserting Tables

On this page, you can see the first table in this document (Table 3).

Column1	Column2	Column3
cell1	cell2	cell3
cell4	cell5	cell6
cell7	cell8	cell9

Table 3: Sample Table

Adding a Table of Contents

```
1 \documentclass{article}
2 \usepackage[utf8]{inputenc}
3
4 \title{Spring 2018 Workshop}
5 \author{Yelda Serin}
6 \date{April 19, 2018}
7
8 \begin{document}
9
10 \maketitle
11 \newpage
12
13 \tableofcontents
14 \newpage
15
16 \section{Introduction}
17 As a sample text, we will use the first paragraph
\textbf{Star Trek} is an American media franchise
```

Contents

1	Introduction	3
2	Television series	3
2.1	Star Trek: The Next Generation	3
2.2	Star Trek: Deep Space Nine	3

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L^AT_EX Resources

<http://gradquant.ucr.edu/gradquant-resources/programming-and-databases/>



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Yelda Serin, PhD
yelda.serin@ucr.edu

<http://gradquant.ucr.edu>
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